Bells Line of Road – Castlereagh Connection Corridor Study

Draft Strategic Environmental Assessment

Prepared for: Transport for NSW, Roads and Maritime Services and Department of Planning and Environment

February 2018
Document/Report Control Form

<table>
<thead>
<tr>
<th>File Location Name:</th>
<th>BLor-CC Draft SEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Name:</td>
<td>Bells Line of Road – Castlereagh Connection Corridor Study</td>
</tr>
<tr>
<td>Project Number:</td>
<td>30011748</td>
</tr>
<tr>
<td>Revision Number:</td>
<td>V9</td>
</tr>
</tbody>
</table>

### Revision History

<table>
<thead>
<tr>
<th>Revision #</th>
<th>Date</th>
<th>Prepared by</th>
<th>Reviewed by</th>
<th>Approved for Issue by</th>
</tr>
</thead>
<tbody>
<tr>
<td>v1</td>
<td>1 July 2016</td>
<td>N. Philps</td>
<td>J. Duncan</td>
<td>I. MacLeod</td>
</tr>
<tr>
<td>v2</td>
<td>7 July 2016</td>
<td>N. Philps</td>
<td>J. Duncan</td>
<td>I. MacLeod</td>
</tr>
<tr>
<td>v3</td>
<td>19 July 2016</td>
<td>N. Philps</td>
<td>J. Duncan</td>
<td>I. MacLeod</td>
</tr>
<tr>
<td>V4</td>
<td>16 June 2017</td>
<td>N. Philps</td>
<td>J. Duncan</td>
<td>O. Davies</td>
</tr>
<tr>
<td>V5</td>
<td>1 December 2017</td>
<td>M. Quinn</td>
<td>J. Duncan</td>
<td>O. Davies</td>
</tr>
<tr>
<td>V6</td>
<td>19 December 2017</td>
<td>J. Duncan</td>
<td>N. Philps</td>
<td>R. Russell</td>
</tr>
<tr>
<td>V7</td>
<td>9 January 2018</td>
<td>J. Duncan</td>
<td>N. Philps</td>
<td>O. Davies</td>
</tr>
<tr>
<td>V8</td>
<td>13 February 2018</td>
<td>N. Philps</td>
<td>N. Philps</td>
<td>O. Davies</td>
</tr>
<tr>
<td>V9</td>
<td>20 February 2018</td>
<td>N. Philps</td>
<td>N. Philps</td>
<td>O. Davies</td>
</tr>
</tbody>
</table>

### Issue Register

<table>
<thead>
<tr>
<th>Distribution List</th>
<th>Date Issued</th>
<th>Number of Copies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owen Davies/Arcadis</td>
<td>20 Feb 2018</td>
<td>1</td>
</tr>
<tr>
<td>David Hartmann / Transport for NSW</td>
<td>20 Feb 2018</td>
<td>1</td>
</tr>
<tr>
<td>Jennifer Richardson / NSW Department of Planning and Environment</td>
<td>20 Feb 2018</td>
<td>1</td>
</tr>
<tr>
<td>Geoff Cahill / Transport for NSW</td>
<td>20 Feb 2018</td>
<td>1</td>
</tr>
</tbody>
</table>

SMEC Company Details

Level 5, 20 Berry Street, North Sydney NSW 2060

Tel: (02) 9925 5555  Fax: (02) 9925 5566

Email: [Nicole.Phils@smec.com](mailto:Nicole.Phils@smec.com)  Website: [www.smec.com](http://www.smec.com)

The information within this document is and shall remain the property of **SMEC Australia**.

This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by SMEC. SMEC makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. Changes to available information, legislation and schedules are made on an ongoing basis and readers should obtain up to date information.
# Table of Contents

**Executive Summary** .................................................................................................................x

1. **Introduction** ..............................................................................................................................1  
   1.1 Background ...............................................................................................................................1  
   1.2 The recommended corridor ......................................................................................................1  
   1.3 Purpose of this report ...............................................................................................................2  
   1.4 Strategic environmental assessment guidelines ......................................................................4  
   1.5 Report structure .......................................................................................................................4  

2. **Strategic justification and corridor need** ................................................................................5  
   2.1 Australian policies and strategies ..........................................................................................5  
   2.2 NSW policies and strategies ...................................................................................................9  
   2.3 Local policies and strategies ..................................................................................................18  
   2.4 Corridor need .........................................................................................................................20  
   2.5 Corridor study objectives .......................................................................................................27  
   2.6 Strategic need ..........................................................................................................................27  
   2.7 Strategic analysis of alternative options to corridor protection .............................................28  

3. **Strategic corridor development** ..............................................................................................35  
   3.1 Methodology for the development of the recommended corridor ........................................35  
   3.2 Phase 1 BLoR-CC study area constraints and opportunities ................................................39  
   3.3 Phase 2 Long listed options assessment ..................................................................................41  
   3.4 Phase 3 Short listed options assessment ................................................................................43  
   3.5 Phase 4 recommended corridor establishment .......................................................................44  

4. **Recommended corridor alignment** ..........................................................................................46  
   4.1 Recommended corridor overview ..........................................................................................46  
   4.2 Overview of the future road and design criteria ...................................................................51  
   4.3 Key features ............................................................................................................................52  
   4.4 Potential staging scenarios ......................................................................................................54  

5. **Consultation** ............................................................................................................................55  
   5.1 Consultation objectives and strategy .....................................................................................55  
   5.2 Overview ................................................................................................................................55  
   5.3 Consultation and engagement activities to date .....................................................................55  
   5.4 Future consultation ..................................................................................................................56  

6. **Recommended corridor overview** ..........................................................................................58  
   6.1 Land use and property ............................................................................................................58  
   6.2 Traffic and transport .............................................................................................................63  
   6.3 Noise and vibration ................................................................................................................64  
   6.4 Visual amenity, built form and urban design .........................................................................64  
   6.5 Geology and soils ....................................................................................................................67  
   6.6 Water quality and hydrology .................................................................................................67  
   6.7 Biodiversity ............................................................................................................................69  
   6.8 Aboriginal heritage .................................................................................................................74  
   6.9 Non-Aboriginal heritage .........................................................................................................74  
   6.10 Socio-economic ....................................................................................................................75  
   6.11 Air quality and greenhouse gases .........................................................................................78  

7. **Strategic assessment of impacts of recommended corridor east of Hawkesbury-Nepean River** .........................................................................................................................81
7.1 Land use and property .................................................................81
7.2 Traffic and transport .................................................................89
7.3 Noise and vibration ......................................................................92
7.4 Visual amenity, built form and urban design ..............................93
7.5 Geology and soils .........................................................................95
7.6 Water quality and hydrology .......................................................97
7.7 Biodiversity ...............................................................................102
7.8 Aboriginal heritage .....................................................................105
7.9 Non-Aboriginal heritage ...............................................................108
7.10 Socio-economic .........................................................................110
7.11 Air quality and greenhouse gases ............................................115

8. Strategic assessment of impacts of recommended corridor west of Hawkesbury-Nepean River .................................................................118
8.1 Land use and property .................................................................118
8.2 Traffic and transport .................................................................123
8.3 Noise and vibration ....................................................................125
8.4 Visual amenity, built form and urban design .........................126
8.5 Soil and geology ..........................................................................127
8.6 Water quality and hydrology .......................................................128
8.7 Biodiversity ...............................................................................131
8.8 Aboriginal heritage ...................................................................132
8.9 Non-Aboriginal heritage ...............................................................133
8.10 Socio-economic .........................................................................134
8.11 Air quality and greenhouse gas ................................................137

9. Cumulative impacts and interactions .............................................138

10. Economic impact of potential future infrastructure ..................141
10.1 Expected economic growth potential .......................................141
10.2 Potential impact on economic growth if future infrastructure project is not delivered .................................................142
10.3 Potential impact on related infrastructure projects ....................143

11. Statutory planning considerations ...............................................147
11.1 Introduction ...............................................................................147
11.2 Objectives for the protection of the BLoR-CC recommended corridor .................................................................147
11.3 Current planning framework .....................................................148
11.4 Considerations in reserving land for the BLoR-CC recommended corridor .................................................................152
11.5 EPIs to be amended by the new SEPP ........................................154

12. Environmental risk analysis .........................................................155
12.1 Overview ................................................................................155
12.2 Strategic environmental risk analysis .......................................155

13. Corridor justification and conclusion ..........................................160

14. References ................................................................................161
Figures

Figure 0-1  Map of the recommended corridor ........................................................ xii
Figure 1-1  Location and regional context of the recommended corridor .......... 3
Figure 2-1  The metropolis of the three cities within Greater Sydney .............. 15
Figure 2-2  Greater Sydney Structure Plan (Draft Greater Sydney Region Plan, October 2017) ........................................................................................................... 21
Figure 2-3  Longer-term vision for the Sydney strategic road network (SIS, 2012) ........................................................ 25
Figure 3-1  Phases of development for the BLoR-CC corridor ......................... 35
Figure 3-2  Inputs into constraints and opportunities identification ............... 36
Figure 3-3  Long listed options development process .................................... 37
Figure 3-4  Long listed corridor options ......................................................... 42
Figure 3-5  BLoR-CC short listed corridor options by zone ............................ 45
Figure 4-1  Recommended corridor (detail) .................................................... 47
Figure 4-2  Recommended corridor (detail) .................................................... 48
Figure 4-3  Recommended corridor (detail) .................................................... 49
Figure 4-4  Recommended corridor (detail) .................................................... 50
Figure 6-1  Land use zoning along the recommended corridor ...................... 59
Figure 6-2  Environmental conservation land uses ........................................ 61
Figure 6-3  Landscape character zones across the BLoR-CC study area .......... 66
Figure 6-4  Major waterways in the vicinity of the recommended corridor .... 68
Figure 6-5  TSC Act threatened ecological communities ............................... 72
Figure 6-6  EPBC Act threatened ecological communities ............................ 73
Figure 6-7  Distribution of dominant greenhouse gas producing sectors in NSW (NSW Government, 2014) ................................................................. 79
Figure 7-1  Recommended corridor east of the Hawkesbury River ............... 82
Figure 7-2  Flood evacuation routes and flood islands ................................ 99
Figure 8-1  Recommended corridor west of the Hawkesbury River .............. 120

Tables

Table 2-1  Population growth in planning regions relevant to the BLoR-CC Corridor Study ............................................................ 22
Table 2-2  Projected population to 2036 ......................................................... 22
Table 2-3  Employment forecasts to 2036 ..................................................... 23
Table 3-1  Short listed assessment MCA criteria .......................................... 43
Table 4-1  Design requirements ................................................................. 51
Table 4-2  Proposed interchanges ............................................................... 52
Table 6-1  BLoR-CC landscape character zones ........................................ 65
Table 7-1  Population and dwelling projections in the Blacktown and Penrith LGAs ................................................................. 85
Table 7-2  Strategic appraisal of potential future land use opportunities east of the Hawkesbury-Nepean River .......................... 87
Table 7-3  Strategic traffic modelling for the BLoR-CC recommended corridor... 90
## Glossary

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT</td>
<td>Average annual daily traffic</td>
</tr>
<tr>
<td>ABS</td>
<td>Australian Bureau of Statistics</td>
</tr>
<tr>
<td>AHD</td>
<td>Australian height datum</td>
</tr>
<tr>
<td>AHIMS</td>
<td>Aboriginal Heritage Information Management System</td>
</tr>
<tr>
<td>ARI</td>
<td>Average recurrence interval</td>
</tr>
<tr>
<td>ASA</td>
<td>Air Services Australia</td>
</tr>
<tr>
<td>BLoR-CC</td>
<td>Bells Line of Road - Castlereagh Connection</td>
</tr>
<tr>
<td>CBD</td>
<td>Central Business District</td>
</tr>
<tr>
<td>DCP</td>
<td>Development control plan</td>
</tr>
<tr>
<td>DEC</td>
<td>Direct economic contribution</td>
</tr>
<tr>
<td>DPI</td>
<td>NSW Department of Primary Industries</td>
</tr>
<tr>
<td>EEC</td>
<td>Endangered ecological community</td>
</tr>
<tr>
<td>EIS</td>
<td>Environmental impact statement</td>
</tr>
<tr>
<td>EPA</td>
<td>Environment Protection Authority</td>
</tr>
<tr>
<td>EP&amp;A Act</td>
<td>Environmental Planning and Assessment Act 1979</td>
</tr>
<tr>
<td>EPBC Act</td>
<td>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</td>
</tr>
<tr>
<td>EPI</td>
<td>Environmental planning instrument</td>
</tr>
<tr>
<td>ERP</td>
<td>Estimated resident population</td>
</tr>
<tr>
<td>FTE</td>
<td>Full time equivalent</td>
</tr>
<tr>
<td>GHG</td>
<td>Greenhouse gases</td>
</tr>
<tr>
<td>Growth Centres SEPP</td>
<td>State Environmental Planning Policy (Sydney Region Growth Centres) 2006</td>
</tr>
<tr>
<td>GVA</td>
<td>Gross value added</td>
</tr>
<tr>
<td>Acronym</td>
<td>Definition</td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
</tr>
<tr>
<td>ISEPP</td>
<td>State Environmental Planning Policy (Infrastructure) 2007</td>
</tr>
<tr>
<td>KTP</td>
<td>Key threatening process</td>
</tr>
<tr>
<td>LALC</td>
<td>Local Aboriginal Land Council</td>
</tr>
<tr>
<td>LEP</td>
<td>Local Environment Plan</td>
</tr>
<tr>
<td>LGA</td>
<td>Local Government Area</td>
</tr>
<tr>
<td>LOS</td>
<td>Level of service</td>
</tr>
<tr>
<td>M7</td>
<td>M7 Motorway</td>
</tr>
<tr>
<td>MCA</td>
<td>Multi-criteria analysis</td>
</tr>
<tr>
<td>MNES</td>
<td>Matter(s) of National Environmental Significance (under the EPBC Act)</td>
</tr>
<tr>
<td>NEPM</td>
<td>National environmental protection measures</td>
</tr>
<tr>
<td>OSO</td>
<td>Outer Sydney Orbital</td>
</tr>
<tr>
<td>PACHCI</td>
<td>Procedure for Aboriginal Cultural Heritage Consultation and Investigation</td>
</tr>
<tr>
<td>PAD</td>
<td>Potential archaeological deposit</td>
</tr>
<tr>
<td>PCL</td>
<td>Cumberland Plain Priority conservation land(s)</td>
</tr>
<tr>
<td>PMF</td>
<td>Probable maximum flood</td>
</tr>
<tr>
<td>SEA</td>
<td>Strategic Environmental Assessment</td>
</tr>
<tr>
<td>SEPP</td>
<td>State Environmental Planning Policy</td>
</tr>
<tr>
<td>SHR</td>
<td>State Heritage Register</td>
</tr>
<tr>
<td>SIS</td>
<td>State Infrastructure Strategy</td>
</tr>
<tr>
<td>TEC</td>
<td>Threatened ecological community</td>
</tr>
<tr>
<td>TfNSW</td>
<td>Transport for NSW</td>
</tr>
<tr>
<td>TSC Act</td>
<td>NSW Threatened Species Conservation Act 1995</td>
</tr>
<tr>
<td>VRZ</td>
<td>Vegetated riparian zone</td>
</tr>
<tr>
<td>yBP</td>
<td>Year before present</td>
</tr>
</tbody>
</table>
Executive Summary

Project overview

The Bells Line of Road–Castlereagh Connection (BLoR–CC) corridor draft Strategic Environmental Assessment is an investigation to identify a suitable transport corridor to link Sydney’s existing motorway network to Bells Line of Road at Kurrajong Heights. The investigation has been initiated by Transport for NSW, and the Department of Planning and Environment to identify, plan and protect a transport corridor for the future. The need for the protection of a transport corridor for the BLoR–CC was identified in the Bells Line of Road Long Term Strategic Corridor Plan and subsequently supported in the Draft Future Transport Strategy 2056, A Plan for Growing Sydney, Towards Our Greater Sydney 2056, Draft Greater Sydney Region Plan, Draft District Plans and the State Infrastructure Strategy.

The Long Term Transport Master Plan and the Draft Future Transport Strategy 2056 recognise the need to protect major transport corridors to meet Sydney’s future transport requirements and includes the BLoR-CC corridor that would connect the M7 Motorway at Dean Park and Bells Line of Road in the vicinity of Kurrajong Heights.

The current investigation supports proposed protection of the recommended corridor to be established through a State Environmental Planning Policy (SEPP) and relevant local environmental plans (LEP).

Purpose of this report

This draft Strategic Environment Assessment (SEA) has been prepared as the evidence base to inform the creation of statutory planning controls to secure land for the purpose of long term infrastructure along the recommended corridor. This SEA is not a statutory requirement, rather it is intended to provide sufficient information to allow the implications and impacts of reserving a corridor to be understood.

The key objectives of this draft SEA are to:

• Identify the strategic justification and need for the future BLoR-CC corridor
• Provide the evidence base to inform the creation of statutory planning controls that protect land for the purpose of a long term transport infrastructure corridor
• Describe the baseline conditions of the recommended corridor and surrounding areas with regard to key environmental aspects
• Undertake a strategic impact assessment of the recommended corridor
• Recommend appropriate strategic mitigation and management measures to support the protection of the recommended corridor
• Identify any statutory planning implications of the recommended corridor for consideration.

Strategic need

North-western Sydney is set to grow dramatically over the next 30 years with increased demand for improved transport connections. Given the rapid expansion of development in north-western Sydney, early protection of a transport infrastructure corridor is vital to ensure there is sufficient land available in the future when the construction is required. With the expected change in patterns of land use, early protection of land for a future corridor will be beneficial in providing certainty around land use, minimising acquisition costs, avoiding future disturbance, and providing new opportunities for land use and economic development.

The existing Bells Line of Road provides an alternative route to the Great Western Highway across the Blue Mountains, providing an important east-west link between Sydney and central and western NSW. A long term need to connect Bells Line of Road to the Sydney motorway network has been identified to meet future freight and passenger vehicle traffic demands and to provide a missing link in the Sydney motorway network.

By reserving the BLoR-CC recommended corridor now, the NSW government is securing the opportunity to address future transport needs in the longer term when traffic volumes (including freight) require it.

The reservation of a transport corridor also provides an opportunity to contribute toward long term flood evacuation strategies for north-western Sydney. The Hawkesbury-Nepean area is one of the most flood...
prone regions in Australia and the corridor may provide an opportunity to deliver infrastructure that would provide a potential alternative flood evacuation route.

The proposed BLoR-CC corridor is consistent with a number of key Australian, state and local government policies and strategies such as the Australian Infrastructure Plan and the Draft Future Transport Strategy. The proposed corridor will support the Draft Greater Sydney Region Plan and the district planning priorities providing alignment between land use and infrastructure planning. Identifying and reserving a corridor for the proposed BLoR-CC is an important initiative to undertake before development in the region reduces future opportunities for such a piece of infrastructure. It would also provide clarity for the NSW Government, councils, existing residents and planners in the area and better enable future cost effective infrastructure delivery.

**Methodology and purpose of corridor protection**

The process that was followed to identify and protect a corridor of land for future transport infrastructure, included initial stakeholder engagement and involved:

1. Identifying and consulting on a broad study area
2. Identifying viable corridor options
3. Evaluating the options to identify a short list of options
4. Evaluating the short list of options to identify a recommended corridor
5. Preparing a draft SEA of the recommended corridor to support the corridor protection process.

This has been an iterative process that commenced with the identification of environmental and social constraints, planning considerations, engineering criterial and geographic constraints such as topography and waterways. Over 100 corridor options were originally identified and through several rounds of multi-criteria analysis and evaluation they were narrowed down to the selection of the recommended corridor.

**Recommended corridor**

The recommended corridor is around 40 kilometres long and extends through the local government areas (LGAs) of Blacktown, Hawkesbury and Penrith (refer Figure 0-1). The recommended corridor has a varying width which is highly dependent on the existing topography and ranges from 80 metres to 140 metres. It commences at the M7 Motorway at Dean Park and then proceeds due west south of the North West Growth Area along the existing Castlereagh Freeway reservation for about 10 kilometres. It then deviates south-west from the existing Castlereagh Freeway reservation, to cross The Northern Road and Cranebrook Road. From Cranebrook Road, the recommended corridor skirts a section of Cumberland Plain Priority Conservation Lands (PCLs) just north of the Wianamatta Nature Reserve. It then runs along the southern edge of the PCL on a left hand curve, crossing Castlereagh Road and the flood plain of the Nepean River. After crossing the Nepean River, the recommended corridor heads north west to cross the Grose River. It then continues in a north west direction, parallel to Grose Wold Road before crossing Grose Vale Road twice. The recommended corridor continues north before bearing north west just south of the existing Bells Line of Road at Kurrajong Hills. It then runs parallel to the existing Bells Line of Road for approximately 700 metres and crosses it in a north-easterly direction at Kurrajong Hills.

The recommended corridor then proceeds north before turning west where the corridor is anticipated to be in a tunnel. It returns to the surface west of Kurrajong Heights for around two kilometres where it ties in with the existing Bells Line of Road.

The recommended corridor utilises the existing Castlereagh Freeway reservation at the eastern end between the M7 Motorway and just east of The Northern Road. Between The Northern Road and Castlereagh Road, the recommended corridor moves to the south of the existing reservation. The benefits of moving the corridor in this area are to decrease the impact on the PCLs, however, this does result in increased private property impacts. To minimise the impacts on properties, the recommended corridor is located close to property boundaries wherever possible.
Figure 0-1  Map of the recommended corridor
Strategic assessment of potential impacts

The intention of the BLoR-CC Study has been to identify a corridor that balances infrastructure benefits and opportunities with land use and environmental impacts. However, it is unavoidable that a range of impacts would occur. These potential impacts have been assessed at a strategic level in the context of both the current corridor planning process and a possible future infrastructure project. It is noted that any future project would require design development and would be subject to a full environmental assessment under the legislation relevant at that time.

Key potential impacts that have been identified include:

Land use and property impacts

- The recommended corridor covers an area of approximately 528 hectares in total. This includes approximately 155 hectares of land already zoned for the Castlereagh Freeway (mostly zoned SP2 Infrastructure) and an additional 373 hectares that is currently zoned for a range of other land uses.
- Although the land for the corridor would be rezoned, there is provision under ‘existing use rights’ for land owners to continue with current uses (provided the use is already lawfully commenced). However, there would be some restrictions on new development, change of use, and intensification of use.
- Land within the corridor would be acquired in accordance with the Land Acquisition (Just Terms Compensation) Act 1991 when required, which could be many years or decades away, or earlier if owner-initiated.
- The recommended corridor would impact on 428 properties, including 22 that are impacted by both the Outer Sydney Orbital (OSO) and the BLoR-CC.
- Impacts on residential and employment zones have been reduced wherever possible including minimal impact on the released precincts in the North West Growth Area.
- The corridor would bisect the unreleased Shanes Park Precinct within the North West Growth Area and together with the combined impact of OSO corridor would reduce its suitability for future residential development. However, this precinct is flood prone and there is little opportunity for new housing to occur there.

Traffic, noise, visual and hydrology impacts

- A future motorway within the recommended corridor would generate noise levels that may impact on sensitive receivers such as residential dwellings, schools and child care centres and noise mitigation would need to be considered as part of any future infrastructure project.
- A future motorway would have high visual sensitivity due to the proximity to rural residential and urban areas. Some elements of a future motorway, such as bridges and cuttings, particularly in the western section, would represent a particularly high visual impact. This can be mitigated during detailed design and environmental assessment by integrating bridges and earthworks into the landscape to reduce the visual impact.
- Vegetation clearing would increase the visibility of a future motorway. This can be mitigated by designing the future motorway to avoid prominent trees and vegetation communities where possible by using plantings to assist with screening and reducing the scale of the motorway.
- A future motorway would improve traffic capacity, reduce existing congestion on key arterial roads such as Richmond Road, improve travel times and increase the efficiency of freight movements. It would also provide an additional option for flood evacuation, which is an important issue in the region.
**Biodiversity**

- The recommended corridor minimises major biodiversity impacts compared with other options considered).
- A future motorway would however require some clearing of native vegetation, including TECs such as Cumberland Plain Woodland.
- Direct impacts on the edges of the future Colebee Nature Reserve, PCLs at Castlereagh, and riparian vegetation along the Hawkesbury-Nepean River would occur when a future motorway is constructed.
- Construction of a future motorway would result in further fragmentation to existing native vegetation remnants west of the Hawkesbury-Nepean River.
- Vegetation clearing would disrupt wildlife connectivity and remove habitat.
- A biodiversity offset strategy would need to be developed to manage the process of identifying and securing suitable offset sites and vegetation corridor connectivity.

**Aboriginal and non-Aboriginal heritage**

- The recommended corridor is adjacent to areas of exceptional cultural significance (Colebee and Nurragingy Land Grant and the Blacktown Native Institution) listed on the State Heritage Register.
- The lack of Aboriginal and non-Aboriginal heritage recorded sites west of the Hawkesbury-Nepean River is not indicative of less Aboriginal activity and field investigations would be required in order to identify any further sites in order to understand the potential impacts.
- The recommended corridor would have direct impacts on Commonwealth heritage listed Llandilo International Transmitting Station and Shale Woodland on the former Air Serves Australia site at Shanes Park.
- There would be direct and indirect impacts on a number of local heritage listed items, including Castlereagh Road.

**Socio-economic impacts**

- The constraint of a future motorway would cause some severance of prime agricultural land around Llandilo and Castlereagh.
- There would be no direct impact on social infrastructure but the recommended corridor would pass within 500 metres of a number of schools, places of worship and community halls and a future motorway may result in a reduction of amenity for users of these facilities.
- A total of 23 businesses could be potentially impacted by the recommended corridor and the land used by 13 existing businesses could be potentially severed by future transport infrastructure.
- In some cases, the future motorway would represent a barrier between communities, however the provision of interchanges and connections between the local road network across the corridor would reduce these impacts and maintain access opportunities.
Department of Planning and Environment planning process

The primary objective of this draft SEA is to justify the protection of land for the BLoR-CC corridor to, in the future, provide an essential transport link connecting the Sydney motorway network to Bells Line of Road and the second crossing of the Blue Mountains. This would potentially be achieved through the preparation of a new SEPP that would introduce appropriate zonings and controls to protect a corridor.

The SEPP is expected to amend the Blacktown, Hawkesbury and Penrith LEps and the Growth Centres SEPP to protect the recommended corridor. The protected corridor would be shown on the relevant maps in the relevant environmental planning instruments (EPIs). This would enable landowners, and future landowners, to identify whether the protection applies to their land within the recommended corridor.

Controls may also be included in the relevant EPIs to address corridor protection and potential amenity impacts such as noise. Controls would include noise standards and measures to reduce noise for new planning proposals and rezoning requests in an area within an identified vicinity of the corridor, which would be mapped in the relevant EPIs.

The existing use rights provisions established in ss106-109B of the Environmental Planning and Assessment Act, 1979 (EP&A Act) and Clause 5.1(3) of the Standard Instrument would enable the continuation of current approved uses until such time as the future corridor is built.

Land within the corridor may be acquired over time and at any phase of the corridor planning process. Acquisition can either occur through negotiated agreements, through owner-initiated acquisition or through compulsory acquisition if required close to the time when the infrastructure is built. Owners may initiate acquisition in cases of hardship subject to the Land Acquisition (Just Terms Compensation) Act 1991 and other relevant legislation (such as the Roads Act 1993). Further information on property acquisition is available at www.transport.nsw.gov.au.

Conclusions

A future need for a new connection between the M7 Motorway at Dean Park and Bells Line of Road in the vicinity of Kurrajong Heights has been identified in a number of strategic plans, such as the Bells Line of Road Long Term Strategic Corridor Plan and subsequently supported in the Draft Future Transport Strategy 2056, Draft Greater Sydney Services and Infrastructure Plan, A Plan for Growing Sydney, draft Greater Sydney Region Plan and District Plans, and the State Infrastructure Strategy.

Given the rapid expansion of development in north-western Sydney, early protection of a corridor is vital to ensure that there is sufficient land available in the future to provide options for future infrastructure development. With the expected change in patterns of land use, early protection of a corridor will be beneficial in providing certainty around land use, minimising acquisition costs, avoiding redundant development, and providing new opportunities for land use and economic development that would perhaps not otherwise be realised. By reserving the corridor now, the NSW government is securing the opportunity to address future transport needs in the longer term when required.

Protection of a transport corridor would provide for the ultimate operation of a future motorway that would meet growing population needs in north-western Sydney, contribute to reduced congestion costs, increased accessibility and provide infrastructure to efficiently move freight and people through the BLoR-CC study area, as well as improving regional connectivity in the long term.

It would also provide clarity for the NSW Government and councils, and provide greater confidence for existing residents and development in the area. It will assist in guiding and informing the delivery of other transport infrastructure in north-western Sydney.
Protection of the BLoR-CC recommended corridor represents a strategic transport initiative that balances infrastructure benefits and opportunities with land use and environmental impacts and is consistent with the stated objectives of relevant Australian and NSW strategic policies and plans as discussed in section 2 of this report.

It is recommended that the recommended corridor be zoned as SP2 (Reserved Infrastructure Corridor). The remainder of the existing Castlereagh Freeway corridor reservation between The Northern Road and the Nepean River would no longer be required for future infrastructure purposes, representing around half of the existing corridor. There would therefore be an opportunity to consider rezoning of this corridor for other land uses. Given its high conservation value and surrounded by Cumberland Plain PCLs, there may be an opportunity to increase the environmental conservation holdings in the Penrith LGA by applying a suitable conservation rezoning to the redundant land (currently zoned as SP2). However, the ultimate rezoning option that is selected would need to be considered by Penrith Council in consultation with the Department of Planning and Environment. A small area of SP2 land within Hawkesbury City would also need to be rezoned.
1. Introduction

1.1 Background

This Bells Line of Road–Castlereagh Connection (BLoR–CC) corridor draft Strategic Environmental Assessment is an investigation to identify a suitable transport corridor to link Sydney’s existing motorway network to Bells Line of Road at Kurrajong Heights. The investigation has been initiated by Transport for NSW, and the Department of Planning and Environment to identify, plan and protect a transport corridor for the future. The need for the protection of a transport corridor for the BLoR–CC was identified in the Bells Line of Road Long Term Strategic Corridor Plan and subsequently supported in the NSW Long Term Transport Master Plan, the Draft Future Transport Strategy 2056, A Plan for Growing Sydney, Towards Our Greater Sydney 2056, Draft Greater Sydney Region Plan, Draft District Plans and the State Infrastructure Strategy.

The Long Term Transport Master Plan and the Draft Future Transport Strategy 2056 recognise the need to protect major transport corridors to meet Sydney’s future transport requirements and includes the BLoR-CC corridor that would connect the M7 Motorway at Dean Park and Bells Line of Road in the vicinity of Kurrajong Heights.

The outcome of the current investigation will be the protection of a recommended corridor suitable for a future motorway linking the M7 to the Bells Line of Road near Kurrajong. It is intended that the corridor would be established through a State Environmental Planning Policy (SEPP) and included in relevant local environmental plans (LEP).

The process that was followed to identify and protect a corridor of land for future transport infrastructure, included initial stakeholder engagement and involved:

1. Identifying and consulting on a broad study area
2. Identifying viable corridor options
3. Evaluating the options to identify a short list of options
4. Evaluating the short list of options to identify a recommended corridor
5. Preparing a draft Strategic Environmental Assessment (SEA) of the recommended corridor to support the corridor protection process.

1.2 The recommended corridor

The recommended corridor is around 40 kilometres long and extends through the local government areas (LGAs) of Blacktown, Hawkesbury and Penrith (refer to Figure 1-1). The recommended corridor has a varying width which is highly dependent on the existing topography and ranges from 80 metres to 140 metres. It commences at the M7 at Dean Park and then proceeds due west south of the North West Growth Area along the existing Castlereagh Freeway reservation for about 10 kilometres. It then deviates south-west from the existing Castlereagh Freeway reservation, to cross The Northern Road and Cranebrook Road. From Cranebrook Road, the recommended corridor crosses a section of Cumberland Plain Priority Conservation Lands (PCLs) just north of the Wianamatta Nature Reserve. It then runs along the southern edge of the PCLs on a left hand curve, crossing Castlereagh Road and the flood plain of the Nepean River. After crossing the Nepean River, the recommended corridor heads north west to cross the Grose River. It then continues in a north west direction, parallel to Grose Wold Road before crossing Grose Vale Road twice. The recommended corridor continues north before bearing north west just south of the existing Bells Line of Road at Kurrajong Hills. It then runs parallel to the existing Bells Line of Road for approximately 700 metres and crosses it in a north-easterly direction at Kurrajong Hills. The recommended corridor then proceeds north before turning west where the corridor

...
is anticipated to be in a tunnel. It returns to the surface west of Kurrajong Heights for around two kilometres where it ties in with the existing Bells Line of Road.

A detailed description of the recommended corridor is provided in Chapter 4.

1.3 Purpose of this report

This draft strategic environment assessment (SEA) has been prepared as the evidence base secure land for the purpose of long term infrastructure along the recommended corridor. This SEA is not a statutory requirement, rather it is intended to provide sufficient information to allow the implications and impacts of reserving a corridor to be understood.

The key objectives of this draft SEA are to:

- Identify the strategic justification and need for the future BLoR-CC corridor
- Provide the evidence base to inform the creation of statutory planning controls that protect land for the purpose of a long term transport infrastructure corridor
- Describe the baseline conditions of the recommended corridor and surrounding areas with regard to key environmental aspects
- Undertake a strategic impact assessment of the recommended corridor
- Recommend appropriate strategic mitigation and management measures to support the protection of the recommended corridor
- Identify the statutory planning implications of the recommended corridor and make recommendations on potential draft clauses or instructions for the protection of the corridor.

The draft SEA is intended only to support the protection of land for potential future transport infrastructure use, if and when it is required. At such time, detailed design of the final alignment would be undertaken and an environmental assessment of the proposed project under the *Environmental Planning and Assessment Act*, or the relevant legislation at that time, would be prepared.

Community engagement is an essential part of the corridor planning process. Consultation on the recommended corridor will inform the final alignment to be considered by Government for planning protection.
Figure 1-1  Location and regional context of the recommended corridor
1.4 Strategic environmental assessment guidelines

The NSW Department of Planning and Environment has issued SEA guidelines to consider as part of the BLoR-CC Corridor Study. A checklist is provided in Appendix A outlining the relevant sections of this report which address the Guidelines.

1.5 Report structure

The remainder of this draft SEA has the following structure:

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 2</td>
<td>Outlines the strategic justification and corridor need, including a strategic analysis of alternatives to corridor protection</td>
</tr>
<tr>
<td>Chapter 3</td>
<td>Provides an overview of the corridor development process and the constraints, alternatives and options investigated in order to arrive at the selection of the recommended corridor</td>
</tr>
<tr>
<td>Chapter 4</td>
<td>Provides a description of the recommended corridor alignment</td>
</tr>
<tr>
<td>Chapter 5</td>
<td>Provides a summary of the consultation activities undertaken to date</td>
</tr>
<tr>
<td>Chapter 6</td>
<td>Provides an overview of the environmental and social context of the recommended corridor</td>
</tr>
<tr>
<td>Chapter 7</td>
<td>Provides a strategic assessment of environmental issues east of the Hawkesbury-Nepean River and proposes environmental management measures</td>
</tr>
<tr>
<td>Chapter 8</td>
<td>Provides a strategic assessment of environmental issues west of the Hawkesbury-Nepean River and proposes environmental management measures</td>
</tr>
<tr>
<td>Chapter 9</td>
<td>Provides a discussion of the cumulative impacts and interactions of the recommended corridor with other projects in the region</td>
</tr>
<tr>
<td>Chapter 10</td>
<td>Outlines the economic impact of potential future infrastructure</td>
</tr>
<tr>
<td>Chapter 11</td>
<td>Outlines the statutory planning considerations</td>
</tr>
<tr>
<td>Chapter 12</td>
<td>Details the environmental risk analysis process by which the potential environmental issues for assessment were identified</td>
</tr>
<tr>
<td>Chapter 13</td>
<td>Presents the justification for the protection of the recommended corridor and summarises the findings of the draft SEA.</td>
</tr>
</tbody>
</table>
2. Strategic justification and corridor need

This chapter presents the strategic justification and need for the corridor, including consistency with Australian, NSW and local policies and strategies. It also outlines the corridor objectives, the intended long term outcomes of the corridor and considers, at a strategic level, the alternatives to the corridor.

2.1 Australian policies and strategies

Australian Infrastructure Audit

The Australian Infrastructure Audit (the Audit) (Infrastructure Australia, 2015) examines the drivers of future infrastructure demand across each state in Australia, particularly population and economic growth. The Audit provides a top-down assessment of the value-add, or Direct Economic Contribution of infrastructure. It also considers the future demand for infrastructure over the next 15 years and provides an evidence base for further gap analysis, long term planning and future investment priorities.

The Audit identifies specific challenges including improving infrastructure planning, increasing funding, and the need for sustainable development and improved environmental outcomes. The challenges, which will influence future infrastructure needs, include:

- Population – high population growth, particularly in our major cities, will necessitate the delivery of new and renewed infrastructure
- Connectivity – modernised infrastructure networks and gateways are needed to link businesses, boost trade and improve access to the workplace
- Governance – integrated planning, transparent project selection, and stakeholder consultation are essential and all have to improve
- Regional – how infrastructure improvements can enhance local service standards and facilitate rural and regional growth.

The Audit considers the principal drivers of infrastructure demand – population and economy, and ranked the Greater Sydney region first for the Direct Economic Contribution of infrastructure in 2011 ($42.8 billion) and in 2031 ($79.8 billion). Audit findings that will influence transport infrastructure demand include the following:

- The NSW population is projected to reach 9.1 million by 2031, an increase of 1.9 million people or 26 per cent from 2011
- Population growth in Greater Sydney is expected to reach 6.25 million people in 2031, an increase of 1.6 million from 2011
- Major growth is expected in several key areas, including the North West Corridor
- Demand for urban transport infrastructure is projected to increase significantly
- The cost of congestion in capital cities is expected to increase to around $53.3 billion in 2031, an increase of around 290 per cent on 2011 costs, in the absence of additional capacity and/or demand management. A significant proportion of this originates from the Sydney – Newcastle – Wollongong urban area where it is expected to cost around $14.8 billion by 2031
- Urban transport decisions need to complement land use decisions – there remains a risk that community resistance to land use change and higher densities will undermine the economic, social and environmental benefits of investment in urban transport
The national land freight task is expected to grow by 80 per cent between 2011 and 2031, with a large component of this task expected to be handled by road freight vehicles.

**Australian Infrastructure Plan**

The *Australian Infrastructure Plan – Priorities and reforms for our nation’s future* (Infrastructure Australia, 2016) emphasises the importance of quality integrated long-term infrastructure and land use planning, stakeholder engagement and project development studies, and the need to protect corridors and strategic lands for future investments, noting that corridor protection is “often overlooked in government budgets in preference to funding other near-term priorities”.1

The Infrastructure Plan also notes that the failure to protect corridors “reduces the ability of governments to respond to infrastructure pressures and raises the cost of delivering future projects. Nor does the solution lie underground. It is estimated that tunnels – a necessary response to the failure to preserve corridors – can be eight to 10 times more expensive than surface alternatives”. Corridor protection makes future projects more affordable, increasing the likelihood they can be delivered when required. While the BLoR-CC is not identified in the first Infrastructure Priority List, the principles and recommendations of the Infrastructure Plan remain relevant.

This BLoR-CC corridor draft SEA is being undertaken in response to an identified future need for infrastructure and the recognised importance of proactive and integrated transport planning to manage the complex interaction of needs and demands for such projects. This study is consistent with the recommendations of the Audit and the Infrastructure Plan.

Protection of a transport corridor for a future motorway would help facilitate future infrastructure that would meet growing population needs in north-western Sydney, contribute to reduced congestion costs, increased accessibility and provide infrastructure to efficiently move freight and people through the BLoR-CC study area as well as improving regional connectivity in the long term.

**Corridor Protection: Planning and investing for the long term**

Building on the Australian Infrastructure Plan, Infrastructure Australia released *Corridor Protection: Planning and investing for the long term* (IA Corridor Protection) in July 2017. IA Corridor Protection is part of Infrastructure Australia’s reform series and outlines the case for effective corridor protection for future infrastructure projects. IA Corridor Protection identifies that effective corridor protection reduces the future financial costs of delivering infrastructure, while minimising the social costs of acquiring homes and businesses, and disrupting existing communities.2

To maximise the advantage of corridor protection the report outlines that corridors should be integrated with metropolitan and regional land use strategies and that where relevant, reserved corridors can be shared by multiple infrastructure networks.3 In addition, it states that the cost of protecting a corridor and acquiring the corridor early is likely to be significantly less than acquiring the necessary land at a later date.4

Corridor protection is especially important to avoid the possibility that alignment options beyond the current Growth Areas are not closed out.5 The BLoR-CC recommended corridor meets these objectives in relation to north-western Sydney.

---

1 Infrastructure Australia (2016) *Australian Infrastructure Plan – Priorities and reforms for our nation’s future*, pg 156.
2 Infrastructure Australia (2017) *Corridor Protection – Planning and investing for the long term*, pg 2.
3 Infrastructure Australia (2017) *Corridor Protection – Planning and investing for the long term*.
5 Infrastructure Australia (2017) *Corridor Protection – Planning and investing for the long term*, pg 27.
State of Australian Cities 2014-2015

The *State of Australian Cities 2014-2015* (Department of Infrastructure and Regional Development, 2014) brings together current research and data to present a comprehensive picture of how Australia’s major cities are evolving. The report found that in 2015 there was more demand for transport in Australia than ever before, with measures such as kilometres of total travel and freight traffic at the highest levels ever recorded. Consequently, average commuting times in major cities have also increased. It emphasises the importance of improved integration of long term planning in order to anticipate and address growing demand and avoid unnecessary additions to transport tasks, making efficient use of existing transport infrastructure and identifying and planning for future needs.

The report notes that transport infrastructure has an important role to play in shaping cities. With much of the population growth occurring on the urban fringes, an increasing number of people are living further away from city centres and the jobs they provide, leading to a growing need to effectively connect homes and workplaces.

The BLoR-CC draft SEA is responding to the identified population and employment growth in Western Sydney and supports integrated long term transport planning decision making. The Study uses an evidence based approach to the development of corridor options and in responding to the expected continued growth in western and north-western Sydney. As such, the Study is consistent with the recommendations of the *State of Australian Cities*.

Our Cities, Our Future – A national urban policy for productive, sustainable and liveable future

*Our Cities, Our Future – A national urban policy for productive, sustainable and liveable future* (Commonwealth of Australia, 2011) (the National Urban Policy) established the Australian Government’s objectives and directions for the future development of the country’s cities.

The National Urban Policy focuses on the following three themes:

- **Productivity** – to harness the productivity of Australia’s people and industry by better managing our use of labour, creativity, knowledge, land and infrastructure
- **Sustainability** – to advance the sustainability of Australia’s natural and built environment, including through better resource and risk management
- **Liveability** – to enhance the liveability of our cities by promoting better urban design, planning and affordable access to recreational, cultural and community facilities.

The National Urban Policy recognises that a major impediment to the placement of new infrastructure or the expansion of existing infrastructure is the lack of planning for, and protection of, critical infrastructure corridors or sites. The added protection of buffers is important in preventing encroachment by incompatible land uses. The National Urban Policy states that limiting the placement of infrastructure has the potential to impede a city’s productivity and liveability. The Policy notes that there is a need to plan and protect corridors, sites and buffers as part of integrated land use and infrastructure planning.

The identification of a recommended corridor for BLoR-CC is consistent with the National Urban Policy objectives including ‘integration of land use and infrastructure’. The early protection of a future transport corridor will allow its protection from incompatible development activities until the traffic demands achieve a level where construction of a motorway is required.

Western Sydney City Deal

The *Western Sydney City Deal* is part of a Memorandum of Understanding between the Australian and New South Wales Governments to improve collaboration, governance, strategic planning, investment and reform in order to accelerate growth and job creation,
stimulate urban renewal and drive economic reforms. The Western Sydney City Deal recognises that Western Sydney will grow by more than one million people over the next 20 years and there is a need to support jobs growth in parallel with increasing population. The Western City Deal builds on the Australian Government’s commitment to deliver a Western Sydney Airport and leverage other key infrastructure investments to catalyse jobs growth and better transport links.

With the aim of delivering transformative change for Western Sydney, the City Deal will result in an increase in infrastructure investment to “unlock the economic potential of the region, reduce congestion and support local needs”.

BLoR-CC is expected to be one of the emerging priorities for future investment under the Western Sydney City Deal.

National Land Freight Strategy – A place for freight

In 2012, the Standing Council on Transport and Infrastructure released the National Land Freight Strategy – A place for freight (National Land Freight Strategy) (Commonwealth of Australia, 2012). It recognises that integrated, long term corridor protection is essential to ensuring efficient and sustainable freight logistics. The National Land Freight Strategy identifies that the failure to protect corridors could result in preferred routes being built out by encroaching development, sub-optimal routes being used or the requirements for expensive alternatives such as tunnelling.

The protection of the recommended corridor is consistent with the National Land Freight Strategy and as described above, would secure its protection until construction of a future motorway is required. In the long term, a future motorway in the recommended corridor would contribute to the improvement of freight efficiency across NSW.

National Ports Strategy – Infrastructure for an Economically, Socially, and Environmentally Sustainable Future

The National Ports Strategy – Infrastructure for an Economically, Socially and Environmentally Sustainable Future (National Ports Strategy) (Infrastructure Australia, 2011) outlines the actions needed to facilitate trade growth and improve the efficiency of port-related freight movement across infrastructure networks delivering investment certainty, efficiencies in supply chains, and timely and efficient approvals. The planning and protection of corridors was identified as a key issue to improve the performance of ports.

The protection of a transport corridor, such as the BLoR-CC, is consistent with improving the efficiency of freight movements across the infrastructure network. The BLoR-CC corridor would provide a key missing link to the existing motorway network and would support the management of freight within and through the BLoR-CC study area. It would also improve the efficiency of access for goods between the Central West, north-western Sydney and Port Botany in the longer term.

National Road Safety Strategy 2011-2020

The National Road Safety Strategy 2011-2020 (Australian Transport Council, 2011) has a guiding vision that no person should be killed or seriously injured on Australia’s roads. To achieve this long term vision, the National Road Safety Strategy provides a 10 year plan which proposes to reduce the annual number of deaths and serious injuries on Australian roads by at least 30 per cent by 2020.

The National Road Safety Strategy is complemented by the National Road Safety Action Plan 2015-2017 (Transport and Infrastructure Council, 2014) which details a range of priority national actions to be taken by governments. Of direct relevance to the BLoR-CC study is the

---

action to “prioritise and treat high-risk rural and urban roads, focussing on the main crash types and vulnerable road users”.

Provision of the BLoR-CC corridor and the ultimate expected development of a motorway would improve road safety within the BLoR-CC study area and support the reduction in serious injuries and fatalities as set out within the National Road Safety Strategy. The expected motorway would most likely be access controlled, have no traffic signals, be of motorway standard and would provide higher levels of safety than the surrounding arterial connectors, thereby potentially delivering an improved road safety outcome.

2.2 NSW policies and strategies

**NSW Long Term Transport Master Plan**

The *NSW Long Term Transport Master Plan* (Transport for NSW, 2012), released in December 2012, defined the direction for transport planning for the following 20 years, and set the framework for transport and policy decisions.

Some key challenges outlined in the Long Term Transport Master Plan that may be addressed by transport network improvements such as protection of strategic corridors like BLoR-CC, include:

- Accommodating land use, growth and urban renewal
- Meeting the increasing demand for Sydney’s growing travel needs
- Equipping Greater Sydney for jobs growth
- Protecting critical strategic and growth corridors
- Providing essential access to regional NSW
- Supporting efficient and productive freight movements.

A key focus of the Long Term Transport Master Plan is the completion of the motorway network in Sydney to meet the projected demand for vehicles and freight.

The BLoR-CC corridor is one of the identified missing links that is required to complete the Sydney motorway network, and in particular to strengthen the connections of Sydney’s motorway network to regional NSW.

**Draft Future Transport Strategy 2056**

The *Draft Future Transport Strategy 2056* (Future Transport Strategy) (NSW Government, 2017b) was released by Transport for NSW in October 2017. The Future Transport Strategy is an update of the *NSW Long Term Transport Master Plan*. Future Transport Strategy sets the 40 year vision, directions and outcomes framework for customer mobility in NSW, which will guide transport investment over the longer term. Future Transport will be delivered through the Draft Services and Infrastructure Plans and Draft Supporting Plans including:

- Draft Greater Sydney Services and Infrastructure Plan
- Draft Regional NSW Services and Infrastructure Plan
- Draft Road Safety Plan
- Draft Tourism and Transport Plan.

The Future Transport Strategy is responding to changes in technology and rapid innovation is changing traditional modes of travel. As such, the Future Transport Strategy provides a mechanism for preparing for change brought about by changes in technological innovations.

The six state-wide outcomes to guide investment, policy and reform and service provision include:
1. Customer focused - every customer experience will be seamless, interactive and personalised by technology and big data

2. Successful places – by having a local focus across NSW, NSW supports the growth of communities, places and the economy

3. Growing the economy - a transport system that powers NSW’s $1.3 trillion economy and enables economic activity across the state

4. Safety and performance – the transport network will provide every customer with efficiency, safe and secure travel across a high performing network

5. Accessible services – making it possible for everyone to get the most out of life, wherever you live

6. Sustainability – by building a more efficient network deliver benefit for the environment, economy and wellbeing.

The Future Transport Strategy aligns with plans and strategies developed by the Greater Sydney Commission, Infrastructure NSW, and the Department of Planning and Environment. The Future Transport Strategy builds on the vision for Greater Sydney as a metropolis of three 30 minute cities and identifies the development of infrastructure which is as flexible as possible and embed future optionality, maximise capacity, and support innovative service and technology provision and demand management to optimise network performance. As part of enhancing the transport network, the Future Transport Strategy identifies the need to reserve corridors for future network development.

The Future Transport Strategy identifies a staged investment approach that is flexible and respond to change and uncertainty and sets up categories for initiatives:

1. Committed / funded initiatives (0-10 years) where funds are already committed for immediate planning

2. Initiatives for investigation (0-10, 10-20 years) for initiatives to be investigated for potential commitment or implementation with the next 20 years

3. Visionary initiatives (20+ years) for longer term indicatives that may be investigated within the next 10 years, but are unlikely to require implementation with 20 years.

Protection of the BLoR-CC corridor is identified in initiatives for investigation (0-10 years) and new infrastructure provision of the BLoR-CC is identified as a visionary initiative.

NSW Freight and Ports Strategy

The NSW Freight and Ports Strategy (Transport for NSW, 2013) is a core component of NSW’s overall strategic planning framework and supports the goals identified in NSW 2021. It includes the objective of delivering a freight network that efficiently supports the projected growth of the NSW economy.

The expected doubling of freight through NSW to 794 million tonnes by 2031 requires a strategic focus to ensure policy, infrastructure and land use planning initiatives deliver a freight network where capacity and performance meet future demand. This strategy outlines a partnership between the NSW Government and industry that focuses on the development of an action plan to support and promote the effective and efficient movement of freight in NSW. The Strategy also outlines the need to identify and protect future transport corridors based on where and when growth will occur and to co-ordinate the protection of this land to ensure network capacity is achieved. The Strategy emphasises that a failure to adequately identify, protect and enable the development of long term transport corridors will compromise the ability to increase capacity across road and rail networks in the future.

Bells Line of Road is identified as a key transport link in the NSW freight network. The Strategy includes reference to the Bells Line of Road Long Term Strategic Corridor Plan and notes the next phase of the Bells Line of Road upgrade includes safety works, realignments,
improved overtaking opportunities to the west of Kurrajong Heights as well as planning for future works across other sections of the corridor.

The protection of the BLoR-CC corridor is consistent with the objective of the *NSW Freight and Ports Strategy* in delivering a freight network that efficiently supports the projected growth of the NSW economy.

**NSW Draft Freight and Ports Plan**

In December 2017, the NSW Government released the *NSW Draft Freight and Ports Plan* (NSW Government, 2017a). The *Draft Freight and Ports Plan* supports the *Draft Future Transport Strategy 2056* and builds on the *NSW Freight and Ports Strategy*. The Draft Plan identifies key freight priorities to deliver a freight system across NSW in an efficient and environmentally sustainable manner for communities and industry. The Draft Plan recognises the significant infrastructure changes that have occurred and are proposed for the future and recognises the advancements by industry in investing and implementing greater efficiencies across their transport operations as well as the potential of emerging technologies.

The *Draft Freight and Ports Plan* provides a strategic planning approach to freight investment including identifying appropriate modes and routes, provides clarity to industry and facilitates safe and reliable operations of the port, road and rail networks, to meet transport freight needs.

Key trends driving and impacting freight demand include issues of urban encroachment from planned residential and commercial developments resulting in restricted access to key freight corridors and limiting ability to meet future demand. A related challenge is the need to plan for and protect rail and road corridors to efficiently service the areas of city growth. For this reason, a key priority for Transport for NSW includes protecting land for future transport corridors now to ensure land is available, affordable and free from encroachment from incompatible land uses which will be important for the provision of an integrated freight transport network to support the Western Sydney Airport and the development of the ‘aerotropolis’.

Protecting corridors in western Sydney is identified as a committed initiative in the next ten years. This includes a future Western Sydney Freight Line and an Outer Sydney Orbital (OSO) Freight Line. While the *Draft Freight and Ports Plan* did not specifically identify the BLoR-CC, the protection of the corridor would support the future provision of infrastructure to provide freight access to both these corridors and to the Western Sydney Airport.

**NSW Road Safety Strategy 2012-2021**

The *NSW Road Safety Strategy 2012-2021* (Transport for NSW, 2012) sits under the National Road Safety Strategy 2011–2020 and establishes the direction for road safety in NSW. The Strategy is set in the context of the current and future policy operating environments of Transport for NSW.

The Strategy indicates that NSW is committed to achieving a reduction in the fatality rate to 4.3 per 100,000 population by 2016, and at least a 30 per cent reduction in fatalities and serious injuries by the end of 2021.

The *Bells Line of Road Long Term Strategic Corridor Plan* states that for the period 2006–2010 there were 466 crashes along Bells Line of Road which included:

- Nine crashes that resulted in 13 fatalities
- 178 crashes that resulted in 227 injuries.

It was noted that the fatality rate in 2011 was 5.0 per 100,000 and the crash rate is about 54 crashes per 100 million vehicle kilometres or about one fatal crash per 100 million vehicle kilometres. It further notes that these rates are relatively high, and around twice the typical rates for rural roads in NSW.
The proposed protection of the BLoR-CC corridor and the ultimate development of an access controlled motorway would improve road safety at its eastern end, and is therefore consistent with the goals of NSW Road Safety Strategy 2012-2021.NSW Draft Road Safety Plan 2021

The NSW Draft Road Safety Plan 2021 (Transport for NSW) has been developed to set new road safety priorities in order to achieve the State Priority target set in the NSW Road Safety Strategy of 30 per cent reduction in road fatalities by 2021. These include delivering the Safer Roads Program, and new initiatives for a safe network including investigating options to design safety outcomes into the earliest phase of planning. Beyond 2021, the Draft Road Safety Plan identifies motorways as our safest and most efficient ways of moving vehicles.

The proposed protection of the BLoR-CC corridor will support the future construction of a motorway and thus will contribute toward the road safety priorities.

State Infrastructure Strategy Update 2014

The State Infrastructure Strategy 2012-2032 (SIS) (Infrastructure NSW, 2012) presented a 20 year strategy that identified and prioritised the delivery of critical public infrastructure to drive productivity and economic growth for NSW.

Bells Line of Road was identified as a component of Sydney’s strategic road network, principally in the context of improving connections to regional NSW, its associated value as a freight transport corridor and an access route for residents of western NSW. The SIS notes that there are constraints to freight vehicles on both the Great Western Highway and Bells Line of Road. However, it also noted that any investment in reducing/removing access constraints (along the full length of Bells Line of Road) would be difficult to justify based on current low traffic volumes, noting that with the current volumes, the cost of construction in the challenging terrain is likely to outweigh the benefits provided, particularly west of Kurrajong Heights.

The State Infrastructure Strategy Update 2014 (Infrastructure NSW, 2014) identifies long term planning goals, including the protection for future Western Sydney road corridors such as the OSO and the BLoR-CC, in order to ensure that the government is able to deliver infrastructure efficiently and effectively when it is needed in the future.

Key challenges for urban roads identified in the 2014 Update were to:

- Keep Sydney’s roads moving and tackle congestion
- Cater for growing demand for road travel without reducing safety, efficiency and amenity
- Extract the optimum performance from the existing road network
- Build future network capacity and protect potential future road corridors
- Enhance access to Sydney from growing regional cities
- Plan for population growth and integrate transport and land use planning more effectively.

The 2014 Update made 30 investment recommendations for the next round of critical infrastructure for NSW. Infrastructure NSW recommended that future transport corridors should be planned and protected and that the corridor identification work for the BLoR-CC corridor (ie between the M7 Motorway and Bells Line of Road at Lower Hawkesbury) should be completed to enable protection to occur.

The BLoR-CC corridor SEA has been prepared in response to the stated action in the SIS to plan and protect a future transport corridor between the M7 Motorway and Kurrajong Heights. It is also consistent with the 2014 Update’s recommendations to prioritise the delivery of critical public infrastructure to drive productivity and economic growth for NSW in addition to contributing more broadly to address the other key challenges for urban roads in NSW.
Bells Line of Road Long Term Strategic Corridor Plan

The Bells Line of Road Long Term Strategic Corridor Plan (Roads and Maritime, 2012) was prepared to identify a strategic direction for the corridor from North Richmond to Lithgow in the short, medium and long term.

The Plan considered current and future transport needs for Bells Line of Road, taking into consideration population and traffic growth, desired level of service and induced demand in addition to engineering factors and other constraints.

The Plan outlined the strategic opportunities for a major upgrade of the Bells Line of Road corridor and provided the following conclusions:

- A major upgrade of Bells Line of Road west of Kurrajong Heights is not justified in the foreseeable future, however it is anticipated that there will be a traffic efficiency justification for a major upgrade of the Bells Line of Road corridor east of Kurrajong Heights in the long term.

- While traffic levels are not high, a significant proportion of traffic travels between Bells Line of Road and the Sydney motorway network, and an effective ongoing connection to the Sydney motorway network is required.

A new connection between Kurrajong Heights and the Sydney motorway network was confirmed as being more likely to provide an efficient long term solution.

The Plan acknowledged that the current rate of development pressures in north-western Sydney requires the protection of a corridor for a connection between Bells Line of Road and the M7 in the short to medium term before development plans were implemented. The Plan established the strategic need for the protection of the BLoR-CC corridor.

The BLoR-CC SEA has been prepared in response to the action identified in the Bells Line of Road Long Term Strategic Corridor Plan to initiate investigations to identify and protect a corridor for a future connection between Bells Line of Road and the Sydney motorway network.

A Plan for Growing Sydney

A Plan for Growing Sydney (Department of Planning and Environment, 2014) was released in December 2014. It is the NSW Government’s plan for the future of the Sydney Metropolitan plan and is intended to guide land use planning decisions for the next 20 years. A Plan for Growing Sydney provides a framework based around four key goals including “to develop a competitive economy with world-class services and transport”.

Directions and supporting actions that support this goal and that are relevant to the BLoR-CC corridor include:

- Transform the productivity of Western Sydney through growth and investment (Direction 1.4)
- Enhance capacity at Sydney’s gateways and freight networks (Direction 1.5)
- Enhance linkages to regional NSW (Direction 1.8)
- Deliver infrastructure – reserving the BLoR-CC corridor is specifically identified under the supporting action to protect future transport and growth corridors to support future growth (Direction 1.11).

A Plan for Growing Sydney places particular emphasis on western Sydney noting that most of the opportunities and challenges are located within this region. The Plan acknowledges that the future Western Sydney Airport will be a catalyst for significant new investment in infrastructure and jobs in the subregion and identifies a number of priority actions to support economic growth in the West District, including proceeding with the investigation and potential delivery of the OSO transport corridor and the BLoR-CC corridor.
Directions for a Greater Sydney 2017-2056

In July 2017, the Greater Sydney Commission released the Directions for Greater Sydney (the Directions) (Greater Sydney Commission, 2017a) which provide the ten directions to guide future planning for land use and infrastructure across Greater Sydney. The Directions set out a foundation of ten key planning elements that will be reflected in the Greater Sydney Regional Plan, District Plans, Future Transport Strategy and the State Infrastructure Strategy.

Key directions that are most relevant to the BLoR-CC includes:

- **Direction 1** – A city supported by infrastructure. This direction forecasts the development of growth infrastructure compacts to assess the nature, level and timing of infrastructure required for an area in light of its forecast housing and employment growth. This approach will demonstrate the correlation between growth and infrastructure and allow for the timely integration and more effective expenditure on infrastructure by location.

- **Direction 6** – A well-connected city. This direction identifies that by 2036, there will be a 40 per cent increase in the number of trips to 22 million trips per day.

- **Direction 7** – A city in its landscape. This direction recognises that Greater Sydney has evolved within outstanding natural and scenic landscapes and growth within Sydney will require strategic planning to manage the effects of urban development to protect, restore and enhance these landscapes and natural areas.

- **Direction 10** – A collaborative city. Managing the competing needs of a city requires all levels of government, industry and the community to work together.

Protecting a corridor for BLoR-CC will assist government in providing the opportunity for future investment in transport infrastructure within the corridor.

Draft Greater Sydney Region Plan – Our Greater Sydney 2056

In October 2017, the Greater Sydney Commission released the draft Greater Sydney Region Plan - Our Greater Sydney 2056 (Greater Sydney Region Plan) (Greater Sydney Commission, 2017b) which provides the 40-year vision which underpins the development of District Plans. It reflects the contemporary thinking about Greater Sydney’s future and reconceptualises Greater Sydney as a metropolis of three cities:

- **Eastern Harbour City**, will build on strong financial, professional, health and education sectors and extend its capabilities with an innovation precinct.

- **Central River City**, including Greater Parramatta and Olympic Park precincts, will capitalise on its central location and continue to develop health, education and research institutions as well as finance, business services and administration sectors to drive the economy.

- **Emerging Western Parkland City**, incorporating the Western Sydney Airport and Badgerys Creek Aerotropolis, which will grow a strong trade, logistics, advanced manufacturing, health, education and science economy.

The extent of the three cities are presented in Figure 2-1 and the priorities of the draft Greater Sydney Region Plan are focused on productivity, liveability and sustainability as Sydney continues to grow and expand.

The Greater Sydney Region Plan includes a Structure Plan which highlights the principal spatial elements for managing growth and change across Greater Sydney. The BLoR-CC corridor is identified in the Structure Plan as a Road Visionary element (refer Figure 2-2).
Draft District Plans for Greater Sydney were released in October 2017 to inform local council planning and influence the decisions of State agencies. District Plans are the link between the draft *Greater Sydney Region Plan* and councils’ Local Environmental Plans. District Plans were developed to bring together the demographic, social, environmental, economic and employment data of five districts across Sydney. The draft Western City District Plan and draft Central City District Plan are the two plans which contain LGAs within the BLoR-CC study area.
Draft Central City District Plan

The Central City District is part of the Central River City and includes the Blacktown LGA together with Cumberland, Parramatta and The Hills LGAs. The Central City District is rapidly growing and will help drive Greater Sydney’s future in terms of economic and employment opportunities. The population is forecast to grow from around 970,000 people to 1.52 million people over the next 20 years. The Central City District had over 440,000 jobs in 2016 which represented 18 per cent of Greater Sydney jobs and a priority for the Central City District is to grow the number of local jobs.

Priorities for the Central City District include employment, transport and community. A specific focus for the Central City District is to unify the Greater Parramatta and the Olympic Peninsula area as the heart of the District. Jobs growth in strategic centres is also a focus and this includes the emerging Marsden Park strategic centre, located to the north of the BLoR-CC. The jobs target for the Marsden Park centre is 5,000 to 10,000 by 2036 which is an increase from 1,600 in 2016.7

Planned investment in infrastructure to support new opportunities generated by growth is a primary factor in the District. In particular, connectivity improvements include linking people to job centres with a networked transport system and coordinating freight activities with land use planning are key productivity actions.

In relation to the Directions, the Draft Central City District Plan (Greater Sydney Commission, 2017c) has identified the following planning priorities that are most relevant to the BLoR-CC:

- **Planning Priority C1** – Planning for a city supported by infrastructure including Action 3 to align forecast growth with infrastructure
- **Planning Priority C2** – Working through collaboration includes the North West Growth Area which includes the emerging strategic centre of Marsden Park located just to the north of the BLoR-CC recommended corridor
- **Planning Priority C9** – Delivering integrated land use and transport planning and a 30-minute city. This priority includes a need to safeguard the next phase of growth within the District. In particular, corridor protection, integrated with land use planning, will support the Central City District’s next phase of growth. Priority corridors identified for protection includes BLoR-CC which is identified as Action 36 in the Central City District Plan
- **Planning Priority C15** – Protecting and enhancing bushland and biodiversity. With 7 per cent of the Central City District covered by bushland, Action 66 to protect and enhance biodiversity by managing urban bushland and remnant vegetation as green infrastructure.

The eastern end of the BLoR-CC recommended corridor is located within the Central City District.

Draft Western City District Plan

The Western City District is a major part of the Western Parkland City and includes the LGAs of Penrith and Hawkesbury. The vision for the Western City District is for a metropolitan city cluster connected over time by mass transit. The Western Sydney Airport and Badgerys Creek Aerotropolis will transform the District bringing infrastructure, businesses and knowledge-intensive jobs.

The population is forecast to grow from just over one million people to 1.53 million people over the next 20 years. The job targets in Richmond-Windsor are expected to range between 12,000 to 16,500 by 2036, from the current estimated 10,300 in 2016.8 The Western City will

---

7 Draft Central City District Plan, page 9.
8 Draft Western City District Plan, page 9.
account for 25 per cent of the total new housing for Greater Sydney of 725,000 to 2036 and 27 per cent of Greater Sydney’s total growth of 1,740,400 to 2036.9

Employment and the proposed Western Sydney Airport are the priorities of the Western City District. The Plan outlines the culture and heritage of the district as well as the development of diverse housing that respects the District’s distinctive town character and surrounding environment. Investigating and protecting suitable corridors for the OSO and BLoR-CC has been identified as a key opportunity in improving connections within the Western City District. Quality transport networks including rail and road connections are critical to the growing economic base of the District.

In relation to the Directions, the Draft Western City District Plan (Greater Sydney Commission, 2017d) has identified the following planning priorities that are most relevant to the BLoR-CC:

- **Planning Priority W1** – Planning for a city supported by infrastructure including Action 3 to align forecast growth with infrastructure.
- **Planning Priority W2** – Working through collaboration including through the Western Sydney City Deal and development of Growth Areas
- **Planning Priority W7** – Establishing the land use and transport structure to deliver a liveable, productive and sustainable Western Parkland City. This includes protecting corridors for future transport infrastructure. BLoR-CC is identified as a proposed strategic road which would improve east-west connectivity and access to regional NSW. This is reflected in Action 21 – investigate, plan and protect future transport and infrastructure corridors
- **Planning Priority W14** – Protecting and enhancing bushland and biodiversity. Bushland covers 60 per cent of the Western City District. The bushland is located within protected natural areas as well as remnant vegetation within urban and rural areas. In delivering the Western Parkland City, the plan recognises that strategies must be developed for the protection and management of bushland and biodiversity. Of relevance to the BLoR-CC, Action 68 supports landscape-scale biodiversity conservation and the restoration of bushland corridors, and managing urban bushland and remnant vegetation as green infrastructure
- **Planning Priority W15** – Increasing urban tree canopy cover and delivering Green Grid connections. This green infrastructure priority supports mitigation of the urban heat island effect as well as providing local habitat. Green grid connections in the vicinity of the BLoR-CC include Cranebrook to Windsor Nature Reserve Corridor, and Shanes Park and Wianamatta Regional Park
- **Planning Priority W20** – Adapting to the impacts of urban and natural hazards and climate change. This priority includes planning for flood events including flood evacuation which is reflected in Action 85.

The central and western sections of the BLoR-CC are located within the Western City District.

**Central West and Orana Regional Plan 2036**

The Central West and Orana Regional Plan 2036 (Regional Plan) (Department of Planning and Environment, 2017a) is a 20 year blueprint for the future of the Central West and Orana region. This region covers 19 LGAs located west of the Blue Mountains including Bathurst, Dubbo, Lithgow, and Orange.

The Regional Plan contains four goals:

---

9 Draft Western City District Plan, page 14
1. To be the most diverse regional economy in NSW
2. A stronger, healthier environment and diverse heritage
3. Quality freight, transport and infrastructure networks
4. Dynamic, vibrant and healthy communities.

The Central West and Orana region is a major exporter of beef, lamb, grain, cotton, raw minerals and metals, manufactured foods, beverages and other value-added produce. These sectors rely on efficient freight and transport infrastructure networks to move products to external markets and ports. Freight volumes are projected to double by 2030 and triple by 2050 and a large portion of this growth will occur in the Central West and Orana region.

The Bells Line of Road provides an alternative route to the Great Western Highway across the Blue Mountains. The proposed Bells Line of Road upgrade is identified in the NSW State Infrastructure Strategy as a priority for regional freight access to markets.

### 2.3 Local policies and strategies

**Our Blacktown 2036**

*Our Blacktown 2036* (Blacktown City Council, 2017) is Blacktown City Council’s long term strategic plan to 2036, setting out the priorities and actions to achieve its vision as a “City of Excellence – diverse, dynamic, progressive”. *Our Blacktown 2036* identifies the future of the city through six strategic directions which address social, environmental, economic and civic leadership aspirations.

The outcome for the strategic direction of ‘a growing city supported by accessible infrastructure’ is that ‘our neighbourhoods are well planned and liveable with housing, transport and infrastructure that meet the diverse needs of our growing community’.

Specific focus areas of relevance to transport infrastructure are:

- Provide transport networks that connect the City for vehicle and non-vehicle users
- Improve road safety
- Secure commitment from Government to deliver the accessible infrastructure required to meet the needs of the community and the North West Growth Centre.

Our Blacktown 2036 identifies a number of transformational projects or key priorities that will assist in advancing and delivering the long term strategy.

The proposed protection of the recommended corridor would provide a clear indication of the NSW Government’s future intentions and provide certainty for Council in developing the local transport network to support the growing population of Blacktown LGA.

**Hawkesbury Community Strategic Plan 2013-2032**

The *Hawkesbury Community Strategic Plan 2013-2032* (Hawkesbury Council, 2013) is Council’s high level plan that outlines the key community aspirations and sets the essential direction for future Council activities and decision making. The Plan is divided into five themes which illustrate the overall vision of where the community would like to be in 20 years’ time. These are:

- Looking after people and place
- Caring for our environment
- Linking the Hawkesbury
- Supporting business and local jobs
• Shaping our future together.

Directions identified in the Plan that relate to transport infrastructure are:

• Population growth is matched with the provision of infrastructure and is sympathetic to the rural, environmental, heritage values and character of the Hawkesbury
• Have development on both sides of the river supported by appropriate physical and community infrastructure
• Have a comprehensive system of transport connections which link people and products across the Hawkesbury and with surrounding regions
• Be linked by accessible, viable public transport, cycleways and pathways to the major growth, administrative, commercial and service centres within and beyond the Hawkesbury
• Have a comprehensive system of well-maintained local and regional roads to serve the needs of the community.

The proposed protection of the recommended corridor would provide a clear indication of the NSW Government’s future intentions to improve transport connections across the Hawkesbury and with surrounding regions.

**City Strategy**

Penrith City Council’s *City Strategy* (Penrith City Council, 2013) provides direction for the City’s future over the next 20 years. The Strategy examines the long term issues facing the city and community and sets out policy responses for each issue, including issues that extend beyond Council boundaries to the broader Sydney region and the state. The Strategy is structured around seven themes – housing, jobs and economy, transport and access, infrastructure delivery, community wellbeing, the environment and places. Transport related goals include:

• A better integrated, well-connected and more sustainable road network in the City and region
• Improved road network efficiency and safety.

The critical need for a safe, efficient arterial road network is strongly emphasised as something outside of the direct responsibility of Council, but something that they would be advocating for.

The *City Strategy* notes that investment in regional road links to and within Penrith has not kept pace with population growth and urban expansion and it is not expected that the regional roads will meet the travel demands of future employment areas, expansion of the centres or the City’s new suburbs.¹⁰

The *Community Plan* (Penrith City Council, 2017) establishes the vision for Penrith as “a sustainable and prosperous Regional City with a harmony of urban and rural qualities”.

Key priorities identified by the community were more local jobs and making sure the services and infrastructure the community needs are in place. Priority actions that Council has announced are:

• Attract investment to grow the economy and increase the range of businesses operating in the region
• Provide access to lifelong learning to maximise opportunities for our community.

As a regional centre, Penrith plays an important role in servicing the wider area, including parts of the Central West.

The proposed protection of the recommended corridor would support Council's goal for a better integrated road network in the region and contribute to better connectivity of employment areas.

2.4 Corridor need

This section provides an overview of the primary drivers for the BLoR-CC corridor SEA to show how they have collectively been considered to inform the development of the recommended corridor. The Draft Future Transport Strategy and the Draft Greater Sydney Region Plan identifies the challenges that the transport system in NSW needs to address to support the State's economic and social performance over the next 40 years. With the projected growth in population and employment in western Sydney, it is important to ensure that appropriate future provisions are made now to meet the future transport needs of not only Western City and Central City Districts but also the wider Greater Sydney Region. Integrated transport planning decisions are required, that consider the long term requirements for both land use and transport.

2.4.1 Key traffic generators and attractors

There are a number of key traffic generators and attractors in Greater Sydney which would benefit (directly or indirectly) from the BLoR-CC corridor. While not all of these are directly impacted by the BLoR-CC, the following key land uses influence strategic transport patterns in the BLoR-CC study area and beyond:

- **Western Parkland City** – including the Western Sydney Airport and the Badgerys Creek Aerotropolis which will become a catalyst for the city cluster and will grow a strong trade, logistics, advanced manufacturing, health, education and science economy. Extensive future development will occur within the Western Parkland City in the Western Sydney Airport Growth Area and North West Growth Area, the Western Sydney Employment Area, as well as a future Greater Penrith to St Marys corridor growth area. A collaboration area for the Greater Penrith area has been established which is forecast to from about 33,000 jobs in 2016 to 44,000-45,000 jobs in 2036. Over the next 10 years, 33,000 homes will be provided in the North West Growth Area and once fully developed will be home to around 250,000 people.\(^\text{11}\) To date land in the North West Growth Area has been rezoned to support 53,150 dwellings\(^\text{12}\)

- **Central River City** – including the expected strong growth expected within the Greater Parramatta and Olympic Peninsula (GPOP) economic corridor and the Greater Parramatta Growth Area. The Greater Parramatta city centre is targeted to have more than 55,000 new jobs by 2036

- **Eastern Harbour City** – including the Sydney Airport and Port Botany precinct and the inner west and Sydney Central Business District (CBD)

- **Blue Mountains and surrounds** - As a major natural attraction, the Blue Mountains World Heritage Area, Blue Mountains and Wollemi National Parks and the surrounding area generates significant visitors, particularly on weekends for both domestic and international travellers. The area is known for its mountain villages, high quality restaurants and eco-tourism


\(^{12}\) [North West Priority Growth Area – Landuse and Infrastructure Implementation Plan](http://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts/North-West-Growth-Area) (Department of Planning and Environment, 2011b)
• **Central West NSW** – Bells Line of Road serves as one of two east-west routes connecting greater Sydney to Central West NSW, connecting residents, business and freight.

Figure 2-2 shows Sydney's strategic centres and transport gateways identified in the *Draft Future Transport Strategy* and *Draft Greater Sydney Region Plan* that influence strategic transport patterns across the wider Sydney region.

![Greater Sydney Structure Plan](image)

**Figure 2-2** Greater Sydney Structure Plan (Draft Greater Sydney Region Plan, October 2017)

### 2.4.2 Demographic drivers and growth

Over the last 200 years, population growth has resulted in Sydney’s expansion across the Cumberland Plain between the Blue Mountains, the Pacific Ocean, the Hawkesbury-Nepean River and the Southern Highlands. Sydney’s population will continue to grow resulting in increased population density in existing areas and the creation of new urban areas on Sydney’s fringe.

The *Draft Greater Sydney Region Plan, Draft Central City District Plan* and *Draft Western City District Plan* describes Western Sydney as key to Sydney’s success, with population growth anticipated to grow at higher rates than other parts of Sydney. The Western Sydney Airport and Badgerys Creek Aerotropolis will create a once-in-a generation economic boom, bringing infrastructure, businesses and knowledge-intensive jobs for residents. The Parramatta CBD will be the driver of the Central River City and will be one of the top five CBDs in Australia.

**Population growth**

Population is an important driver of economic growth and the need for infrastructure provision, including transport infrastructure. Table 2-1 provides a snapshot of the population growth projections in key planning regions relevant to the BLoR-CC corridor study. The recommended corridor is located within the West and West Central Districts of the Sydney Metropolitan Area.

---

13 *Draft Western City District Plan*, October 2017, pg 6.
14 *Draft Central City District Plan*, October 2017, pg 6.
Table 2-1  Population growth in planning regions relevant to the BLoR-CC Corridor Study

<table>
<thead>
<tr>
<th>Region</th>
<th>Pop 2011</th>
<th>Forecast pop 2036</th>
<th>Average annual growth rate (2011-2036)</th>
</tr>
</thead>
<tbody>
<tr>
<td>West District</td>
<td>327,406</td>
<td>442,626</td>
<td>1.41%</td>
</tr>
<tr>
<td>West Central District</td>
<td>868,137</td>
<td>1,520,670</td>
<td>3.01%</td>
</tr>
<tr>
<td>Western Sydney</td>
<td>1,835,140</td>
<td>3,053,137</td>
<td>2.65%</td>
</tr>
<tr>
<td>Total Greater Sydney Commission</td>
<td>4,286,292</td>
<td>6,421,875</td>
<td>1.99%</td>
</tr>
<tr>
<td>Central West</td>
<td>199,500</td>
<td>224,350</td>
<td>0.50%</td>
</tr>
<tr>
<td>NSW</td>
<td>7,218,550</td>
<td>9,925,550</td>
<td>1.50%</td>
</tr>
</tbody>
</table>

Of the three LGAs along the recommended corridor, in 2016 Blacktown LGA had the largest population of any LGA in NSW (351,855),\(^{19}\) with the next largest LGA in NSW being almost 100,000 less in size. In 2016, the total population of the LGAs along the recommended corridor was 625,101.\(^{20}\) These three LGAs are predicted to increase by 315,950 people between 2011 and 2036, bringing the total population to over 877,000 people (Table 2-2). Both Blacktown and Penrith LGAs are predicted to continue to grow at a faster rate than Metropolitan Sydney as a whole.

Table 2-2  Projected population to 2036

<table>
<thead>
<tr>
<th>LGA</th>
<th>Population, at 30 June</th>
<th>Change 2011 - 2036</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2011</td>
<td>2021</td>
</tr>
<tr>
<td>Blacktown</td>
<td>312,350</td>
<td>387,200</td>
</tr>
<tr>
<td>Hawkesbury</td>
<td>64,350</td>
<td>71,000</td>
</tr>
<tr>
<td>Penrith</td>
<td>184,600</td>
<td>221,600</td>
</tr>
<tr>
<td>Total 3 LGAs</td>
<td>561,300</td>
<td>679,800</td>
</tr>
<tr>
<td>Sydney Metro</td>
<td>4,286,200</td>
<td>5,106,300</td>
</tr>
</tbody>
</table>


---

\(^{15}\) Comprises Blue Mountains, Hawkesbury and Penrith LGAs.

\(^{16}\) Comprises Auburn, Bankstown, Blacktown, Holroyd, Parramatta and The Hills LGAs.

\(^{17}\) Defined as West, West Central and South West GSC Districts.

\(^{18}\) Defined as members of Centroc – Bathurst, Blayney, Cabonne, Cowra, Forbes, Hilltops, Lachlan, Lithgow, Oberon, Orange, Parkes, Upper Lachlan, Weddin.

\(^{19}\) Transport for NSW Population ERP by LGA released 26 July 2017.

North West Growth Area Land Use and Infrastructure Implementation Plan

Development of the North West Growth Area (formerly the North West Growth Centre) spans three council areas (The Hills, Blacktown and Hawkesbury). The North West Growth Area is forecast to contribute 12 per cent of the homes needed over the next 20 years. Over the next 10 years, 33,000 homes will be provided and the growth area will be home to around 92,400 people. The North West Priority Growth Area Land use and Infrastructure Plan (Department of Planning and Environment, 2017b) guides the direction for growth and development. Precinct planning is underway for new communities that benefit from infrastructure and services, including Marsden Park.

Early planning will therefore maximise the opportunity to integrate new infrastructure such as roads into future urban and employment areas and minimise impact to existing and future communities. The identification and protection of a future transport corridor, like BLoR-CC, would enable continued development of the rapidly growing and changing land use areas in north-western Sydney, protect the corridor from encroaching development and facilitate forward planning to accommodate the potential impacts of a higher order road.

The Department of Planning and Environment is continuing to update and revise the strategic planning for the North West Growth Area and it is expected that targets and proposed infrastructure would continually be adjusted.

Employment growth

It is anticipated that the future Western Sydney Airport, located to the south of the BLoR-CC study area, will be the single largest infrastructure catalyst for employment growth in the history of Western Sydney. Development of the Western Sydney Airport will stimulate long-term economic activity in the area. The Western Sydney Airport is expected to support almost 28,000 direct and indirect jobs by 2031. The Western Sydney Growth Area around the future Western Sydney Airport has the potential to eventually accommodate an employment workforce of up to 200,000 people, with full development achieved over the next 50 to 100 years.

The following table presents the estimates of employment based on the place of work by LGA. Blacktown and Penrith LGAs are both expected to experience increases in employment equal to or greater than the Greater Metropolitan Area by 2036.

Table 2-3  Employment forecasts to 2036

<table>
<thead>
<tr>
<th>LGA</th>
<th>Employment</th>
<th>Change 2011 - 2036</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2011</td>
<td>2021</td>
</tr>
<tr>
<td>Blacktown</td>
<td>109,289</td>
<td>131,999</td>
</tr>
<tr>
<td>Hawkesbury</td>
<td>28,031</td>
<td>33,162</td>
</tr>
<tr>
<td>Penrith</td>
<td>70,833</td>
<td>85,422</td>
</tr>
<tr>
<td>Total 3 LGAs</td>
<td>208,153</td>
<td>208,153</td>
</tr>
</tbody>
</table>

Other employment growth in western Sydney is expected through the Western Sydney Employment Area, and other growth areas further to the south.

The Draft Greater Sydney Region Plan emphasises the importance of integrating transport projects across the metropolitan area to support the rapidly growing city, with a key action in the Plan being to protect future transport and road corridors, including the BLoR-CC corridor, to support future population and employment growth.

The establishment of a transport corridor connection between Kurrajong Heights and the M7 Motorway, would support further development of integrated transport solutions across Western Sydney that serve to connect future residents with future employment opportunities.

The NSW Department of Planning and Environment is continuing to update and revise the strategic planning for the North West Growth Area and it is expected that targets and proposed infrastructure would continually be adjusted.

### 2.4.3 Transport environment

#### Strategic function

The existing Bells Line of Road is classified as a “main road” under the Roads Act 1993 and as a “state road” by Roads and Maritime. It runs from North Richmond in the east to the Darling Causeway at Bell in the west, a distance of approximately 60 kilometres. From North Richmond to Kurrajong Heights the posted speed limit varies between 60 km/h and 80 km/h depending on the geometry of the road and the steepness of the terrain. The existing Bells Line of Road fulfils the following key roles:

- Provides a second crossing of the Blue Mountains, supporting the Great Western Highway
- Is a key access route for local communities (providing access to rural properties) located along the route in the Kurrajong and Bilpin areas
- Is a regional through route for motorists travelling between urban communities in the west (eg Bathurst, Lithgow) and Greater Sydney
- Is a scenic route for tourists and road users wanting to access recreational areas and tourism centres around the Blue Mountains.

The existing Bells Line of Road forms a key element in the longer term Sydney strategic road network connecting with the radial and orbital motorway network of Greater Sydney (refer Figure 2-3).
Figure 2-3 Longer-term vision for the Sydney strategic road network (SIS, 2012)

Transport growth

The Bells Line of Road Long Term Strategic Corridor Plan (Roads and Maritime, 2012) found that the central and western sections of Bells Line of Road are generally operating at good levels of service and that forecast traffic numbers will not reach the levels that would trigger a need (from a traffic perspective) to upgrade the full length of Bells Line of Road to four lanes in the foreseeable future. The Corridor Plan does however identify that the forecast traffic numbers suggest that there may be a need to protect a road corridor connecting the eastern section of Bells Line of Road from Kurrajong Heights to the existing Sydney motorway network to meet long term needs for both freight and passenger vehicle traffic (the Bells Line of Road Long Term Strategic Corridor Plan is discussed further in Section 2.8).

The urgency of early planning for future road development in Western Sydney as a consequence of the increasing urbanisation (population and employment growth, as discussed above) is emphasised in the Plan.

Planning is also currently underway for the OSO, a multi-modal corridor to provide a north south connection in Western Sydney for a future motorway and freight rail connecting the Central Coast to the Illawarra. The OSO Study and the BLoR-CC Study are being undertaken concurrently. An overlap exists between the two study areas with the northern portion of the OSO study area running through the central part of the BLoR-CC study area. It is intended that there would be an interchange between the two transport corridors in the area of Llandilo.
By reserving both of these corridors now, the NSW government is securing the opportunity to address future transport needs in the longer term when traffic volumes require it. This is in line with best practice recommendations emphasised in Australian and NSW strategic policies such as the Australian Infrastructure Plan.

**Freight movement**

Bells Line of Road provides an alternative route to the Great Western Highway linking north-western Sydney with central and western NSW. As such, Bells Line of Road plays an important role for transporting freight over the Blue Mountains. It also serves as an important route for recreational and tourism activities.

Currently there are no direct routes for B-Doubles (vehicles longer than 19 metres) from the central and west regions of NSW to Sydney via the Blue Mountains. A motorway standard road corridor connecting Bells Line of Road at Kurrajong Heights with the Sydney motorway network would improve the regional connectivity and efficiency of freight by road and open up opportunities for regional productivity benefits in central NSW.

Freight from the central and western regions of NSW serves both domestic and export markets. The majority of freight comprises bulk coal and containerised minerals, which are moved to Sydney and then to Port Botany and Port Kembla by rail over the Blue Mountains, and to Newcastle via the Ulan line. There are major constraints on increased rail freight from the Central West. These include:

- Significant growth in passenger trains within the Sydney metropolitan network, which reduces the availability of freight paths as a result of freight restrictions during commuter peaks
- Short passing and crossing loops as well as insufficient passing and crossing loops.

The constraints on increased rail freight, if they are not alleviated, will likely reinforce the importance of the Bells Line of Road as a secondary route for road freight movements across the Blue Mountains.

As discussed in Section 2.2, the Draft Future Transport Strategy identifies the importance of protecting corridors, including BLoR-CC for future infrastructure to support the freight network. This confirms the earlier planning strategies of the NSW Long Term Transport Master Plan and the NSW Freight and Ports Strategy which both emphasised the importance of the completion of missing links in the motorway and freight networks to support economic growth in NSW. BLoR-CC represents one of the identified missing links in the wider regional network that needs to be protected to meet future traffic needs.

**Flood evacuation route**

Although not a primary driver for the BLoR-CC corridor SEA, opportunities to contribute long term to flood evacuation strategies for north-western Sydney have been identified.

The Hawkesbury-Nepean area is one of the most flood prone regions in all of Australia. A flood evacuation strategy is in place, and Infrastructure NSW has released the Hawkesbury-Nepean Flood Risk Management Strategy in January 2017 to provide a long term framework for the reduction and management of the flood risk. New infrastructure proposals, such as BLoR-CC, provide an opportunity to support and supplement the regional evacuation routes for flood operations in the long term. Infrastructure NSW has been consulted during the development of the recommended corridor with a view to designing the recommended corridor to improve flood evacuation for the area.

The Flood Prone Land Policy, as set out in the NSW Floodplain Development Manual (Office of Environment and Heritage, 2011), was considered in the development of options and in the Strategic Concept Design of the recommended corridor. In the future, the corridor may...

---

provide an opportunity to deliver a transport facility that provides an additional flood evacuation route in this flood prone area.

**Existing Castlereagh Freeway corridor reservation**

The existing Castlereagh Freeway corridor reservation was first identified in the 1951 County of Cumberland Plan and is included in local and regional planning instruments. It was intended to provide a north-western extension of the M7 motorway from Dean Park to the Nepean River.

The existing corridor reservation extends from the M7 motorway at Dean Park along the northern border of the suburbs of Hassall Grove, Bidwell, Shalvey and Willmot. It passes along the southern edge of the former International Radio Transmitter Station at Llandilo (known as and referred to hereafter as Shanes Park).

West of Shanes Park, the existing corridor reservation heads north-west across rural small holdings and Priority Conservation Lands (Cumberland Plain Woodland) before crossing the Nepean River. The existing corridor reservation has an average width of 120 metres to the west of Shanes Park and approximately 100 metres to the east.

Approximately 40 per cent of the land in the existing Castlereagh Freeway reservation is owned by Roads and Maritime including significant holdings on either side of the former ASA site at Shanes Park.

Blacktown LEP 2015 contains SP2 zoning for the majority of the Castlereagh Freeway road reservation, with a short section on the northern edge of the suburb of Willmot zoned RE1. Penrith LEP contains SP2 zoning for the reservation of the Castlereagh Freeway corridor between Shanes Park and the Nepean River. Hawkesbury LEP also contains a short extent of SP2 zoning for the Castlereagh Freeway road reservation between the Nepean River and Springwood Road.

Much of the Castlereagh Freeway road corridor is now deemed to contain highly significant remnant vegetation and is no longer feasible for motorway construction.

**2.5 Corridor study objectives**

The objectives of the BLoR-CC corridor study are to identify and assess potential transport corridors and to identify a recommended corridor for protection which would provide future capability to:

- Expand the motorway network in western Sydney to support population and economic growth
- Improve transport connectivity and efficiency through and within western Sydney and to regions outside Sydney
- Integrate land use, housing supply and transport planning
- Balance transport needs with those of the broader community and the environment
- Enable future cost effective infrastructure delivery and operation.

**2.6 Strategic need**

Western and north-western Sydney are set to grow dramatically over the next 30 to 40 years. The NSW Government has set targets for residential and employment growth and the land release program is already well underway. In addition, road user demands for commuters, freight and transport are also expected to grow exponentially.

Given the rapid expansion of development in north-western Sydney, early protection of a corridor is vital to ensure that there is sufficient land available in the future when the
construction of a motorway or other suitable transport mode is required. With the expected change in patterns of land use, early protection of land for a future transport corridor will be beneficial in providing certainty around land use, minimising acquisition costs, avoiding redundant development, and providing new opportunities for land use and economic development that would perhaps not otherwise be realised.

The existing Bells Line of Road provides an alternative route to the Great Western Highway across the Blue Mountains, providing an important east-west link between Sydney and central and western NSW. A long term need to connect Bells Line of Road to the Sydney motorway network has been identified to meet future freight and passenger vehicle traffic demands and to complete a missing link in the Sydney motorway network.

As an identified initiative for investigation (0-10 years) in the Draft Future Transport Strategy, reserving the BLoR-CC recommended corridor now, provides the opportunity to address future transport needs in the longer term when traffic volumes (including freight) require it. The Draft Future Transport Strategy identifies the provision of the BLoR-CC as a visionary initiative (20+ years).

The proposed BLoR-CC corridor is consistent with a number of key Australian, state and local government policies and strategies such as the Australian Infrastructure Plan. Identifying and reserving a corridor for the proposed BLoR-CC is an important initiative to undertake before development in the region reduces future opportunities for such a piece of infrastructure. It would also provide clarity for the NSW Government and councils, provide greater confidence for existing residents in the area that the infrastructure will be provided in the future when needed, and better enable future cost effective infrastructure delivery.

2.7 Strategic analysis of alternative options to corridor protection

The identification and assessment of corridor options considered during the BLoR-CC corridor SEA are presented in Chapter 3.

The strategic alternatives were identified to address the high-level need to improve connectivity across the Blue Mountains, serving east-west transport demand by improving connections between the Central West and Sydney. Strategic alternatives must address increased travel demand originating from a mix of long distance travel needs (fast and uninterrupted travel), intra-regional travel needs (fairly fast travel with good access) and local travel needs (including school buses, cyclists and pedestrians).

Four strategic alternatives to the carrying out of the future project were considered, as follows:

- Alternative 1 – The base case or ‘do nothing/minimum’
- Alternative 2 – Road based improvement options
- Alternative 3 – Rail infrastructure improvement options
- Alternative 4 – Investment to improve public transport.

Each is described in further detail in Sections 2.6.1 to 2.6.4, accompanied by an assessment of the strategic costs and benefits relative to the protection of a corridor for a future motorway.

2.7.1 Alternative 1 – The base case or ‘do nothing/ do minimum’

The base case or ‘do nothing/do minimum’ scenario would involve not reserving a road corridor for provision of a future motorway, instead carrying out only currently planned transport infrastructure improvements such as routine road network and intersection upgrades that would be provided over time to improve capacity.
Bells Line of Road would therefore be retained in its current configuration as a two lane road from Richmond to Lithgow, serving as the secondary east-west route over the Blue Mountains. Richmond Road would be upgraded progressively as planned, from a two lane road to four lanes, for the section north of Bells Creek Bridge, Colebee to the South Creek floodplain. Western Sydney would continue to develop, and the Western City District Plan projects a population growth of over 460,000 more people by 2036 to 1,534,450 people and an increase in the number of dwellings from 388,000 (2016) to 572,500 (2036).

Existing congestion at North Richmond currently affects the connection between Bells Line of Road and the Sydney motorway network at peak times. Significant increases in daily traffic are forecast over the next 20 years, with many roads generally doubling their demand in this time frame. The Bells Line of Road Long Term Strategic Corridor Plan reported in 2012 that the section of Bells Line of Road between Ninth Avenue and Richmond Road has an existing volume of approximately 25,000 vehicles per day and is expected to increase to almost 40,000 vehicles per day.

Without substantial future road upgrades in the BLoR-CC study area by 2050, levels of service (LOS)\(^{23}\) are predicted to be D or E in peak traffic periods along the eastern section of the road. LOS D indicates that the road is approaching unstable flow conditions and the freedom of manoeuvre is restricted and LOS E represents forced flow, with frequent stopping and queuing.\(^{24}\)

While there would be traffic and transport implications associated with not proceeding with a motorway connection between Kurrajong Heights and the Sydney motorway network in the future, there would also be significant issues should a corridor not be protected.

This is because urban expansion and land use changes in north-western Sydney are likely to build out areas where a future motorway could be constructed. Much of the BLoR-CC study area west of Shanes Park is currently characterised by rural residential and agricultural uses, however, with the continued development of the North West Growth Area, there could be continued pressure to develop land to the west. This would lead to a number of undesirable scenarios, potentially including:

- Higher property acquisition costs as a consequence of intensification of development, and changes in property values over time
- Greater community disruption through disturbance to new, denser, settlement patterns
- Higher compensation costs for relocation of community facilities, services and businesses
- Failure to integrate transport planning and land use planning
- Restriction of development opportunities through lack of certainty around future public land uses.

The significant cost of land acquisition, always a major component of infrastructure projects, can often be a decisive factor in determining whether a project can proceed. A lack of strategic planning for corridors or their early protection and acquisition results in high prices paid for land just prior to development. This can threaten the economic viability of a project.

Compulsory acquisition of land at the last moment can cause significant public concern. This has been emphasised in the most recent Australian Infrastructure Plan as discussed in Chapter 2.

---

\(^{23}\) Level of service (LOS) of a road is a quality measure of aspects such as speed and travel time, freedom to manoeuvre, lack of traffic interruptions, and comfort and convenience. Safety is not included in the measures that establish levels of service, as it is considered as a separate key area for assessment. LOS is measured in terms of per cent of time spent following slower vehicles due to an inability to pass. Six levels of service are normally used, from A representing the best operating conditions to F, the worst.

\(^{24}\) Roads and Maritime (2012) Bells Line of Road Long Term Strategic Corridor Plan.
Through the identification of the need to protect the corridor in the Bells Line of Road Long Term Strategic Corridor Plan, the NSW Long Term Transport Master Plan, the Draft Future Transport Strategy, A Plan for Growing Sydney and the Draft Greater Sydney Regional Plan, it has been established that the option of “do nothing” is not acceptable.

2.7.2 Alternative 2 - Road based improvement options

In terms of alternative road based options to a new road corridor, there is an existing network of arterial roads that extend generally between these locations. This includes the existing Richmond Road/Blacktown Road/Bells Line of Road corridor, and other major arterial roads such as Old Windsor Road/Windsor Road and The Northern Road/Londonderry Road.

The corridor options assessment presented in Chapter 3 includes consideration of corridor alignments that incorporated sections that followed existing road corridors such as these. As described, these were typically not favoured as they currently serve a different transport function at a more local and regional level. However, the strategic alternative of other road based improvement options considers upgrades to other comparable alternative routes.

Richmond Road, for example, runs from Blacktown to Richmond (linking with Blacktown Road at Bligh Park) and serves as an important arterial road in north-western Sydney. It is proposed to be progressively upgraded to a six lane urban arterial road as the North West Growth Area develops. However, it is unlikely that an upgrade primarily within the existing alignment would provide an efficient long term connection between the Bells Line of Road and the Sydney motorway network, as it traverses existing and future urban areas and will continue to provide access for local traffic. Consequently, it would not provide as efficient a traffic flow as what would be provided by a high quality, high speed, restricted access motorway.

Numerous studies have been completed to investigate the viability of upgrading Bells Line of Road and other local roads to improve connectivity over the Blue Mountains. The two most recent studies undertaken in 2000 and 2012 are discussed in turn below.

Bells Line of Road Development Study

While the Bells Line of Road Development Study (Maunsell McIntyre, 2000) did not include connections into the Sydney road network and specifically to the M7 Motorway (Bells Line of Road only extends from Richmond to Bell), it considered a number of potential upgrade options. These ranged from only maintenance and progressive local safety improvements through to upgrade of the road to motorway or near motorway standard over its full length. Other options included the addition of passing lanes, and upgrading the road to a standard four lane road suitable for ‘B-Double’ vehicles.

The evaluation of options for improving Bells Line of Road considered engineering, environmental and economic considerations and arrived at the following conclusions:

- The Main West Rail Line over the Blue Mountains could be upgraded but any upgrade would be unlikely to deliver significant benefits without major upgrades east of Penrith and west of Lithgow
- All of the road upgrade options examined were feasible from an engineering perspective
- None of the four-lane, B-Double road upgrade options examined appear feasible from an economic or financial perspective for a range of growth assumptions

---

25 Department of Transport and Regional Services and RTA (2005) Bells Line of Road Corridor Study.
• All of the four-lane B-Double capable upgrade options would require the full regional and economic development growth potential of the Central West region\textsuperscript{26} to be realised over the next 30 years for the project to progress towards being justified economically.

As a result of the economic evaluation, it was instead recommended that limited improvements to the Bells Line of Road be undertaken between Richmond and Bell, largely comprising additional overtaking or climbing lanes and improvements to locations with poor accident history. This recommendation was carried forward to the Bells Line of Road Long Term Strategic Corridor Plan.

**Bells Line of Road Long Term Strategic Corridor Plan**

Opportunities for the upgrading of Bells Line of Road were examined for the full length of Bells Line of Road from Richmond to Lithgow, as well as in three sections identified based on environmental character and corridor planning challenges:

• Eastern section – Sydney motorway network to Kurrajong Heights
• Central section – Kurrajong Heights to Bell
• Western section – Bell to the Great Western Highway.

Information regarding a range of transport activities and population projections was collected to inform the analysis of high, medium and low growth scenarios. A sensitivity analysis was also conducted on the higher growth scenario to test the upgraded road projections to account for induced demand.

Three streams of technical analysis covering engineering, transport and constraints analysis were used to identify strategic options. The analysis found that a major upgrade of the Bells Line of Road west of Kurrajong Heights is not justified in the foreseeable future. This was based on projected traffic volumes even under a high growth scenario. However, it is anticipated there will be a traffic efficiency justification for a major upgrade of the Bells Line of Road corridor east of Kurrajong Heights in the long term.

Traffic analysis shows that a substantial proportion of traffic originating from within and beyond the corridor is bound for the Sydney metropolitan area and an effective connection between Bells Line of Road and the Sydney motorway network is required.

The following strategic opportunities were then identified for an upgraded Bells Line of Road corridor east of Kurrajong Heights (similar to the area considered by the BLoR-CC study):

• Upgrade primarily within the existing alignment, including upgrading of Richmond Bridge and its approaches, and connecting with the Blacktown Road/Richmond Road corridor, which would also be upgraded as appropriate
• Establish a new connection between Kurrajong Heights and the Sydney motorway network, potentially utilising sections of the existing road network such as The Driftway, Richmond Road and/or Londonderry Road, or alternatively identify an entirely new corridor
• Establish a new connection that crosses the Hawkesbury (or Nepean) River further south and utilises all or part of the Castlereagh Freeway corridor to connect with the M7 at Dean Park.

The **Bells Line of Road Long Term Strategic Corridor Plan** (Roads and Maritime, 2012) identified short and medium term improvements focussed on the existing corridor to

\textsuperscript{26} The Central West Region would need to become a major growth centre in NSW, with population and employment doubling by 2035. Over the past 20 years, each update to population projections has seen progressive downwards revisions in growth rates for the Central West region, indicating that such a scenario is extremely unlikely.
complement the longer term strategy of initiating a future motorway if required. This included improvements on Bells Line of Road such as minor curve realignments and straightening, overtaking/passing lanes, intersection upgrades and bridge widening at particular locations. These improvements currently comprise 10 proposed upgrade sites along Bells Line of Road between Kurrajong Heights and Bell that will be upgraded between 2016 and 2020.\(^{27}\) These improvements would serve to improve safety and access in the short to medium term, whilst there remains sufficient capacity for forecast (relatively small) traffic increases. However, the long term demand for increased capacity would remain.

To address these longer term needs, the *Bells Line of Road Long Term Strategic Corridor Plan* recommended proceeding with investigations to identify a new corridor, or corridor that utilises parts of the existing network, to connect Kurrajong Heights and the Sydney motorway network. As a consequence of significant development pressures in north-western Sydney, the Plan recommended that the corridor should be protected in the short to medium term.

### 2.7.3 Alternative 3 - Rail infrastructure improvement options

The strategic alternative to improve rail infrastructure considered these options, viz to improve the existing corridor of the Main West Line, a new rail crossing over the Blue Mountains and new or improved rail services east of the Blue Mountains. Consideration of each is provided below.

**Main West Line**

This railway corridor currently serves both passenger and freight (Main West Line) functions but is constrained by both having to share the same corridor and tracks. Passenger trains have priority over freight trains and therefore freight movements need to fit in where possible, restricting the movement of freight along this line. This, along with the steep grades, tight track curvature and limited opportunities for commuter trains to overtake freight trains, presents considerable constraints in the opportunities available for increasing the amount of freight that can be transported by rail across the Blue Mountains. The *Central West Transport Needs Study* (SKM, 2009) confirmed that there is sufficient capacity within the existing rail network to meet future needs (west of Penrith) for at least 25 years, noting however that transport efficiency on the Central West transport network could be improved.

The *Penrith to Orange Transport Corridor Study* (SKM, 1998) considered options to improve corridor transport performance of the Great Western Highway and Mitchell Highway route to Orange. The preferred strategy identified in that study was to continue with the commitment to upgrade the Great Western Highway, noting that current policies and funding and pricing give little encouragement for mode shifts from road to rail for either passengers or freight services. Subsequent studies have confirmed that enhancement of the Main West Rail Line would be difficult, but feasible, from an engineering perspective but is unlikely to deliver the significant transport and access benefits desired without further capacity enhancements east of Penrith and west of Lithgow.

Long term initiatives to support rail infrastructure provision over the Blue Mountains have been identified including further investigation into the Main West Line (Mount Victoria to Parkes) to support rail freight. However, based on current demands and available capacity, these are long term initiatives and are currently not included in the NSW Government’s strategic plans.

**New rail crossing over the Blue Mountains**

Considerations for new rail infrastructure over the Blue Mountains have included:

- A new route for freight only or freight plus express passenger trains to complement the Main West Line

• A new rail alignment in the vicinity of the Bells Line of Road east-west crossing. These would connect into the existing rail network via the existing Richmond Rail Line that currently terminates at Richmond.

The *Central West Transport Needs Study* found that a new rail alignment could not easily follow a new highway alignment in the vicinity of Bells Line of Road as geometric design standards differ, especially with regard to gradients. Ideally the gradient for freight rail is around one per cent.

Consideration of possible alternative alignments for a railway suggest that viable options do not exist apart from the very expensive option of substantial tunnelling for sections of a new alignment. Tunnelling is also undesirable for freight trains due to diesel exhaust management issues.

Given the difficult terrain, the significant costs, and other environmental constraints, including the Greater Blue Mountains World Heritage Area, it is highly improbable that any new rail crossing of the Blue Mountains would be considered in the foreseeable future.

**Rail network connections east of the Blue Mountains**

The Sydney Metro Northwest is currently under construction, and when completed will extend from Epping to Cudgegong via eight new stations. An extension to Marsden Park is also under consideration. The North South Rail Line is in the corridor planning phase to protect a future north-south corridor connection from St Marys to Narellan via the future Western Sydney Airport.

The OSO, currently in the corridor planning phase, would comprise a multi-modal transport corridor connecting the Hunter and Illawarra regions, including a freight corridor with connections to the Main West Rail Line and a future Western Sydney Freight Line (currently being investigated).

In September 2016, the Australian and NSW Governments released the *Western Sydney Rail Needs Scoping Study* (Department of Infrastructure and Regional Development and Transport for NSW, 2016). The study examined the passenger rail transport needs of the Western Sydney Region and the proposed Western Sydney Airport. The study identified an initial set of rail service options emanating from the Western Sydney Airport site and linking with the existing passenger rail network. One of those options links the Western Sydney Airport with north-western Sydney. This option involved a new line providing connections to the existing rail network as places such as St Marys and Schofields and could provide connections for housing and employment development at intermediate locations such as Marsden Park.

This option, the north-south train line (Western Sydney Airport to St Marys and Cudgegong Road) is identified in the *Draft Future Transport Strategy* and the *draft Greater Sydney Region Plan* as a mass transit option for investigation within the next ten years with a vision that it be part of the mass transit network by 2056.

It is anticipated the recommended corridors for land use protection will be exhibited for the OSO, future Western Sydney Freight Line, South West Rail Link as well as the recommended corridor for BLoR-CC.

### 2.7.4 Alternative 4 - Investment to improve public transport

In addition to heavy rail infrastructure discussed in Section 2.7.3, north-western Sydney is served by several bus services connecting centres and some local communities. Two bus services utilise sections of Bells Line of Road, with one service operating from Berambing to Richmond. There are no services connecting towns to the west of the Blue Mountains to north-western Sydney. All long distance bus services utilise the Great Western Highway. Generally, development across north-western Sydney is relatively dispersed and typically of low density and consequently private vehicles are the predominant form of travel.
Public transport options such as rail, light rail or bus require certain volumes of passengers in order to be financially viable and typically serve to transport people to and from centres. However, the key drivers identified for the BLoR-CC study include highly dispersed and long distance passenger movements, as well as heavy and light freight and commercial services and businesses whose travel patterns are also greatly dispersed and diverse in nature. Public transport would only partially address these customer demands. There are no feasible strategic transport alternatives, such as light rail or bus corridors, that would meet the diverse range of customer needs for travel in this corridor.

Notwithstanding, improvements to public transport, including improved bus services, would be complementary to any future motorway within the BLoR-CC corridor and would not be precluded by the protection of a corridor for BLoR-CC in its proposed location.

As discussed in Section 2.7.3, the nature of the expected future transport demands, as currently understood, is not likely to require a dedicated public transport line through the BLoR-CC study area. The start and end points of both passenger and freight journeys would be too diverse to be served by a dedicated public transport line. The nature of the terrain west of the Hawkesbury-Nepean River does not support construction of light rail due to steep grades.

Once constructed, the motorway would ultimately reduce traffic on the existing road network which may create new opportunities for reallocating road space to public transport. The corridor retains the potential to support a range of transport infrastructure modes.

Opportunities to improve public transport on existing roads could be pursued to address local passenger demand in the short to medium term, however it is unlikely that local public transport services alone would address the long distance passenger and freight needs that are predicted in the future which could be provided by the implementation of a BLoR-CC motorway.

2.7.5 Recommended strategic alternative

All studies prepared to date have concluded that the cost, time and complexity of implementing a major new transport route across the Blue Mountains, or significantly upgrading Bells Line of Road to the west of Kurrajong Heights, would not be warranted in the foreseeable future. However a road based transport corridor connecting Bells Line of Road from Kurrajong Heights to the Sydney motorway network was identified as the long term preferred strategic alternative, with protection of the corridor required in the short to medium term as a consequence of urban development pressures in north-western Sydney.

The preferred strategic alternative, being a future road corridor between the M7 Motorway at Dean Park and Kurrajong Heights, best achieves the objectives as set out in Section 2.5. In particular, it would:

- Contribute to the future expansion of the motorway network in Western Sydney to support population and economic growth when it is required
- Contribute to improved transport connectivity and efficiency through and within western Sydney and to Central West NSW
- Balance future transport needs with the needs of the broader community and environment through the identification and protection of a transport corridor.

Reserving a corridor now not only will enable future cost effective infrastructure delivery and operation and will allow integrated transport and land use planning decisions to be made. Clear protection of a corridor on land use control plans will give a measure of certainty around decision making and future development planning in the BLoR-CC study area.
3. Strategic corridor development

This chapter describes the process that was undertaken to identify and develop corridor alignment options and explains how and why the recommended corridor was selected.

3.1 Methodology for the development of the recommended corridor

A detailed and robust methodology was adopted for the development and assessment of corridor options.

The development of corridor alignment options for the BLoR-CC was undertaken in four phases, being the identification of constraints and opportunities; development and assessment of the long listed options; development and assessment of the short listed options and selection of the recommended corridor. This process is presented graphically in Figure 3-1, and each phase is described in more detail in Sections 3.1.1 to 3.1.4.

Figure 3-1 Phases of development for the BLoR-CC corridor

The investigations and assessments to support each phase of the corridor options development have been based on available desktop information and generally no ground truthing has been undertaken, with the exception of some identification of business operations. In the context of the strategic nature of this assessment, the level of investigation undertaken is considered appropriate. Further testing and verification of data sources will be undertaken to support a future infrastructure project.

3.1.1 Phase 1 BLoR-CC study area

The constraints identification phase was intended to characterise the existing environment within the BLoR-CC study area and to identify the natural and built environment constraints and opportunities, and the planning and engineering constraints and opportunities that would inform the subsequent corridor options process, as shown in Figure 3-2.

Constraints were analysed for a broad range of environmental and social aspects including land use, biodiversity, Aboriginal and non-Aboriginal heritage, socio-economic, noise and vibration, soils and geology, hydrology, air quality, contaminated land and landscape
character and amenity. Constraints were identified through a desktop review of relevant environmental literature, databases and spatial data sets.

Planning considerations were identified, taking into account the strategic objectives identified in the *Bells Line of Road Long Term Strategic Corridor Plan* (Roads and Maritime, 2012).

Design criteria and principles were based on Roads and Maritime’s Network and Corridor Planning Practice Notes and Austroads Guide to Road Design.

These inputs were used to inform options development and the assessment of identified options, as discussed further below.

The BLoR-CC study area identified for the early phases of the study was approximately 45 kilometres long and 18 kilometres wide. It covers the area generally between the existing Sydney motorway network and Kurrajong Heights, including much of Sydney’s North West Growth Area, Rouse Hill, Kellyville, Windsor Downs, Llandilo, Windsor, Richmond, North Richmond, Kurrajong, and Kurrajong Heights. It encompasses the north-western portion of the M7, the existing reservation for the Castlereagh Freeway corridor, and Richmond and Windsor Roads.

Phase 1 was supported by comments received during the public exhibition of the study area in 2015.

### 3.1.2 Phase 2 Long listed options assessment

The aim of the long list assessment phase was to develop feasible corridor options driven by the corridor objectives and design principles. It gave consideration to opportunities and constraints within the BLoR-CC study area and generated alignments that complied with engineering standards and minimised environmental and socio-economic impacts.

The process of long listed options generation comprised five stages, as illustrated in Figure 3-3.
The process of generating route options within the BLoR-CC study area was performed using a computer software package called “Quantm”. Characteristics of the BLoR-CC study area including the constraints mapping, geometric requirements and cost parameters were defined and input into the scenarios to generate possible corridors. Geometric requirements refer to road design requirements such as lane width, gradients and radius of curves.

The Quantm route development software is used to generate routes to best avoid the constraint areas while simultaneously meeting the geometric requirements.

Quantm software was used for the following tasks during the long list options development:

- Alignment generation
- Alignment review to identify performance of alignments generated
- Long list options refinement.

**Fatal flaw analysis**

For the first run of alignment generation, a number of “free to roam” scenarios were created in Quantm, generating over 100 possible alignments. This initial process did not consider identified constraints or required performance outcomes.

Alignments generated by the Quantm route development software often do not entirely comply with all the geometric requirements defined. This is a result of balancing competing criteria. Some of these non-compliances can be resolved through minor realignments.
Alignments unable to comply with fundamental geometric requirements are regarded as having fatal flaws and are thus discarded from further assessment.

Fatal flaws identified included:

- Unable to achieve 100 year flood immunity
- Substandard geometry that could not be rectified in the concept design stage
- High level of impact to areas of high conservation value
- Bridges higher than 80 metres.

Alignments that passed the fatal flaw analysis from all of the scenarios were overlayed together to inform the trends of corridors. The corridor trends were reviewed and adjusted to inform the final long listed corridors.

3.1.3 Phase 3 Short listed options assessment

Multi-criteria analysis (MCA) was used to short list the options. The short listed options assessment built on the two preceding activities, ie the identification and preliminary analysis of likely and potential key constraints, and the subsequent MCA process for the long listed options.

The short list options process broadly comprised:

- Development of strategic design for each of the short listed options giving consideration to environmental and engineering issues
- Development of strategic interchange designs for all short listed options
- Identification of measurable criteria for key environmental aspects
- Identification of potential constraints for each of the short listed options in areas of planning, environment and engineering
- Preparation of quantities and budget cost estimates for each of the short listed options
- Feasibility assessment for each of the short listed options

The MCA process developed for the short listed options was consistent with the principles outlined in Transport for NSW’s Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives (2013). Criteria were identified to enable a comparative analysis of each short listed option based on the corridor objectives. These were developed as measurable attributes across a range of environmental and design issues that would allow for the differentiation between each short listed option.

Each short listed option was scored and weighted, based on agreed scales that reflected the relative impact and importance of each criterion. A sensitivity check was also conducted to confirm the robustness of the MCA results. Using the results, the highest ranked short listed corridor option was selected as the recommended corridor for further investigation.

3.1.4 Phase 4 recommended corridor establishment (including this draft SEA)

As a result of the MCA workshop, the recommended corridor option was identified and then further refined in the Strategic Concept Design.

The Strategic Concept Design is intended to do the following:

- Provide a good quality, feasible technical solution to meet the project objectives and business requirements
- Give certainty of the footprint and land take required for inclusion in a SEPP and relevant LEPs
• Provide a constructible solution that can be built safely whilst maintaining key traffic movements
• Provide a robust strategic cost estimate
• Provide sufficient design detail to inform the draft SEA
• Provide enough flexibility in footprint, road corridor width and design tolerances to allow innovation and value engineering during the future detailed design process.

To deliver the above, the Strategic Concept Design has been developed to balance the requirements of the draft SEA and the future design and construction needs of the project. Care has been taken to adopt appropriate tolerances, standards, and footprints to ensure that the design does not leave a legacy of cost increases as the project is further progressed.

Once the recommended corridor was identified, the draft SEA was prepared in accordance with the SEA guidelines.

3.2 Phase 1 BLoR-CC study area constraints and opportunities

Opportunities that were established included taking into account the following:
• Reliable and efficient movement of people and goods
• Compliance with current acceptable standards
• Maximising the safety of the road environment, vehicles and road user behaviour
• Minimising the impacts on the natural, cultural and built environments
• Consideration of all types of road users including passenger, freight and commercial vehicles, buses, motorcycles, bicycles and pedestrians
• Road classification suitable for its function in terms of mobility and access
• Integration with the surrounding landscape
• Integration with the wider transport network, including motorways, arterial roads, freight rail, passenger rail, bicycle and pedestrian facilities
• Traveller experience including visual experience, awareness of nearby towns and opportunities to stop for services
• Future land use, transport and industry changes and impacts on the corridor over the long term.

Key constraints identified include the following:
• Topography which is strongly undulating in the western part of the BLoR-CC study area (up to a height of 600 metres Australian Height Datum (AHD) at Kurrajong Heights) and softly undulating in the remainder of the BLoR-CC study area (rising to 200 metres AHD at the bottom of the Blue Mountains escarpment)
• Constant increase in ground level from the Hawkesbury River to the Blue Mountains presents a challenge to achieve motorway gradients of no more than six per cent
• The extensive floodplains in the central part of the BLoR-CC study area associated with the Grose and Nepean Rivers which converge to form the Hawkesbury River, flowing north-easterly across the western half of the BLoR-CC study area
• The extent and location of flooding which is extensive in parts of the BLoR-CC study area, noting for example, that the 100 year Average Recurrence Interval (ARI) flood level in the Windsor area is 17.3 metres and modelled to reach 26 metres in the Probable Maximum Flood (PMF)
• Existing land use, particular existing and planned development within the North West Growth Area and associated housing targets

• Areas of biodiversity including national parks, nature reserves, Cumberland Plain PCLs and Endangered Ecological Communities (EECs) listed under both State and Commonwealth legislation (Threatened Species Conservation Act 1995 (TSC Act) and Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act))

• Commonwealth and State heritage listed sites

• Two Aboriginal heritage sites listed on the State Heritage Register (SHR), the Blacktown Native Institute and the Colebee and Nurragingy Land Grant

• Land subject to an Aboriginal land claim in the vicinity of Londonderry

• Special designated land uses including RAAF base, Western Sydney University and TAFE NSW Western Sydney campus, the John Morony Correctional Centre, former Castlereagh Waste Management Centre and the former Air Services Australia site (at Shanes Park)

• Biodiversity investment opportunities identified for the Cumberland and Hawkesbury areas

• Utilities including 132kV, 330kV and 500kV electricity transmission lines and associated substations

• Gas and fuel trunk infrastructure including the Jemena Wilton to Newcastle gas pipeline and Caltex Sydney to Newcastle fuel pipeline

• Sewers greater than 750 millimetres in diameter and rising mains greater than 450 millimetres diameter

• Water mains greater than 600 millimetres in diameter.

Key opportunities for connections into the existing transport network were identified. These included:

• Connection into the M7 Motorway, and the Sydney motorway network. Investigations determined that the natural starting point for the BLoR-CC connection is considered to be at the corner of the M7 at Dean Park in the vicinity of the Richmond Road interchange. This location provides a balanced travel distance for road users travelling to and from the M7 Motorway both from the north/south section connecting to M4 Motorway and the east/west section connecting to the M2 Motorway

• The OSO is proposed to cross the BLoR-CC study area in a north-south direction. The crossing provides the opportunity to create a system interchange between the two motorways. The OSO horizontal and vertical alignment is governed by the design requirements for freight rail (gradient of approximately one per cent. As such, whilst the location and grading of the OSO corridor would afford the opportunity to create an interchange, it also constrains the grading of the BLoR-CC corridor which would be required to pass over the OSO.

Utilisation of the existing Castlereagh Freeway corridor reservation for the BLoR-CC corridor presented the following opportunities:

• The existing corridor reservation provides a connection to the M7 Motorway at Dean Park

• Consistency with community expectations as the Castlereagh Freeway corridor reservation has been in existence for over 50 years

• Minimal impact to the North West Growth Area.

However, there are also constraints associated with utilising the existing corridor reservation:
• Good quality vegetation has established itself in sections of the existing corridor as a result of limited development since its protection.

### 3.3 Phase 2 Long listed options assessment

#### 3.3.1 Identification of long listed corridor options

The long listed corridor options are shown in Figure 3-4, noting that there are sections of similarity within some corridors.

#### 3.3.2 Assessment of long listed corridor options

A MCA workshop was held on 1 September 2015 for the development of corridor options. The workshop was attended by the design team, cost estimators, representatives from the Roads and Maritime, Transport for NSW and the Department of Planning and Environment.

The MCA process for the long listed options was an evidence-based approach to the ranking of each of the 10 long listed options against the BLoR–CC corridor objectives. For each criterion, sub-criteria were developed, focussing on those constraints or features that would assist in the comparison of each option. Information was then collected and measured for each option. This information was based on constraints information provided in the previous phase.

The broad criteria that were developed were:

A. Transport connectivity – motorway
B. Land use integration – North West Growth Area
C. Land use integration – other areas
D. Balancing the needs of natural and cultural environment
E. Balancing the needs of the built environment
F. Balancing the needs of broader community
G. Future cost effectiveness

Weightings for each criteria were established, with two scenarios tested to check the sensitivity of the weightings. The weighted scores, using each scenario, were calculated for each short listed option.

In selecting the short listed options, a decision was made to not short list options that:

- Have a significant impact on the North West Growth Area (Options 8, 9 and 10)
- Require extensive bridging to cross the Hawkesbury-Nepean floodplain (Options 3, 4 and 9)
- Would result in increased risk by being significantly dependent on using part of the OSO, potentially resulting in increased land take requirements to accommodate additional lanes and additional structures to minimise weaving and ensure safe traffic movements (Option 10).

Five long list options were recommended for short listing.
Figure 3-4  Long listed corridor options
3.4 Phase 3 Short listed options assessment

3.4.1 Description of short listed corridors

The five short listed options are shown on Figure 3-5, noting that there are sections where all corridor options share the same corridor. Four broad zones were defined to assist with the assessment process of the short listed corridors. The four zones are as follows:

- Eastern Zone – from the eastern commencement point on the M7 Motorway through to Second Avenue/Llandilo Road, Llandilo
- Central East Zone – from Second Avenue/Llandilo Road to the crossing of the Hawkesbury-Nepean floodplain
- Central West Zone – from the Hawkesbury-Nepean floodplain crossing to the bottom of the Blue Mountains escarpment
- Western Zone – from the bottom of the Blue Mountains escarpment to the tie-in with the existing Bells Line of Road west of Kurrajong Heights.

3.4.2 Assessment of short listed corridor options

Broad criteria were identified for assessing the consequences of each short listed option based on the corridor assessment objectives. For each criterion, sub-criteria were developed, as shown in Table 3-1, and information was collected and measured for each short listed option to allow the MCA to be completed.

Table 3-1 Short listed assessment MCA criteria

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Sub-criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport connectivity – motorway</td>
<td>▪ Distance from the closest BLoR-CC interchange to Richmond ▪ Supporting flood evacuation strategy</td>
</tr>
<tr>
<td>Land use integration – outside growth areas</td>
<td>▪ Impact on social infrastructure ▪ Impact on open space and recreational areas ▪ Impact on mineral resources ▪ Impact on strategic agricultural land</td>
</tr>
<tr>
<td>Balancing the needs of the natural and cultural environment</td>
<td>▪ Impact on watercourses ▪ Impact on Cumberland Plain PCLs ▪ Impact on locally listed heritage items</td>
</tr>
<tr>
<td>Balancing the needs of the built environment</td>
<td>▪ Potential for staged delivery</td>
</tr>
<tr>
<td>Balancing the needs of the broader community</td>
<td>▪ Impact on local businesses ▪ Impact on primary producers ▪ Potential noise impact ▪ Impact on existing properties ▪ Landscape character and visual impact</td>
</tr>
<tr>
<td>Criterion</td>
<td>Sub-criteria</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>Future cost effectiveness</td>
<td>• Operational cost effectiveness</td>
</tr>
<tr>
<td></td>
<td>• Estimated construction cost.</td>
</tr>
</tbody>
</table>

The broad criteria used were consistent with those utilised in the long list MCA, and provided a differentiation between the short listed options.

Weightings for each criteria were established, with four scenarios reflecting separate emphasis on planning, engineering, environmental considerations and costs constructed to enable the comparative assessment of the short listed options and inform the selection of the recommended corridor. The weighted scores, using each scenario, were calculated for each short listed option.

The Purple Option was the highest ranked short listed option and was therefore recommended as the recommended corridor.

The recommended corridor utilises the existing Castlereagh Freeway reservation at the eastern end between the M7 and just east of The Northern Road. Between The Northern Road and Castlereagh Road, the recommended corridor moves to the south of the existing reservation. The benefits of moving the corridor in this area are to decrease the impact on the PCLs and other biodiversity impacts. To minimise property impacts, the recommended corridor is located close to property boundaries wherever possible.

### 3.5 Phase 4 recommended corridor establishment

Following the identification of the recommended corridor, further refinement of the Strategic Concept Design was undertaken. This included:

- Redrawing a section of the corridor to further reduce impacts on PCLs
- Adjustments to accommodate stakeholder requirements, such as flood evacuation routes
- Adjustments to accommodate drainage, utilities and local access arrangements
- Inclusion of a new potential interchange at Grose Vale Road and a temporary interchange with Bells Line of Road, east of Kurrajong Heights, to better provide for potential staging scenarios.

Ongoing consultation with relevant stakeholders, including Department of Planning and Environment, provided input and refinement to the Strategic Concept Design and the specialist input prepared to inform the draft SEA.
Figure 3-5  BLoR-CC short listed corridor options by zone
4. Recommended corridor alignment

This chapter describes the recommended corridor, outlining the characteristics of the alignment and providing an outline of the likely infrastructure components that could ultimately be delivered within the corridor. This includes the likely requirements for interchanges, bridges, tunnels and potential staging options.

4.1 Recommended corridor overview

4.1.1 Recommended corridor location

The recommended corridor is around 40 kilometres in length and extends through the Blacktown, Hawkesbury and Penrith LGAs. The recommended corridor commences at a full system interchange with the M7 at Dean Park. The corridor proceeds due west passing over Richmond Road and along the existing Castlereagh Freeway reservation. The recommended corridor is located between the former ASA site at Shanes Park and the existing suburbs of Hassall Grove, Bidwell, Shalvey and Wilmot to the south.

From Shanes Park, the recommended corridor proceeds north-west, crossing Stony Creek Road, South Creek, and Second Avenue, Llandilo. It continues to follow the alignment of the existing Castlereagh Freeway corridor reservation. After about one kilometre, the corridor deviates from the existing corridor reservation to cross The Northern Road south of the roundabout at the intersection between The Northern Road, Londonderry Road and Cranebrook Road.

The recommended corridor crosses the narrowest section of Cumberland Plain PCL just north of the Wianamatta Nature Reserve, at Castlereagh. It then follows an alignment along the south western edge of the PCL before crossing over Castlereagh Road and the floodplain of the Nepean River.

After crossing the Nepean River, the recommended corridor then heads north west, crossing the Grose River to continue along an alignment parallel to Grose Vale Road before crossing Grose Vale Road twice. The corridor then continues north until the existing Bells Line of Road. The corridor runs parallel to the existing Bells Line of Road for approximately 700 metres before crossing it at Kurrajong Hills.

The recommended corridor alignment then proceeds north before turning west to pass below Kurrajong Heights in tunnel. It comes to the surface west of Kurrajong Heights and ties in with the existing Bells Line of Road at the western end of the BLoR-CC study area.

The recommended corridor is shown in Figure 4-1 to 4-4.

4.1.2 Recommended corridor width

The recommended corridor has a varying width which is highly dependent on the existing topography. The minimum width of the corridor is approximately 80 metres along the southern edge of the former ASA site, where the median has been reduced to accommodate the corridor into a separately agreed reservation as part of the land transfer from the Commonwealth Government to the NSW Government. The corridor between the M7 and the Nepean River is typically about 120 metres wide. West of the Nepean River the corridor width varies between 120 metres and 140 metres, as a wider area was required in some locations to accommodate embankments and cuttings in the steeper terrain.
Figure 4-1  Recommended corridor (detail)
Figure 4-2  Recommended corridor (detail)
Figure 4-3  Recommended corridor (detail)
Figure 4-4  Recommended corridor (detail)
4.2 Overview of the future road and design criteria

As described above, for the purposes of informing the bounds of the recommended corridor, a Strategic Concept Design was developed to:

- Give a level of certainty around the expected footprint and land take required for inclusion in a SEPP and relevant LEPs
- Provide a constructible solution that can be built safely whilst maintaining key traffic movements
- Provide a robust strategic cost estimate
- Understand potential impacts at a strategic level to inform the draft SEA
- Provide enough flexibility in footprint, road corridor width and design tolerances to allow innovation and value engineering during the future detailed design process.

A set of design requirements has been established for the BLoR-CC corridor study, as shown in Table 4-1. This includes the functional classification of the future road as an M Class motorway.

An M Class motorway provides a high speed and unhindered flow of traffic, with no traffic signals, intersections or other at-grade accesses or crossings such as property access or pedestrian paths. Instead, these would be provided as overpasses and underpasses with vehicular access to and from the motorway provided at interchanges. An M Class motorway has dual carriageways where traffic travelling in opposite directions is separated by a median strip with traffic barriers or vegetation. Other design requirements include the need to transport heavy vehicles.

Table 4-1  Design requirements

<table>
<thead>
<tr>
<th>Design element</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional classification</td>
<td>M Class motorway</td>
</tr>
<tr>
<td>Cross section</td>
<td>3.0m nearside shoulder, 2 x 3.5m lanes and 2.0m offside shoulder, with allowance for an ultimate three lanes by widening in the median</td>
</tr>
<tr>
<td>Vertical clearance</td>
<td>5.4m minimum</td>
</tr>
<tr>
<td>Design vehicle</td>
<td>26m B-double (Checking vehicle – 36.5m B-Triple) for movement through all interchanges</td>
</tr>
<tr>
<td>Design speed</td>
<td>110km/h</td>
</tr>
<tr>
<td>Maintenance corridor</td>
<td>3.0m wide along the length of the motorway</td>
</tr>
<tr>
<td>Motorway services corridor</td>
<td>6.0m wide</td>
</tr>
<tr>
<td>Accessibility</td>
<td>No direct access to the motorway. Grade separated interchanges at: M7 Motorway; Richmond Road; Outer Sydney Orbital; The Northern Road; Londonderry Road; Grose Vale Road; and Bells Line of Road</td>
</tr>
</tbody>
</table>
Specific geometric design requirements have been established in accordance with the Austroads Guide to Road Design with Roads and Maritime supplements to satisfy the design requirements above.

While a design speed of 110km/h is proposed (consistent with other motorways in NSW), the topographical conditions associated with the corridor restrict this in some locations. During the early stages of corridor identification, it became apparent that the steep topography in the western portion of the BLoR-CC study area made it difficult to find suitable corridors. Roads and Maritime and Transport for NSW determined that a 90km/h design speed (80km/h posted speed) would be appropriate in this mountainous zone.

The proposed motorway alignment would, follow the recommended corridor alignment described in Section 4.1. The key infrastructure components that are anticipated to be delivered within the corridor, such as interchanges, bridges and tunnels are outlined in Sections 4.3. Potential staging options are briefly described in Section 4.4.

### 4.3 Key features

#### Proposed interchanges

The interchanges proposed for the recommended corridor are described in Table 4-2. Indicative arrangements for access ramps have been provided, however these would be subject to design development in the future.

<table>
<thead>
<tr>
<th>Interchange location</th>
<th>Interchange type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M7 Motorway System</td>
<td>Provides free flowing connections for all movements between the BLoR-CC and the M7 Motorway north/east bound and west/south bound.</td>
<td></td>
</tr>
<tr>
<td>Richmond Road Service</td>
<td>A half diamond interchange with an eastbound exit ramp and westbound entry ramp connecting to BLoR-CC to the west side of Richmond Road via T-intersections.</td>
<td></td>
</tr>
<tr>
<td>Outer Sydney Orbital System</td>
<td>Provides free flowing connections for all movements between BLoR-CC and the OSO.</td>
<td></td>
</tr>
<tr>
<td>The Northern Road and Londonderry Road Service</td>
<td>Two half diamond interchanges with east facing ramps connecting to The Northern Road and west facing ramp connecting to Cranebrook Road. The ramps connect to the local roads with T intersections.</td>
<td></td>
</tr>
<tr>
<td>Castlereagh Road Service</td>
<td>A full diamond interchange layout with ramps connecting the both the east and west bound BLoR-CC carriageways to Castlereagh</td>
<td></td>
</tr>
<tr>
<td>Interchange location</td>
<td>Interchange type</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Grose Vale Road</td>
<td>Service</td>
<td>A full interchange with loop ramps on the exit ramps. The ramps terminate at the local road with a T-intersection.</td>
</tr>
<tr>
<td>Bells Line of Road</td>
<td>Service</td>
<td>A diamond interchange layout with roundabout intersections between the ramp terminals and the local road. The existing Bells Line of Road is connected to the eastbound roundabout.</td>
</tr>
</tbody>
</table>

Further detail on the Strategic Concept Design relating to potential road infrastructure such as bridges and local road treatments is provided in Appendix B, noting that the Strategic Concept Design is indicative only and does not necessarily represent what would be built in the future.

**Floodplains and watercourses**

The recommended corridor crosses the floodplain of the Hawkesbury-Nepean River and its tributaries including the following watercourses:

- Hawkesbury-Nepean River
- Grose River
- South Creek
- Rickabys Creek
- Bells Creek
- Straight Creek
- Wood Creek
- Redbank Creek
- Rivets Creek
- Mahons Creek
- Little Wheeny Creek
- Blue Gum Creek

The Strategic Concept Design provides that floodplain and watercourse crossings east of the Hawkesbury-Nepean River will generally be multi-span prestressed concrete planks or Super T girder bridges. The bridge will provide clear opening for the active flow area of the floodplain and be elevated sufficiently to provide freeboard to the 100 year ARI flood level.

Similar bridge types will be utilised in the mountainous area to the west of the Hawkesbury-Nepean River with the exception of the crossing of deep and wide valleys. In these locations, where the height of the bridge is greater than about 20 metres, balanced cantilever type bridges would be more appropriate.

**Proposed tunnel**

Due to the topography and land use constraints, a section of tunnel under Kurrajong Heights has been considered. The tunnel portals would be located about one kilometre east and one kilometre west of the existing Bells Line of Road. The overall tunnel length would be about two kilometres and it would reach a maximum depth of about 150 metres below the natural surface.

The tunnel cross section would have the same configuration as the motorway carriageways (3.0 metres nearside shoulder, 2.0 x 3.5 metre lanes and 2.0 metre off side shoulder, with allowance for an ultimate three lanes) and would provide a 5.4 metre minimum vertical clearance. There would be one tunnel per carriageway with cross passages as required for emergency evacuation.
4.4 Potential staging scenarios

There are a number of potential staging scenarios for the BLoR-CC corridor. Each scenario is based upon construction of the motorway between the proposed interchanges. An additional, temporary, connection to the local road network would be possible where the BLoR-CC Corridor crosses Bells Line of Road at Kurrajong Hills.

Each potential section is described below, proceeding west along the BLoR-CC corridor. It is envisaged that the staging would reflect the traffic demand, resulting in a staged delivery of the BLoR-CC Corridor that provides the section from the M7 Motorway to the OSO first and then progresses west, as required. These staging scenarios are indicative only. Any staging of the motorway would be subject to future traffic demand and further detailed investigations.

Section 1 (M7 Motorway to OSO)

Section 1 would comprise the construction of the system interchange with the M7 Motorway, Richmond Road interchange and motorway carriageway up to the system interchange with the OSO. Interchange ramps connecting to the OSO would be provided as required, dependent upon how much of the OSO had been constructed. This section would be around seven kilometres in length.

Section 2 (OSO to The Northern Road)

Section 2 would comprise the construction of the remaining system interchange ramps at the interchange with the OSO, and the motorway carriageway up to The Northern Road. The east facing ramps of the interchange with The Northern Road would be constructed, providing connectivity to the existing road network. This section would be around five kilometres in length.

Section 3 (The Northern Road to Castlereagh Road)

Section 3 would comprise the construction of the bridge over The Northern Road, the west facing ramps connecting to Cranebrook Road, and the motorway carriageway up to Castlereagh Road. The east facing ramps of the interchange with Castlereagh Road would be constructed, providing connectivity to the existing road network. This section would be around seven kilometres in length.

Section 4 (Castlereagh Road to Grose Vale Road)

Section 4 would comprise the construction of the west facing ramps at the Castlereagh Road interchange, the crossings of the Hawkesbury-Nepean River and the Grose River and the motorway carriageway up to the interchange with Grose Vale Road. The east facing ramps of the interchange with Grose Vale Road would be constructed, providing connectivity to the existing road network. This section would be about 8.5 kilometres in length.

Section 5 (Grose Vale Road to Bells Line of Road)

Section 5 would comprise the construction of the west facing ramps at the Grose Vale Road interchange and the motorway carriageway up to about one kilometre from the crossing of the existing Bells Line of Road at Kurrajong Hills. A temporary connection would be provided to connect the motorway carriageway to the existing road network at the Bells Line of Road. This section would be about three kilometres in length.

Section 6 (Bells Line of Road to western tie-in)

Section 6 would comprise the demolition of the temporary connection to Bell Line of Road, construction of the Bells Line of Road bridge over the motorway, the motorway carriageway tunnel below Kurrajong Heights (about two kilometres long) and the interchange and tie-in at the western end. This section would be about six kilometres in length.
5. Consultation

This chapter provides a summary of consultation undertaken to date for the BLoR-CC corridor study and how this has influenced the development of the corridor options and the selection of the recommended corridor.

5.1 Consultation objectives and strategy

Communication and engagement objectives include:

- To explain the process of identifying and protecting a corridor through the provision of good information
- To provide accurate information about the plan to protect a corridor for the BLoR-CC and gain feedback on a recommended corridor
- To provide an opportunity for interested community members and stakeholders to provide information on the BLoR-CC study area and feedback on the recommended corridor
- To explain the recommended corridor and how the corridor was identified as the preferred alignment. To provide an integrated approach for the provision of information on all transport related projects for the area.

5.2 Overview

In June 2015 the NSW Government announced that investigations were underway to identify a suitable corridor for the BLoR-CC to provide a link from the Lower Hawkesbury to Sydney’s existing motorway network.

Key stakeholders identified for the BLoR-CC corridor study included:

- State agencies (eg Department of Planning and Environment, Infrastructure NSW, State Emergency Services and Office of Environment and Heritage)
- Local government (Blacktown City, Hawkesbury City and Penrith Councils)
- Elected representatives (Federal, State and local government)
- Public utilities, special interest, business and industry groups across the BLoR-CC study area
- Deerubbin Local Aboriginal Land Council (LALC)
- Directly impacted communities
- The broader community.

5.3 Consultation and engagement activities to date

The corridor protection process was announced in June 2015. Community consultation for the BLoR-CC corridor (in conjunction with the OSO) was undertaken between 6 June 2015 and 7 August 2015 to invite feedback from the community and stakeholders that would help inform the understanding of challenges and opportunities in the BLoR-CC study area. Activities included drop in sessions and meetings with key stakeholder groups including representatives of Windsor Downs homeowners, Shanes Park residents, various environmental groups and representatives from the freight industry.

Key issues for the corridor selection and assessment process identified in the feedback received included:
• The Shanes Park Woodland (former ASA site) and its connection to Wianamatta Nature Reserve
• Undisturbed vegetation and habitat along the existing Castlereagh Freeway corridor reservation, as well as along creek corridors
• Threatened species, including but not limited to Cumberland Plain Woodlands and existing nature reserves and protected areas
• Flooding and floodplain management issues
• Heritage significance of the Macquarie Towns
• Heritage values along parts of Castlereagh Road
• Historic homes along Grose Vale Road between Kurrajong and Grose Vale
• Rural amenity and neighbourhood character of existing established communities
• Need for an additional crossing of the Hawkesbury River to ease traffic congestion
• Timeliness of information surrounding the proposed protection and the potential anxiety that can be generated for land owners and future decision making.

Feedback raised by the community was used to inform the development of corridor options and the assessment of the recommended corridor in this draft SEA.

The Deerubbin LALC, located in the BLoR-CC study area, were briefed and consulted on the BLoR-CC Corridor Study. A meeting was held with representatives from the project team including the Roads and Maritime Aboriginal Liaison Officer.

During the meeting LALC representatives were given maps of the BLoR-CC study area with sites identified from the Aboriginal Heritage Information Management System (AHIMS) and areas of archaeological sensitivity. Other areas that may be of cultural Aboriginal significance. During the meeting future fieldwork were discussed, and it was proposed that field investigations with Aboriginal representation along with further consultation will be undertaken with the LALC in the future.

Ongoing engagement with the Department of Planning and Environment has been conducted to inform the strategic planning process and the preparation of this draft SEA to support the proposed SEPP.

Ongoing discussions with the Office of Environment and Heritage have also been conducted particularly in relation to biodiversity issues including existing biobank sites, wildlife corridors, Cumberland Plain PCLs, the Wianamatta Regional Park and the former ASA site at Shanes Park.

Meetings have been held with Blacktown, Hawkesbury and Penrith Councils to gain an understanding of the issues affecting the location of the corridors from the perspective of the local council.

Meetings have also been held with Infrastructure NSW and State Emergency Services regarding flood evacuation and the potential for the BLoR-CC Corridor to contribute to future flood evacuation scenarios. Urban Growth and numerous utilities and service authorities, including Transgrid, were also consulted to discuss potential implications arising from the proposed corridors at the constraints stage.

5.4 Future consultation

This draft SEA will be placed on public exhibition and comments sought from the community and other stakeholders. Comments will be taken into consideration in the finalisation of the draft SEA and the final protection of the recommended corridor. Transport for NSW will hold
a series of community drop-in sessions as part of the exhibition process to facilitate receipt of any feedback or concerns.

As part of the corridor protection process, the Transport for NSW will engage with all affected landowners. Other stakeholders will continue to be engaged, including local government, State government agencies, service providers and developers. Consultation activities will continue as part of the preparation of the SEPP for the corridor. Further detail on the proposed engagement strategy is provided below.

**Property owner consultation**

Transport for NSW will contact affected property owners, with letters and notices being sent to those properties located within the recommended corridor. Consultation will include information regarding the process and implications of corridor protection, and future phases.

**LALC consultation**

To identify cultural constraints and to ground-truth AHIMS sites and areas of archaeological sensitivity, further consultation and field investigation is proposed to be undertaken with LALC representatives prior to any construction works.

**Government consultation**

Government endorsement of a corridor is an important component of the corridor protection process and as such, all levels of government will continue to be consulted and involved in the process. Meetings will continue to be held with each of the three councils during the corridor protection process to discuss issues affecting the location of the corridors from their perspective.

As the project progresses, Transport for NSW will continue to consult with the Department of Planning and Environment, Roads and Maritime and the Office of Environment and Heritage in providing input regarding various issues associated with the corridor. Furthermore, meetings will continue to be held with Infrastructure NSW and State Emergency Services regarding flood evacuation, and service authorities, including Transgrid, to further discuss unavoidable constraints and potential management measures.
6. Recommended corridor overview

This section provides an overview of the recommended corridor as a whole by environmental aspect, to provide the context for the strategic environmental assessment presented in Chapters 7 and 8.

6.1 Land use and property

Zoning

The recommended corridor extends across three LGAs: Hawkesbury, Blacktown and Penrith with land use development regulated through the following LEPs:

- Blacktown LEP 2015
- Hawkesbury LEP 2012
- Penrith LEP 2010.

The North West Growth Area is located within the Blacktown LGA and the land use controls are established in Precinct Plans under the State Environmental Planning Policy (Sydney Region Growth Centres) 2006 (Growth Centres SEPP).

The following Precinct Plans apply to land located along the recommended corridor:

- Marsden Park Industrial Precinct Plan 2010 (Appendix 5 to the Growth Centres SEPP)
- Blacktown Growth Centres Precinct Plan 2013 (for Marsden Park Precinct) (Appendix 12 to the Growth Centres SEPP)
- Schofields Precinct Plan 2012 (Appendix 7 to the Growth Centres SEPP).

The Indicative Layout Plans (zoning), and the respective Precinct Plans set out the planning controls that will inform future land use development across the Precincts.

Current land use zoning along the recommended corridor is shown in Figure 6-1.

Shanes Park, the fourth precinct in the North West Growth Area that would be crossed by the recommended corridor, has not yet been released for planning. It is currently zoned RU4 (Primary Production Small Lots) under the Penrith LEP 2010.
Figure 6-1  Land use zoning along the recommended corridor
Residential and employment lands

The recommended corridor is situated to the south of the North West Growth Area, avoiding the residential, industrial and environmental conservation lands. The highest concentration of residential development along the entire recommended corridor is located to the south of the North West Growth Area, adjacent to the suburbs of Dean Park, Hassall Grove, Shalvey and Willmot. These suburbs are characterised as being established residential development comprising detached dwellings and local and neighbourhood facilities such as schools, places of worship and shopping centres.

Much of the recommended corridor crosses rural residential land, particularly in the north west. Rural residential land involves “the use of rural land for primarily residential purposes. The main source of income is not from a pursuit carried out on the land. Most rural residential dwellers move there for lifestyle rather than for the land’s productive potential.”

There is very little large scale employment land use along the recommended corridor. At the eastern end, immediately to the north of the recommended corridor, the Marsden Park Industrial Precinct in the North West Growth Area is predominantly zoned for employment generating uses and is currently under development. Across the remainder of the recommended corridor employment generating activity is generally limited to scattered small independent businesses and industries.

Environmental conservation land uses

The recommended corridor crosses a number of sensitive environmental land uses including Cumberland Plain Priority Conservation Lands (PCL), the former ASA site at Shanes Park and parcels of Crown land (refer Figure 6-2).

National parks estate

The recommended corridor has been situated to avoid national parks estate, and in particular it avoids the Blue Mountains National Park and Wollemi National Park, both part of the World Heritage listed Greater Blue Mountains Area. The Castlereagh Nature Reserve and Wianamatta Regional Park are also avoided.

A parcel of land at Colebee near the corner of the M7 Motorway and Richmond Road owned by Roads and Maritime has been provided as an offset for the M7 Motorway and is in the process of being transferred to the Office of Environment and Heritage to form part of the future Colebee Nature Reserve. The Nature Reserve has not yet been declared under the National Parks and Wildlife Act 1974.

Wianamatta Nature Reserve is located to the south of the proposed interchange with Cranebrook Road, Londonderry Road and The Northern Road. Created in 2011, it protects a number of EECs, including 10 per cent of the total remaining population of Castlereagh Swamp Woodland Community. It an important refuge for native fauna and flora in the Western Sydney region due to its large size, connectivity and ecological diversity.

Crown land

The recommended corridor intersects a number of parcels of Crown land, particularly in the central and western sections. It avoids the large parcel of interconnected Crown lands at Castlereagh and Agnes Banks.

---

Figure 6-2  Environmental conservation land uses
Cumberland Plain Priority Conservation Lands

The PCLs at Castlereagh comprise the largest intact area of native vegetation remaining on the Cumberland Plain. The PCLs have been identified as conservation priorities in the Commonwealth and NSW endorsed Cumberland Plain Recovery Plan (DECCW, 2011a) and are considered to represent “the best remaining opportunities to secure long-term biodiversity benefits in the region at the lowest possible cost”.

While not a statutory protection, given the high ecological significance under the Threatened Species Conservation Act and the Environment Protection and Biodiversity Conservation Act, these areas are considered highly sensitive. The alignment of the recommended corridor has sought to avoid impact on these lands.

Former ASA site at Shanes Park

The former ASA site at Shanes Park is currently owned by AirServices Australia (ASA). Discussions have commenced to transfer the site to the NSW Government and for it to be reserved as a Regional Park. The site is zoned Environment Conservation under the Growth Centres SEPP. It contains a number of endangered vegetation and Endangered Ecological Communities listed under both State and Commonwealth legislation, and also provides habitat for endangered wildlife. The site contains a high proportion of high quality native vegetation which must be maintained under both the biodiversity certification under the TSC Act and the EPBC Act strategic approval.

Approximately three per cent, or 18 hectares, along the southern boundary of the site was identified in 1951 as a road corridor, as part of the existing Castlereagh Freeway corridor reservation.

Social land uses

Key land uses such as schools, tertiary education, open space and recreation, hospitals and places of worship are shown on Figure 6-1.

Agriculture

Agricultural land covers approximately 77,000 hectares of land within the greater Sydney Basin, estimated at approximately two per cent of the NSW total land agricultural area.29 Much of the agricultural land borders the Blue Mountains and provides an important buffer protecting urban areas from bushfires and maintaining critical catchment functions.30 Currently, the majority of Sydney’s agricultural operations are located in Western Sydney.

Land crossed by the recommended corridor between Castlereagh Road and the Hawkesbury-Nepean River is classified as Class 2 land in the NSW Agriculture Land Classification Report (NSW Agriculture, 2002), which is considered to be highly productive agricultural land.

Utilities infrastructure

The recommended corridor is traversed by a number of utility installations including water supply pipelines and multiple electricity transmissions lines and easements. These are predominantly located in the eastern portion of the recommended corridor where the land is more developed and established.

Within new development areas, such as the North West Growth Area, the necessary utilities infrastructure is being rolled out progressively as precincts are developed and released. The recommended corridor does not intersect any major infrastructure installations such as sewage or water treatment plants.

---

Mining

Important coal resources of strategic value to NSW underlie the entire BLoR-CC study area, although generally these areas are not currently held under title. The former Department of Trade and Industry (now Department of Industry (Resource and Energy) has advised that underground mining in this area should not be discounted although it would likely be in the medium to longer term time frame.\(^{31}\)

Operating and proposed quarries and mines have an associated ‘transition area’ which refers to surrounding areas that may be subject to impacts from mining or quarrying operations such as noise, dust or vibration. These are based on criteria developed by the EPA and intended as guidance only, i.e. transition widths are 1000 metres for sites where blasting does or would occur and 500 metres for sites where blasting is not required. The recommended corridor crosses the transition area for the “Londonderry Clay Resource Area B” at Londonderry.

6.2 Traffic and transport

The existing transport environment within and in the vicinity of the BLoR-CC study area comprises road, freight and passenger rail and active transport (cycleway and pedestrian) networks and corridors (refer Figure 1-1).

Major road corridors in western and north-western Sydney include the M7 Motorway, the M5 South West Motorway (M5) and the M4 Western Motorway (M4) with additional arterial roads such as the Great Western Highway, Cumberland Highway, The Northern Road, Richmond Road, Windsor Road and Bells Line of Road. While these roads provide high quality transport connections between regional centres and employment areas across the city, they experience various levels of congestion, particularly during peak hours and can provide poor levels of service and increasing travel times for road users.

Major passenger rail lines include the Main Western Line which runs along an east-west alignment to the south of the BLoR-CC study area between Blacktown and Penrith and the Northern Line between Blacktown and Richmond. The Cumberland Line also provides passenger rail services from Schofields south to Campbelltown via Blacktown and Parramatta. There is no rail freight infrastructure within the BLoR-CC study area.

The Sydney Metro Northwest is currently under construction, and when completed will extend from Epping to Cudgegong via eight new stations. An extension to Marsden Park is also under consideration. The North South Rail Line extension is in the corridor planning phase to protect a future north south corridor connection from St Mary’s to Narellan via the future Western Sydney Airport.

Key routes regularly used by heavy vehicles (freight) include the M7 Motorway, Great Western Highway, Windsor Road, Old Windsor Road, The Northern Road, Bells Line of Road, Richmond Road, Castlecrag Road and Garfield Road. Depending on the specific road, heavy vehicles can make up between 10 and 13 per cent of the total traffic volume.

Within the BLoR-CC study area, Richmond Road provides a strategic bus corridor from Blacktown to Glendenning, just south of the North West Growth Area. The *North West Sector Bus Servicing Plan* (NSW Transport and Infrastructure, 2009) defines the long term bus network for the North West Growth Area and proposes regional routes to centres and employment areas, as well as district routes to provide coverage to local residential areas.

In the vicinity of the BLoR-CC study area, an integrated rail and bus network is planned for the North West Growth Area. The *North West Priority Growth Area Land Use and Infrastructure Implementation Plan* (Department of Planning and Environment, 2017b) states

\(^{31}\) Correspondence from NSW Trade and Investment - Resources and Energy to Roads and Maritime, 15 April 2014.
in the intermediate term, the transit network will comprise rapid bus routes and suburban bus routes linking major centres. Two dedicated higher order bus corridors are proposed from Box Hill to Marsden Park which will connect to Mount Druitt and the Schofields Road Route which will connect to Blacktown via Richmond Road.

The Plan states that rapid bus routes will be developed for the North West Growth Area which will provide frequent all day cross-regional connections to existing and new major centres and rail stations. A rapid route is being investigated to connect Rouse Hill to Blacktown via Marsden Park using major roads including Schofields Road and Richmond Road. Suburban routes will also be investigated to connect the Growth Area and its new rail link to Penrith via Ropes Crossing and to the Western Sydney Employment Area.

Planning for more bus services to the North West Growth Area is also supported in the Draft Future Transport Strategy. The strategy identifies a visionary intermediate transit network for 2056 which will support high capacity, ‘turn up and go’ journeys. Many services on the immediate network will be on-demand, flexible and focused on connecting people to the mass transit network. The visionary network includes on-street rapid transit corridors (light rail/rapid bus) linking the Western Sydney Airport with Mt Druitt and Greater Penrith and a rapid bus linking Blacktown with Norwest.

6.3 Noise and vibration

Background noise levels along the recommended corridor are influenced by a range of noise sources. These include localised sources such as motor vehicles, public transport, construction activities, residential properties, farming and agricultural activities and some commercial and industrial activities. Other more significant sources of noise include:

- Movements of aircraft associated with the Richmond RAAF Base operations
- Movement of freight and passenger trains on the Main West Line and passenger trains on the Richmond Line
- Passenger train movements on the Sydney Metro Northwest Line (when operational)
- Traffic movements, including heavy vehicle movements, on the M7 Motorway and other arterial roads within the BLoR-CC study area.

Aircraft movements associated with the operation of the future Western Sydney Airport would be a noise source in the future. Also, the continuing urban development of land adjacent to the recommended corridor would increase background noise levels over time.

Noise-sensitive receivers along the recommended corridor include residences, educational facilities, places of worship, aged-care facilities and other community facilities such as areas of open space used for recreation. Noise-sensitive receivers adjacent to the recommended corridor are identified in Figure 6-1.

6.4 Visual amenity, built form and urban design

The fringes of Western Sydney occupy a landscape of great natural and cultural value. Culturally it is the home of the Eora Nation. Historically it is a pioneering settlement area of the British colony, the setting for the Macquarie towns and communities of the great immigration waves of the 20th Century. Naturally it is the Cumberland Plain, the Nepean River valley and the foothill areas of the Blue Mountains.

The scenic value of the BLoR-CC study area is characterised by a mix of rural/agricultural and remnant indigenous landscapes. Existing native vegetation is a major feature of the

---

32 As identified in the Road Noise Policy (DECCW, 2011) and the Noise Criteria Guideline (Roads and Maritime, 2015a).
journey and provides a visually pleasant driving experience with opening and closing views that extend to the Blue Mountains and across river landscapes. Much of the motorist’s experience when travelling along roads within the study area relies on the ‘borrowed’ landscape outside the road corridor.

Landscape character zones (LCZs) have been defined for the purpose of gaining an understanding of land use, topography and vegetation in combination with other factors intrinsic to the local landscape.

Six LCZs have been identified within the BLoR-CC study area as described in Table 6-1 and shown in Figure 6-3.

*Table 6-1  BLoR-CC landscape character zones*

<table>
<thead>
<tr>
<th>No</th>
<th>LCZ</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Urban</td>
<td>A variety of high, medium and low density residential housing and associated town centres with a range of services and facilities</td>
</tr>
<tr>
<td>2</td>
<td>Rural</td>
<td>Rural land uses, including areas of primary production and pastureland with native vegetation mostly along fence line plantings</td>
</tr>
<tr>
<td>3</td>
<td>Mountain escarpment</td>
<td>Densely vegetated escarpment with a small number of rural properties with some dairy grazing on the lower terraces</td>
</tr>
<tr>
<td>4</td>
<td>Bushland and conservation areas</td>
<td>Protected bush and parkland of environmental significance and public open and recreational spaces on gently undulating country</td>
</tr>
<tr>
<td>5</td>
<td>Rivers, creeks and tributaries</td>
<td>Water bodies used for irrigation water supply and recreational and sporting activities</td>
</tr>
</tbody>
</table>
Figure 6-3  Landscape character zones across the BLoR-CC study area
6.5 Geology and soils

The geology of the BLoR-CC study area falls entirely within the Penrith 1:100,000 geological map which extends from the western part of Sydney (roughly aligned with Parramatta) to the lower Blue Mountains (roughly midway between Penrith and Katoomba).

There are a number of regionally significant lineaments in and around the BLoR-CC study area. These include the Kurrajong Fault which is located in the general vicinity of Kurrajong Heights. The Lapstone Monocline is also located in the western part of the BLoR-CC study area, generally following the base of the Blue Mountains. The Penrith 1:100,000 geological map also shows an unnamed fold crossing the lower half of the BLoR-CC study area from the Oakhurst locality to the Londonderry area. The recommended corridor crosses this fold in the general vicinity of Shanes Park.

There are two physiographic regions (Blue Mountains Plateau, Cumberland Lowlands) in the BLoR-CC study area containing 13 different soil landscapes. The Blue Mountains Plateau consists of a deeply incised Hawkesbury Sandstone surface overlying Narrabeen sandstone. Narrabeen Group outcrops occur on some valley floors and there are occasional volcanic intrusions. The Cumberland Lowlands unit consist of low lying, gently undulating plains and low hills on Wianamatta Group shales and sandstone with a dense drainage network of predominantly northward flowing channels.

The potential for contamination is often linked to past uses and a useful indicator is land zoning. Contamination is more likely to have occurred if the land is currently, or was previously, zoned for industrial, agricultural or defence purposes. There are no known contaminated sites within alignment of the recommended corridor.

6.6 Water quality and hydrology

Catchment context and waterway crossings

The recommended corridor is located in the catchment of the Hawkesbury-Nepean River, one of the largest coastal basins in NSW with an area of 21,400 square kilometres. Over 70 per cent of the catchment consists of mountainous terrain, with approximately 10 per cent flat terrain. The catchment includes the coastal reaches from Turimetta Headland to Barrenjoey near its mouth, and catchments for Warragamba, Upper Nepean and Mangrove Creek dams; which are the main water supply reservoirs for the Sydney Metropolitan Area, Gosford and Wyong.

The main waterways within the vicinity of the recommended corridor are shown on Figure 6-4.

Water quality

Water quality in the Hawkesbury-Nepean River is affected by wastewater treatment plant discharges as well as by diffuse-source pollution from urban and agricultural runoff. As a result of cumulative development and population growth over time, the Hawkesbury-Nepean River system has been placed under increasing pressure and the environmental health of the river system has been adversely impacted. Also large volumes of water are extracted for drinking water, irrigation and industrial uses, reducing the capacity of the river to dilute and flush pollutants discharged in the river system. Algal and introduced macrophyte blooms commonly occur and are likely to continue to occur in the future. While there has been some improvement, water quality in some areas does not meet water quality objectives (such as those in the ANZECC / ARMCANZ (2000) Guidelines for Fresh and Marine Water Quality).
Figure 6-4  Major waterways in the vicinity of the recommended corridor
Water supply infrastructure

The upstream reaches of the Hawkesbury-Nepean River catchment contain a number of dams, including Warragamba Dam which provides drinking water for Sydney’s population and regulates the flow of water in the Hawkesbury-Nepean River. These would not be affected by the recommended corridor.

The North Richmond Water Filtration Plant is located about 6.5 kilometres downstream of the recommended corridor’s crossing of the Hawkesbury River and approximately five kilometres downstream of the crossing of the Grose River. The North Richmond Water Filtration Plant supplies an average of about 20 million litres of drinking water a day to the Hawkesbury region including Windsor, Richmond and Kurrajong.

6.7 Biodiversity

Landscape context

The BLoR-CC study area is located in the Hawkesbury-Nepean catchment and the northern part of the Cumberland subregion in the Sydney Basin bioregion. The study area is dissected by two major waterways: the Hawkesbury River and South Creek, with the whole area located in a region of varying topography.

Vegetation communities

Over 10,500 hectares of native vegetation has been identified within the BLoR-CC study area from the Native Vegetation of the Cumberland Plain mapping (NPWS, 2002), comprising 16 native plant communities.

Threatened ecological communities

Over 9,000 hectares of the BLoR-CC study area is listed as threatened ecological community (TEC). This includes two TECs listed as critically endangered under the TSC Act and six TECs listed as critically endangered under the EPBC Act (refer Figure 6-5 and Figure 6-6). These comprise:

- Cumberland Plain Woodland in the Sydney Basin Bioregion (TSC Act and EPBC Act)
- Shale Gravel Transition Forest in the Sydney Basin Bioregion (EPBC Act)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (TSC Act and EPBC Act)
- Cooks River Castlereagh Ironbark Forest in the Sydney Basin Bioregion (EPBC Act)
- Sydney Turpentine Ironbark Forest (EPBC Act)
- Western Sydney Dry Rainforest in the Sydney Basin Bioregion (EPBC Act).

River-Flat Eucalypt Forest on Coastal Floodplains and Freshwater Wetlands are present along the Hawkesbury River, South Creek and other smaller drainage lines.

Shale Sandstone Transition Forest predominantly occurs in the north-western part of the BLoR-CC study area where the Cumberland Plain transitions to the sandstone soils of the Hornsby and Blue Mountains Plateaux.

Fragmentation

An analysis of the spatial configuration of remnant vegetation within the BLoR-CC study area was undertaken to provide a better understanding of remnant size and distribution. This assessment indicated a high degree of fragmentation throughout the area with some 605 individual remnants of native vegetation are present, ranging in size from less than one hectare to 3,599 hectares.
The majority of native vegetation in the BLoR-CC study area is contained within larger patches of vegetation, with over 61 per cent of the total area of native vegetation in patches of greater than 100 hectares.

**Threatened flora and endangered populations**

There are 36 threatened flora species and one endangered population listed under the TSC Act that have previously been recorded within the BLoR-CC study area. Of these, 19 threatened flora species were found to have a moderate or high likelihood of occurrence of occurrence within the recommended corridor.

**Fauna**

Apart from a few larger vegetation remnants, much of the remaining areas of natural fauna habitat within the study area are fragmented, smaller remnants.

The range of fauna habitats represented in the BLoR-CC study area has resulted in utilisation by a high diversity of species. Records in the Office of Environment and Heritage Atlas of NSW Wildlife include 383 native fauna species that have been identified in the BLoR-CC study area. Some of these are threatened and/or regionally significant species.

The most important areas of fauna habitat occur in large remnants of native bushland and the vegetation that links these areas of important habitat. In addition to protected areas, an unpublished report have identified important areas of habitat for fauna on the Cumberland Plain. These areas are the largest remaining areas of bushland outside designated national parks and reserves.

Sixty-five threatened fauna species (four amphibians, 40 birds, one reptile, 15 mammals, three fish and two gastropods) listed under the TSC Act and/or EPBC Act have previously been recorded within the BLoR-CC study area or have been predicted to occur.

The likely presence of Koala habitat was assessed according to the *EPBC Act Referral guidelines for the vulnerable koala* (Department of Environment, 2014). Based on the definition of koala habitat within this document it is likely that the BLoR-CC study area may be considered to contain koala habitat. It is also likely that parts of the BLoR-CC study area would meet the definition of potential koala habitat under SEPP 44 however this would need to be assessed at the project assessment and approval stage.

There is no listed critical habitat within the BLoR-CC study area.

Sixteen migratory birds have previously been recorded within the BLoR-CC study area. The species that are most likely to occur within the BloR-CC study area are the more common species that utilise dams and occasionally inundated paddocks in farmlands such as the Cattle Egret (*Ardea ibis*) and Latham’s Snipe (*Gallinago hardwickii*). Low numbers of records for migratory species that use woodland habitats suggests they are only occasional visitors to the BLoR-CC study area.

**Wetlands, aquatic and riparian habitat**

There are no wetlands of state, Commonwealth or international importance within or in proximity to the recommended corridor. The BLoR-CC study area contains a large number of smaller wetlands not classified under SEPP 14, or Wetlands of National Importance or the Ramsar Convention. These wetlands provide valuable resources for wildfowl and other species dependent upon such habitat. Some of these wetlands are also listed as protected under the TSC Act, being mapped as the Freshwater Wetlands on Coastal Floodplains.

The section of the Hawkesbury River that occurs within the BLoR-CC study area is tidally influenced. The upstream reaches of the Hawkesbury and Nepean Rivers contain a number of dams, including Warragamba Dam, which regulates flow in the river. Other water bodies present in the BLoR-CC study area include freshwater wetlands, farm dams and industrial
reservoirs. These can provide important habitat and refuge for threatened and migratory fauna species.

Riparian corridors form the transition zone between the terrestrial environment and the watercourse or aquatic environment. As such, the protection of riparian corridors is important for maintaining the ecological functions of a watercourse. The riparian corridor consists of the channel, comprising the bed and banks of the watercourse to the highest bank, and the vegetated riparian zone (VRZ) adjoining the channel. The Office of Water recommends protecting a VRZ width based on watercourse order as classified under the Strahler System of ordering watercourses and using current 1:25 000 topographic maps.

Key fish habitat mapped in the BLoR-CC study area includes the Hawkesbury River, Nepean River, South Creek, Eastern Creek, Wianamatta Creek, Grose River, Killarney Chain of Ponds, Strangers Creek, Caddies Creek, Second Ponds Creek, Little Island Creek, Blue Gum Creek, Redbank Creek, Little Wheeny Creek and Rickabys Creek.

The following rivers and creeks are considered to be groundwater dependent ecosystems (GDEs) according to the National Atlas of Groundwater Dependent Ecosystems (BoM, 2015): Hawkesbury River, Nepean River, South Creek, Rickabys Creek and Yarramundi Lagoon.

The majority of vegetation communities in the BLoR-CC study area have been identified to have a high potential for groundwater interaction. As such it is likely that vegetation within these vegetation communities could have a moderate to high dependence upon groundwater at various times, including during low rainfall or drought periods.

**Wildlife connectivity**

The Cumberland Plain is regarded as an over-cleared, highly fragmented landscape with limited opportunities for meaningful ecological connectivity. The BLoR-CC study area contains some of the largest remnants of vegetation remaining on the Cumberland Plain and opportunities have been identified to enhance connectivity and connect these patches to other remnant vegetation both within and beyond the Cumberland Plain. This is important for both fauna movement and plant pollination and dispersal. Protection of the Cumberland Plain PCLs that adjoin NPWS estate and other parks and reserves would retain important connectivity opportunities in the BLoR-CC study area. The presence of vegetation remnants of the Cumberland Plain played an important factor in the selection of the recommended corridor.

Rivers and riparian vegetation in the BLoR-CC study area are important to some threatened fauna species which are likely to use these environments for foraging and movement throughout the landscape such as at South Creek, Ropes Creek and Eastern Creek. Grassy woodlands are particularly important for conserving the declining woodland birds that are found in the region; including the Diamond Firetail, Brown Treecreeper and Speckled Warbler.

The Office of Environment and Heritage consider the existing elements within the BLoR-CC study area as important to a variety of species including kangaroos, wallabies, emus and the Cumberland Plain Land Snail. They have also noted that koala and spotted-tailed quoll records exist in the area, both of which are threatened.
Figure 6-5  TSC Act threatened ecological communities
Figure 6-6 EPBC Act threatened ecological communities
6.8 Aboriginal heritage

The traditional boundaries of the Darug people are thought to extend from the mouth of the Hawkesbury River inland to the current locations of Windsor, Penrith and Campbelltown and then to Mount Victoria. The oldest dated sites for Aboriginal occupation in the Sydney Basin are from the late Pleistocene period, with a securely dated site at the base of the Blue Mountains of 14,700 years before present (yBP). The archaeological material record provides evidence of this long occupation, but also provides evidence of a dynamic culture that has changed through time.

European expansion throughout the Cumberland Plain displaced Aboriginal people from their traditional land and cut off access to many resources. The archaeological record is skewed towards materials and objects that were able to withstand degradation and decay. As a result, sites containing stone artefacts, grinding sites, shelter sites, art and engraving sites and culturally modified trees feature predominantly in the archaeological record. However, European activity has severely impacted the survivability of even these sites. Clearing for agriculture would have destroyed many old growth native trees suitable for cultural modification and agricultural activities and development have disturbed or destroyed archaeological deposits and surface archaeological sites. However, all sites can be regarded as part of a larger cultural landscape. A cultural landscape is a mosaic consisting of natural elements, physical remnants of human activity, places and landscapes that shaped and were shaped by people and their lifestyles.

The existing archaeological record is limited to certain materials and objects that were able to withstand degradation and decay. As a result, the most common type of Aboriginal objects remaining in the archaeological record are stone artefacts. Archaeological analyses of these artefacts in their contexts have provided the basis for the interpretation of change in material culture over time. Technologies used for making tools changed, along with preference of raw material. Different types of tools appeared at certain times, for example ground stone hatchets are first observed in the archaeological record around 4,000 yBP in the Sydney region.33

Some places within the BLor-CC study area have cultural significance and are extremely important to the indigenous community.

6.9 Non-Aboriginal heritage

Early European exploration and Hawkesbury settlements

The first recorded European expedition to the Hawkesbury River region was conducted by boat in June and July of 1789. Governor Phillip wrote in 1790 that the Hawkesbury was easily navigable as far as the current locations of Richmond and that the banks of the river in that area possessed fine soil for farming. In this letter he recommended that the area was an advantageous location for a settlement. However, the upper reaches of the Hawkesbury were not immediately exploited for farming in the early colony. Phillip had noted during his expedition in 1789 that flooding from heavy rains could inundate the floodplain up to “thirty feet above its common level”. Furthermore, the long distance of Richmond Hill from Farm Cove would have meant that convict workers would be difficult to supervise or control and the primary agricultural settlement in the colony remained at Rose Hill (Parramatta).

In 1794 the first 19 land grants along the Hawkesbury were allotted near the junction of South Creek with the Hawkesbury River and were called the Pitt Town Bottoms. A road was commissioned by Grose in 1794 to link the Pitt Town Bottoms with Parramatta. Further land

---

grants were allotted to settlers who were eager to exploit the rich alluvial land around the Hawkesbury River for farming, and the settlement of Green Hills (later renamed Windsor) was informally established by 1795.

The unofficial settlements were formalised by Governor Macquarie, who proclaimed the establishment of the five ‘Macquarie Towns’ in 1810, of Windsor, Richmond, Castlereagh, Wilberforce and Pitt Town. While not all the townships that Macquarie established were successful, farmland grants along the banks of the Hawkesbury were rapidly taken up to the east and south of Windsor. The wooded foreshores and ridgelines along the banks of the Hawkesbury River were deforested by settlers and convict workers, and crops of wheat, maize and barley were sown. The rich soil of the Hawkesbury drew large numbers of settlers to the region and the farmers were exporting abundant produce to Sydney Cove by road and by ferry by the 1820s.34

**Late 19th and 20th century development**

Residential subdivision from the late 19th century until the mid-20th century occurred in the farming communities in the Hills District and around Blacktown. By the end of the Second World War, quarter-acre land divisions had become standard for detached residential construction in these areas.35 In comparison, residential development along the Hawkesbury grew out of the existing Macquarie Towns of Richmond and Windsor and remains clustered near to the town centres to this day.

**Archaeological potential**

All listed archaeological sites have the potential to contain further archaeological remains. Furthermore, it is likely that further sites would be identified once field investigations are undertaken. A detailed predictive model of archaeological potential has not been prepared however the following general predictive statements have been developed to guide later, more detailed investigations into the nature and location of potential archaeological sites:

- Earlier road alignments, including but not limited to Bells Line of Road, Castlereagh Road and The Northern Road
- Earlier road surfaces beneath current road surfaces
- Potential evidence of coach stops on either side of current or past road alignments
- Earlier rail alignments, including the former alignment of the Richmond – Kurrajong rail line
- Earlier built infrastructure such as gates or gatehouses, residences, guesthouses, shops and other building and infrastructure foundations.

**6.10 Socio-economic**

Key socio-economic characteristics of the three LGAs that are crossed by the recommended corridor are summarised below.

**Population and demography**36

The recommended corridor crosses three LGAs with scattered patterns of residential development which have experienced moderate population growth rates to date. Compared to Greater Sydney’s population of 4.76 million people and a population growth rate of 1.6 per cent, the LGAs crossed by the recommended corridor are characterised by:

---

36 Note: Demographic data is derived from ABS 2011 Census of Population and Housing, unless otherwise noted.
• At the 2011 Census, there was a combined population of 580,730 people, which comprised approximately 12 per cent of Greater Sydney’s total population

• The combined estimated residential population in 2015 was 603,384\textsuperscript{37}

• An average population growth rate of 1.6 per cent, with the highest population growth rate in Blacktown (2.1 per cent) and the lowest in Hawkesbury (0.6 per cent)

• Slightly lower mobility, compared to Greater Sydney, with nearly 65 per cent of the region’s population residing at the same address as before, 29 per cent moved from within NSW, 1.2 per cent moved inter-state and 4.7 per cent moved from abroad

• Population density of 159 people per square kilometre, compared to Greater Sydney’s 358 people per square kilometre, with the highest density of 1,257 in Blacktown and lowest in Hawkesbury (22.4)

• A relatively large indigenous population resides in the region (15,214) contributing to nearly 30 per cent of the Greater Sydney’s total indigenous population of 55,222. The area seems to be slightly less culturally diverse in terms of residents’ place of birth and home language compared to Greater Sydney.

Family and housing

• The BLoR-CC study area LGAs are characterised by:

• A combined number of households of nearly 173,900, of which more than 54 per cent were located in Blacktown, followed by Penrith (34 per cent) and Hawkesbury (12 per cent)

• An average household size varying from 2.8 in Hawkesbury to 3.1 persons in Blacktown, compared to 2.7 for Greater Sydney.

Employment and economic base

• The economic base is well developed, with a total of 36,270 businesses located in the three LGAs crossed by the recommended corridor, accounting for eight per cent of total businesses in Greater Sydney. Furthermore, the region is characterised by:

• A dominant ‘construction’ industry (average share of 21.3 per cent of all businesses), compared to Greater Sydney (14.3 per cent), where the highest share of businesses were classified as ‘professional, scientific and technical’

• Blacktown had the highest number of businesses (17,571), followed by Penrith (12,288) and Hawkesbury (6,415), in 2011

• More than 252,000 were people employed, with a slightly lower employment participation rate compared to Greater Sydney

• The top five industries of employment were ‘manufacturing’, ‘retail’, ‘health care and social assistance’, ‘construction’, and ‘public administration and safety’.

Travel behaviour

The travel behaviour of residents in the three LGAs, compared to Greater Sydney is characterised as follows:

• Residents are heavily reliant on private vehicles as the main mode of transport. Approximately 84 per cent of residents travelled to work by car as a passenger or driver, compared to 74 per cent in Greater Sydney

\textsuperscript{37} ABS 2015 ERP data
• A significantly lower share of public transport usage, with only 10.3 per cent of residents using public transport to travel to work, compared to 17.9 per cent in Greater Sydney.

• More than a quarter of travel was undertaken for commuting and work related, which was slightly higher than Greater Sydney (23.9 per cent). The next largest trip purposes included trips for serving other passengers\textsuperscript{38}, social and recreational purposes, shopping and education/childcare. The share of trip purpose differed slightly from that of Greater Sydney, showing considerably higher rates for serving other passengers and education/childcare, again a likely reflection of current levels of public transport provision.

• Residents travelled longer distances per trip (12.2 kilometres) and by person (41 kilometres) compared to Greater Sydney (9.4 kilometres and 31.4 kilometres).

**Agriculture**

• A total of 19,622 hectares of agricultural land is located in the LGAs crossed by the recommended corridor, nearly 18 per cent of Sydney Metropolitan Area, of which Hawkesbury contained the largest proportion (11 per cent).

• Fruit, nut and vegetable producers comprised the bulk of agricultural enterprises, contributing to more than 40 per cent of all agricultural enterprises in the three LGAs, followed by cattle (26.6 per cent) and other livestock (including horses, goats, etc) (17.6 per cent).

**Tourism**

• The three LGAs crossed by the recommended corridor are not currently popular tourism destinations however they are located between the Blue Mountains, Central NSW and Sydney and surrounds. These areas are very popular destinations for both overnight and daytrip visitors, mostly originating from Sydney towards rural or eco-tourism destinations.

• The two main routes connecting Sydney and surrounds with the Blue Mountains and Central NSW are the Great Western Highway and Bells Line of Road. Consequently, the BLoR-CC study area represents a transition zone for the majority of tourists, with some small scale tourism activity such as B&Bs and farm and orchard visiting activities located in the western section of the BLoR-CC study area, particularly along Bells Line of Road and quieter local roads.

**Social infrastructure**

Community services and facilities that cater for the needs of both local and regional communities are scattered along the length of the recommended corridor, including education facilities, health, medical and emergency services; sport, recreation and leisure facilities; community and cultural facilities and justice and correctional facilities (refer Figure 6-1).

**Amenity and community values**

Community values are values held as important to residents for quality of life and well-being. They relate to things such as amenity and character; social cohesion and sense of community; environmental values and intangible connections to place.

Social infrastructure, such as religious facilities, schools, public places and community centres are highly valued in local communities, as are demographic characteristics and local features.

Amenity refers to the quality of a place, its appearance, feel and sound, and the way its community experiences the place. Aesthetic qualities are an important part of amenity, but...
the broader concept of amenity is determined also by the physical design of a place and the human activity that takes place within it. Amenity is a characteristic of a community that is determined by the physical environment yet it depends on the human response to that environment. A place that has ‘amenity’ is regarded as pleasant and attractive, as well as convenient and comfortable.  

Consultation conducted to date has indicated that residents in the BLoR-CC study area value the following:

- The native flora and fauna, particularly in conservation areas
- The rural amenity and character of the area
- Maintenance of agricultural land and food production areas
- Connections between the communities.

**Potential future environment**

The potential future environment of the Western City District, in terms of population growth and its drivers, dependency and employment can be characterised as follows:

- The total population of the Western City District is predicted to increase from 388,000 in 2016 or 47.5 per cent, bringing the total population in the district to 572,500 in 2036.
- 25 per cent of total new housing for Greater Sydney of 725,000 in 2036 is anticipated to be located within the Western City District.
- 15 per cent of Greater Sydney’s total of 2,439,800 jobs are within the Western City District.

### 6.11 Air quality and greenhouse gases

Local and regional meteorology is a key factor for air quality within a region through its influence on the dispersion of pollutants. The meteorology in the region is influenced by a number of factors including land use, terrain features, thermally driven daytime convection and the occurrence of sea breezes. Key meteorological parameters include temperature, relative humidity, and wind speed and wind direction.

The recommended corridor experiences a significant increase in elevation beyond Richmond, heading towards Kurrajong Heights and the Blue Mountains. The climate of the Blue Mountains is typically more temperate than the lower Sydney region, with a temperature reduction of 2°C experienced every 300 metres of increased elevation. The elevation at Kurrajong Heights is approximately 480 metres compared to about 40 metres at Colebee and Sydney. Thus, temperatures at the western end of the recommended corridor are expected to be about 3°C lower than those at the eastern end. Elevation changes along the proposed alignment are also expected to significantly affect pollutant dispersion.

The recommended corridor comprises only a portion of a larger air shed, as derived from data from the Office of Environment and Heritage monitoring stations at Richmond, Vineyard and Prospect.

Monitored concentrations of the key air quality goals (as established in the National Environmental Protection Measures (NEPM) (NEPC, 1998) demonstrate that within the air shed, carbon monoxide (CO), nitrogen dioxide (NO₂) and sulfur dioxide (SO₂) exist at levels which are well below the criteria. However photochemical oxidants (O₃), particles as PM₁₀ and PM₂.₅ levels have the potential to exceed the recommended criteria.

---

Greenhouse gases (GHGs) form a natural part of the atmosphere, trapping and re-radiating energy from the earth's surface. The natural greenhouse effect maintains a surface temperature that can support life; however, man-made greenhouse gas emissions contribute to climate change. GHG concentrations (excluding water vapour) are usually expressed as a carbon dioxide equivalent (CO2-e).

GHG emissions in NSW are largely generated through the production and use of fossil fuels. Stationary energy (generation of heat and electricity) is the sector which produces the most GHGs in NSW (Figure 6-7). The majority of these emissions are in the form of CO2, with the next largest contribution being CH4.

![Figure 6-7 Distribution of dominant greenhouse gas producing sectors in NSW (NSW Government, 2014).](image)

Sensitive receivers (with regards to air quality) are typically locations where people are likely to work or reside (ie residential dwellings, schools, hospitals, offices or public recreational areas). Sensitive receivers are most abundant at the more developed eastern end of the corridor near Colebee. The North West Growth Area also coincides with the eastern end of the corridor. As such population density is expected to further increase in the future. Fewer sensitive receivers are located at the western end of the recommended corridor, and are associated with existing settlements and towns.

**Potential future environment**

Climate change is expected to increase the number of extreme events which occur in NSW in the future. This includes an increase in the number of annual extreme heat and bushfire days. Considering meteorological factors, mean temperature is expected to increase whilst rainfall and relative humidity are expected to decrease. The combined effect is likely to decrease dispersion of pollutants, particularly particulates (PM10 and PM2.5) resulting in elevated ground level concentrations.

Awareness of potential health impacts of various air pollutants continues to grow. Maximum allowable emissions and concentration standards are becoming more stringent, and this trend is expected to continue in the future. Although this is expected to result in reduced concentrations of some pollutants, the atmospheric concentration of other pollutants is likely to increase in the future due to growth in population, developed land, and emissions-generating activities.

Given the future projections for population growth in NSW, it is anticipated that a larger number of residents would be occupying dwellings in the North West Growth Area and lands

---

40 Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (NSW EPA, 2005)

surrounding the recommended corridor. As a result of anticipated population growth, there is the potential for sensitive receivers in the near future to be exposed to adverse air quality impacts.
7. Strategic assessment of impacts of recommended corridor east of Hawkesbury-Nepean River

This chapter provides a strategic assessment of impacts of the recommended corridor to the east of the Hawkesbury-Nepean River (refer Figure 7-1). Impacts relating to the recommended corridor west of the river are discussed in Chapter 8.

7.1 Land use and property

7.1.1 Current land use

As described in Section 6.1, the recommended corridor crosses a diverse range of land use types. Key sensitive land uses east of the Hawkesbury-Nepean River include:

- North West Growth Area
- Former ASA site at Shanes Park
- PCLs at Castlereagh
- Colebee, Wianamatta and Castlereagh Nature Reserves
- Wianamatta Regional Park
- Crown land at Agnes Banks and Castlereagh
- Highly productive agricultural land between Castlereagh Road and the Hawkesbury-Nepean River at Castlereagh
- Existing established residential suburbs and associated social land uses at Hassall Grove, Bidwill, Shalvey, Willmot Llandilo and Castlereagh and recently developed suburbs such as Ropes Crossing
- North-south linear utilities infrastructure around Marsden Park and Llandilo
- Mineral resource transition zones at Castlereagh.

7.1.2 Strategic assessment of potential impacts

Zoning

The recommended corridor would cover an area of approximately 547 hectares in total. This would entail the conversion of a total of approximately 391 hectares of land currently committed to a range of uses and development. The balance of approximately 156 hectares is already part of the existing Castlereagh Freeway reserve or other SP2 Infrastructure zoning.

East of the river the recommended corridor would cover an area of approximately 294 hectares, requiring the conversion of approximately 146 hectares of land. The balance of approximately 148 hectares is already protected as SP2 Infrastructure.

There is no direct impact on open space or recreation zones land uses. Impacts on social infrastructure are discussed in Section 7.10.

As a consequence of rezoning of land within the recommended corridor as SP2 (Reserved Infrastructure Corridor), the existing use rights provisions established in ss106-109B of the EP&A Act and Clause 5.1(3) of the Standard Instrument would enable the continuation of current approved uses.
Figure 7-1  Recommended corridor east of the Hawkesbury River
Residential and employment lands

The eastern section of the recommended corridor makes full use of the existing Castlereagh Freeway reservation which has been in place for over 50 years. Consequently, there would be minimal impact on the general land use pattern in the eastern section of the recommended corridor. The corridor would not impact on land within the Marsden Park Industrial Precinct in the North West Growth Area or on any land released.

Development adjacent to the corridor within the Growth Area, which is primarily zoned industrial or environmental conservation, is not expected to be affected by the protection of the recommended corridor. Similarly, to the south of the corridor, it is not anticipated that there would be a change in land use from the existing residential suburbs that have been constructed in recent years.

The recommended corridor bisects the Shanes Park Precinct in the North West Growth Area, which has not yet been released for precinct planning. With the combined impact of the OSO corridor and the proposed interchange between the two corridors, the majority of land in the precinct is likely to be occupied by transport infrastructure which would reduce its suitability for residential development. Notwithstanding this, much of this precinct contains flood prone land which is not be suitable for further intensification of development. The indicative residential capacity that the Department of Planning and Environment had determined for this precinct was therefore already low. The recommended corridor would therefore represent only a minor impact on residential growth capacity for north-western Sydney.

Through the central section (between Llandilo and the Nepean River) the recommended corridor would traverse land currently utilised for rural residential development, generally comprising residential dwellings, hobby farms, some small industries and businesses. Existing use rights would permit the continuation of these land uses until such time as the motorway may be built. Future development of noise sensitive land uses such as schools or places of worship immediately adjacent to the recommended corridor would need to be assessed in terms of compatibility with a future corridor.

In total, the recommended corridor would impact on 281 properties east of the river, including 22 properties which would also be impacted by the OSO corridor.

Under ‘existing use rights’, land owners can continue with current uses (provided the use is already lawfully commenced).

Further information on property acquisition is available at www.transport.nsw.gov.au..

Land use viability and future development potential

In identifying the recommended corridor, the impact on land use viability and future development potential was considered. Parcels of land severed by the indicative footprint were examined for suitability of residual land for continuing or alternative uses, and ongoing accessibility requirements. Consequently, parcels of land that would not support a viable land use if a future motorway were constructed, were included in the recommended corridor boundary. By undertaking this process, properties that would no longer have a viable land use would be eligible for consideration for property acquisition prior to the construction of future potential infrastructure.

The likely future land use of the remnant portions of directly affected lots was determined based on:

- Possibility for property boundary adjustment
- Access via the existing local road network
- Size of remnant area and suitability of continuation of use (based on current zoning).

The likely future land use of the remnant land was allocated to one of the following possibilities:
• Remain in current land use
• Potentially suitable for change in land use (with or without lot consolidation)
• Unsuitable for continuation of current land use and should be included in the recommended corridor boundary.

An important consideration in mitigating the impacts of any proposed future motorway is reducing the potential or future conflict between the motorway and adjacent land uses. Land use conflicts can result in land becoming effectively sterilised from agriculture, as farms become constrained from carrying out certain farming practices. The major impacts to neighbours from agricultural activities include spray drift, dust and noise. Vegetative buffers can be used to mitigate conflicting land use and reduce the potential impact of one activity on an adjoining activity.

North-western Sydney is currently experiencing, and will continue to face, considerable development and growth, as Greater Sydney grows and expands. Once protected, the recommended corridor would present opportunities for both local authorities and private developers to explore new opportunities for residential and employment growth.

Environmental conservation land uses

The recommended corridor avoids the PCLs at Castlereagh, passing to the south of these high value vegetated areas. The existing Castlereagh Freeway corridor reservation continues through the PCLs and contains good quality vegetation, consequently avoidance of this area is a positive outcome for biodiversity conservation with about 40 hectares of PCLs conserved.

The recommended corridor would impact on a small parcel of Crown land at Castlereagh. The primary purpose of the parcel is currently designated as “future public requirements”.

The recommended corridor would also fall over land currently owned by Roads and Maritime at the M7 Motorway interchange which is designated to be transferred to the Office of Environment and Heritage as part of the future Colebee Nature Reserve. This would be largely confined to the edges of the land parcel and would not materially impact on the integrity of the conservation land uses as the proposed Strategic Concept Design would be elevated on piers at this location. The statutory implications of this are discussed in Section 11.

The remainder of the Castlereagh Freeway corridor reservation that would no longer be required would require rezoning. This would apply to around half the existing reservation from Llandilo to the Nepean River and a small section on the western side of the river. It would present an opportunity to increase the environmental conservation holdings in the Penrith LGA.

The section that is surrounded by Crown lands is also identified as PCL and would ideally be rezoned with an appropriate environmental conservation status. A section of the existing corridor reservation to the east of The Northern Road is relatively undisturbed native vegetation and this section would present an opportunity to conserve additional native vegetation.

Agriculture

The recommended corridor would cut across prime agriculture land between Castlereagh Road and the Nepean River. This would result in a small reduction in availability of Class 2 agricultural land. The socio-economic impact of this is discussed further in Section 7.10.

Utilities infrastructure

The recommended corridor would cross a number of major linear utilities infrastructure and any future proposal for the construction and operation of the motorway would need to include consideration of these impacts and relocation requirements. The indicative design has
sought to limit impacts on major utilities where possible, however given the north-south alignment of the majority of the affect infrastructure, there were very limited alternatives.

Mining

A section of the recommended corridor at Castlereagh would be located within the 1000 metre transition zone for identified mineral resources. At this stage it has not been determined if there would be any implications on future mining opportunities as a result.

7.1.3 Strategic assessment of future land use opportunities

The population of Western Sydney will grow by almost 1 million people (or 46 per cent) over the next 20 years. The region will continue to grow faster than Sydney as a whole; by 2031, Western Sydney will be home to 50 per cent of the city’s population, up from 47 per cent in 2011.

The population projections and the implied dwellings for Blacktown and Penrith LGAs are provided in Table 7-1, giving an indication of the growth in residential land use that can be expected over the next 20 years.

Table 7-1 Population and dwelling projections in the Blacktown and Penrith LGAs

<table>
<thead>
<tr>
<th>LGA</th>
<th>2011</th>
<th>2016</th>
<th>2021</th>
<th>2026</th>
<th>2031</th>
<th>2036</th>
<th>Total Change</th>
<th>Total % Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blacktown (population)</td>
<td>312,350</td>
<td>349,050</td>
<td>387,200</td>
<td>433,500</td>
<td>475,800</td>
<td>521,450</td>
<td>209,100</td>
<td>66.9</td>
</tr>
<tr>
<td>(implied dwellings)</td>
<td>106,600</td>
<td>121,100</td>
<td>135,800</td>
<td>153,300</td>
<td>169,300</td>
<td>186,800</td>
<td>80,200</td>
<td>75.0</td>
</tr>
<tr>
<td>Penrith (population)</td>
<td>184,600</td>
<td>205,150</td>
<td>221,600</td>
<td>237,500</td>
<td>253,600</td>
<td>270,750</td>
<td>86,150</td>
<td>46.7</td>
</tr>
<tr>
<td>(implied dwellings)</td>
<td>67,150</td>
<td>76,200</td>
<td>83,350</td>
<td>90,200</td>
<td>97,100</td>
<td>104,400</td>
<td>37,250</td>
<td>55</td>
</tr>
</tbody>
</table>

Source: Department of Planning and Environment (2016) NSW State and Local Government Area Household Projections and Implied Dwelling Requirements, Population Projections.

The majority of residential growth, in proximity to the recommended corridor, is likely to occur in the North West Growth Area which is forecast to deliver 70,000 dwellings, 200,000 residents and up to 40,000 jobs on completion.

A Plan for Growing Sydney places particular emphasis on Western Sydney noting that most of the opportunities and challenges are located within this region. The vision identified for Western Sydney includes:

- Growing Greater Parramatta as Sydney’s second Central Business District
- Building new housing and urban renewal around strategic centres in Western Sydney
- Building on the investment and building opportunities provided by the WSEA (now Western Sydney Airport Growth Area)
- Bolstering economic development in strategic centres and transport gateways in western Sydney as well as the proposed enterprise corridors
- Connecting centres in Western Sydney to support their development

42 Department of Planning and Environment website, accessed 25 August 2015.
Building on the development of the Western Sydney Airport at Badgery’s Creek. Development of the recommended corridor has taken into consideration the relevant strategic land use plans for north-western Sydney. As detailed in Section 2.2, *A Plan for Growing Sydney* identifies the need to protect future transport corridors, including the BLoR-CC Corridor, in the face of projected growth in north-western Sydney. Furthermore, investment in new transport infrastructure across Western Sydney is seen as critical to providing more opportunities to foster economic development and deliver more jobs closer to where people live.

Early planning will therefore maximise the opportunity to integrate a future transport corridor into future urban and employment areas and minimise impact to existing and future communities. The identification and protection of a transport corridor would likely enable continued development of the rapidly growing and changing land use areas in north-western Sydney, protect the corridor from development encroachment and facilitate forward planning to accommodate the potential impacts of a motorway.

The LGAs crossed by the recommended corridor fall into the West (Hawkesbury and Penrith) and West Central (Blacktown) Districts for the purpose of delivering the outcomes of *A Plan for Growing Sydney*. The District Plans are currently under preparation and the recommended corridor would support the following two priorities identified for the West District:

- Improve transport connections to provide better access between centres in the subregion and centres in other subregions, and particularly in the North West Growth Area, and with regional NSW (including freight connections)
- Provide planning support in the investigation and potential delivery of the Outer Sydney Orbital transport corridor and the Bells Line of Road - Castlereagh Connection transport corridor.

**Housing and job growth potential**

Demand for residential land will depend on the rate of population growth and on the influence of changing demographics.

The North West Growth Area is of strategic importance for residential and employment growth in Western Sydney, as established in the *North West Growth Centre Structure Plan* (Edition 3). The recommended corridor avoids the majority of the Growth Area, and would only impact on the unreleased Shanes Park Precinct, which was already identified as an area likely to deliver a low number of new residential development opportunities as a result of being located on flood prone land. The proposed interchange with the M7 Motorway near Richmond Road would support future access to the North West Growth Area. The proposed interchange with the OSO would provide opportunities for accessing the Western Sydney Growth Area, around the future Western Sydney Airport.

Outside of the North West Growth Area there is currently no major developments proposed in the vicinity of the recommended corridor that could potentially alter current land use patterns.

The intensity of future development will depend on proximity to facilities and services, the availability of service infrastructure, the capability of the land and the amenity of established areas.

Rezoning proposals in the vicinity of Castlereagh Road would need to take into consideration the findings of the Hawkesbury-Nepean Flood Study which may place limits on development activities in flood zones.

Consequently, it is expected that the protection of the recommended corridor is unlikely to provide any significant opportunities for housing and job growth, other than those already identified in *A Plan for Growing Sydney*. 
Key locations

As described in Section 4.1, the recommended corridor has been developed based on the Strategic Concept Design for a future motorway. Principles used in the design of motorways provide guidance with respect to distances between interchanges and the number of access opportunities onto the motorway, in the interests of safety and operational efficiency. Furthermore, motorways typically require the supporting arterial road network to be setback at a distance of around one kilometre from interchanges in order to realise land use development opportunities. Typically, the primary benefit of motorways is derived from improvements to regional connectivity not local access improvements. Consequently, along the recommended corridor integration opportunities are limited and land use opportunities may be restricted to proximity to the proposed interchanges.

Opportunities for intensification of land use activities are typically informed by:

- Current zoning and strategic land use strategies
- Topography
- Environmental constraints
- Ownership
- Access.

Table 7-2 provides a strategic appraisal of potential future land use opportunities that could be investigated at each interchange location, noting that such suggestions are indicative only and would require additional planning and assessment, including potential rezoning, should the relevant authorities choose to pursue such opportunities. Land ownership has not been taken into consideration.

Table 7-2  Strategic appraisal of potential future land use opportunities east of the Hawkesbury-Nepean River

<table>
<thead>
<tr>
<th>Interchange location</th>
<th>Current zoning</th>
<th>Topography</th>
<th>Environmental constraints</th>
<th>Potential opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>M7 Motorway and Richmond Road</td>
<td>RE1 and 2 to south IN1, B6, E2 to north E3 Environmental management to west</td>
<td>Generally level. No major waterways.</td>
<td>Colebee Nature Reserve (future) Colebee and Nurrangingy Land Grant (listed on the SHR) Blacktown Native Institution, Oakhurst (listed on SHR)</td>
<td>Strategic land use planning is well established around this interchange and is unlikely to experience additional intensification. The industrial zoned areas in Marsden Park could potentially benefit from improved connectivity to the Sydney motorway network which could indirectly lead to improved employment opportunities and economic benefits.</td>
</tr>
<tr>
<td>Interchange location</td>
<td>Current zoning</td>
<td>Topography</td>
<td>Environmental constraints</td>
<td>Potential opportunities</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>----------------</td>
<td>------------</td>
<td>-------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Outer Sydney Orbital</td>
<td>RU4</td>
<td>Generally level. South Creek (running north south)</td>
<td>Flooding issues associated with South Creek. Adjacent to former ASA site (future NPWS). Located over Shanes Park Precinct in the North West Growth Area.</td>
<td>The interchange between the two new motorways, and freight rail, is likely to reduce the availability of land in the Shanes Park Precinct for future residential development.</td>
</tr>
<tr>
<td>The Northern Road and Londonderry Road</td>
<td>RU4 and E1</td>
<td>Generally level. Rickabys Creek (running north south)</td>
<td>Wianamatta Nature Reserve Existing Castlereagh Freeway reservation contains undisturbed vegetation that may be suitable for conservation.</td>
<td>The presence of Wianamatta Nature Reserve would present a barrier to an intensification of land use to the south. A corridor of E2 conservation land would similarly present a barrier to intensification of land use to the west. However to the north and east land currently zoned RU4 could be suitable for further intensification of development. Penrith Council do not currently have any specific plans for this area.</td>
</tr>
<tr>
<td>Castlereagh Road</td>
<td>RU4 to east RU1 to west</td>
<td>Landscape is generally level</td>
<td>Class 2 Prime agricultural land Flood prone land PCLs Crown land</td>
<td>Limited opportunity for land use intensification. Prime agricultural land should be retained to the greatest extent practical.</td>
</tr>
</tbody>
</table>

### 7.1.4 Summary of key issues and potential management measures

The following key issues and potential management measures have been identified in relation to land use and property:

- East of the Hawkesbury-Nepean River the recommended corridor would cover an area of approximately 294 hectares, requiring the conversion of approximately 146 hectares of
land. The balance of approximately 148 hectares is already protected as SP2 Infrastructure.

- Property impacts associated with the recommended corridor are likely to be of considerable concern to affected land-owners. A transparent and equitable process to manage and communicate the corridor protection process should be established as early as possible to assist in managing land-owner anxiety and to mitigate potential negative underutilisation of land in the short to medium term.

- As a consequence of rezoning of land within the recommended corridor as SP2 (Reserved Infrastructure Corridor) the existing use rights provisions established in ss106-109B of the EP&A Act and Clause 5.1(3) of the Standard Instrument would enable the continuation of current approved uses within the recommended corridor.

- It is preferable to place some controls on future development adjacent to the recommended corridor in order that new land uses are compatible with a future motorway. Potential land use controls for inclusion in the relevant EPIs are discussed in Chapter 11, and would be subject to consultation with the relevant councils.

- Consultation with councils regarding land use opportunities that could be pursued to support future local development plans and needs is recommended.

- Revocation of small parcels of Crown lands would need to be undertaken. The process and timing of this would need to be confirmed with the relevant government agencies.

- The recommended corridor on the former ASA site and the proposed transfer of land to the Office of Environment and Heritage would be confirmed prior to the finalisation of the transfer process.

- Ongoing discussion with Department of Industry (Resources and Energy) will be required to confirm the recommended corridor through the 1000 metre identified mineral resource transition zone.

### 7.2 Traffic and transport

#### 7.2.1 Existing environment

The existing transport network around the recommended corridor is described collectively in Section 6.2. Important local roads east of the Hawkesbury-Nepean River include:

- M7 Motorway
- Richmond Road
- Windsor Road and Old Windsor Road
- The Northern Road
- Londonderry Road
- Castlereagh Road.

**Future traffic environment**

The road network within and around the recommended corridor to the east of the Hawkesbury-Nepean River is likely to be subject to considerable change over the next 30 years as a reflection of population and employment growth. The *North West Growth Centre Road Network Strategy* (Roads and Maritime, 2015b) sets out the proposed road network upgrades over the next 15 years and the *Western Sydney Infrastructure Plan* (Roads and
Maritime, 2015c) identifies major infrastructure projects currently in planning or under construction, the majority of which are located to the south of the recommended corridor. The future Western Sydney Airport at Badgerys Creek is expected to be completed by 2025. The airport is expected to cater for approximately 3.6 million passengers per annum and to generate 35 to 60,000 jobs over time. The Western Sydney Growth Area surrounding the airport will also eventually accommodate an employment workforce of up to 200,000 people. As described in Chapter 2, freight movements across NSW are expected to double by 2031 and there is currently not sufficient capacity on the road, or rail, network to support this.

Strategic traffic modelling has been undertaken for the OSO and BLoR-CC recommended corridor. The predicted annual average daily traffic (AADT) for a motorway to be developed in the recommended corridor is presented in Table 7-3.

Table 7-3 Strategic traffic modelling for the BLoR-CC recommended corridor

<table>
<thead>
<tr>
<th>Section</th>
<th>AADT 2031</th>
<th>AADT 2041</th>
</tr>
</thead>
<tbody>
<tr>
<td>Richmond Road to Stony Creek Road</td>
<td>34,000</td>
<td>43,000</td>
</tr>
<tr>
<td>Stony Creek Road to Outer Sydney Orbital</td>
<td>34,000</td>
<td>43,000</td>
</tr>
<tr>
<td>Outer Sydney Orbital to The Northern Road</td>
<td>31,000</td>
<td>38,500</td>
</tr>
<tr>
<td>The Northern Road to Castlereagh Road</td>
<td>14,000</td>
<td>19,000</td>
</tr>
<tr>
<td>Castlereagh Road to Grose Vale Road</td>
<td>11,500</td>
<td>17,000</td>
</tr>
<tr>
<td>North of Grose Vale Road to Bells Line of Road, Kurrajong Heights</td>
<td>5,000</td>
<td>5,000</td>
</tr>
</tbody>
</table>

The timing of a motorway operating within the recommended corridor would be subject to traffic demand and changes to surround land uses. The motorway is expected to be constructed in stages, however the timing of any such construction has not yet been determined.

7.2.2 Strategic assessment of potential impacts

Protection of the recommended corridor would not have an impact on existing traffic and transport conditions. Once protected, however, it is expected that subsequent traffic and transport planning studies undertaken in the vicinity of the recommended corridor would take it into account.

Local road network

In the future, when the need for a future motorway to be constructed is identified, further traffic modelling, analysis and assessment would be carried out to provide a quantitative analysis of impacts on the road network at that time.

At a strategic level, it is expected that a future motorway would improve the efficiency of freight transport through and into the BLoR-CC study area via the motorway itself and the proposed interchanges between the arterial road network.

Arterial routes such as Richmond Road, Old Windsor Road and Bells Line of Road at Richmond Bridge currently experience significant levels of congestion, particularly during peak traffic periods. As motorists change their travel patterns and divert onto the proposed
motorway, traffic volumes and congestion levels would be expected to reduce on these arterial roads, which would generate a positive impact for future users of these roads. If constructed, a future motorway would generally present an impediment to north-south movements, crossing a number of existing roads, both major and minor. The Strategic Concept Design developed to inform the recommended corridor has considered the potential local road treatments that would be required to support the ongoing function of the local road network. Appendix B contains details of the proposed bridge treatments for both major and minor roads along the recommended corridor east of the Hawkesbury-Nepean River. Should a future motorway be constructed, it would not be appropriate to connect it with all local roads so alternative local road connections may be required in some locations. The connections would ensure that local communities remain connected and that the motorway does not result in adverse accessibility impacts.

At this stage the patterns of usage on local roads and the likely impacts of the proposed future arrangements have not been fully assessed. Furthermore, these would undoubtedly change over time, particularly in the context of the projected growth in north-western Sydney over the longer term.

The recommended corridor may also generate the possibility for other future extensions of the road network, such as upgrades to The Northern Road, Londonderry Road, Cranebrook Road and Castlereagh Road, improving access to new and existing residential and employment areas serviced by these roads.

Regional connectivity

As discussed in Chapter 2, the long-term need for a motorway connecting the second Blue Mountains crossing (ie Bells Line of Road) to the Sydney motorway network has been established. The primary benefit expected from the future BLoR-CC motorway would be the improvement in regional connectivity. As road journey numbers, both passenger and freight, are forecast to increase over time, future governments will require options to manage transport solutions. Securing a corridor now, in the context of the rapid change that is currently occurring in north-western Sydney, will provide efficiency and savings for future transport decision making.

The proposed interchange with the OSO at Llandilo would enable greater connectivity and transport efficiency across regional NSW.

7.2.3 Summary of key issues and potential management measures

The full length of any potential future motorway within the recommended corridor is unlikely to be required in the near future, however some sections may be required earlier, depending on land use and traffic demand. Some sections may be required earlier, depending on the rate of development in north-western Sydney and the timing of the realisation of the increased traffic demand. An indication of potential staging scenarios is provided in Section 4.4.

A full traffic and transport impact assessment would be prepared in the future, when the timing to construct and operate a future motorway is identified. This would allow for the assessment to incorporate the traffic environment at the time of development to more accurately and to appropriately identify mitigation measures to reduce potential connectivity issues.
7.3 Noise and vibration

7.3.1 Existing environment
The eastern section of the recommended corridor is directly adjacent to established suburbs including residential suburbs of Shanes Park, Plumpton, Hassall Grove, Bidwill, Blackett, Emerton, Shalvey and Willmot. Existing background noise levels in this area would be moderate.

West of Llandilo current land use in the area adjacent to the eastern section of the recommended corridor is mainly small primary production lots and rural residential areas. Existing background noise levels in this area would be low.

7.3.2 Strategic assessment of potential impacts
Protection of the recommended corridor would have no material impact on the acoustic environment.

Development of a future motorway would be subject to a full impact assessment based on the detailed design that is developed closer to the time when construction is proposed.

Should a future motorway be constructed at any time in the future, it is likely that noise levels experienced by residential dwellings and other sensitive receivers would increase in areas surrounding the recommended corridor. The Road Noise Policy (DECCW, 2011b) and Roads and Maritime operational noise guidelines specify the methodology, guidelines and mitigation measures for traffic noise.

While there are criteria for schools, places of worship and other sensitive receivers, the key criteria are those for residential development and are presented in Table 7-4 below.

Table 7-4 Residential noise criteria (Road Noise Policy)

<table>
<thead>
<tr>
<th>Road category</th>
<th>Type of proposal/land use</th>
<th>Daytime noise criteria</th>
<th>Night-time noise criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeway/arterial/ sub-arterial roads</td>
<td>Existing residences affected by noise from New freeway/arterial/sub-arterial road corridors</td>
<td>$L_{Aeq}(15\text{hour})$ 55 dB (A)</td>
<td>$L_{Aeq}(9\text{hour})$ 50 dB (A)</td>
</tr>
</tbody>
</table>

If noise from a future motorway was to exceed the criteria, noise mitigation for affected residential areas and individual residences would need to be considered. For individual residences, noise mitigation would generally be property improvements aimed at reducing noise inside the residence and include improvements such as courtyard screen walls, fresh air ventilation systems, upgraded windows, double glazing, insulation and solid core doors.

For groups of residences, such as those in the adjacent suburbs of Shanes Park, Plumpton, Hassall Grove, Bidwill, Blackett, Emerton, Shalvey and Willmot, noise walls adjacent to the new motorway would be an effective form of noise mitigation. The Strategic Concept Design has allowed sufficient space to accommodate future noise mitigation infrastructure for sections of the motorway adjacent to existing and planned residential areas, should it be required.

7.3.3 Summary of key issues and potential management measures
Noise from traffic using a future motorway along the recommended corridor would be the key focus of management measures in any future Environmental Impact Statement prepared to support the construction and operation of a motorway within the recommended corridor. Existing traffic noise guidelines, or any future applicable guidelines, provide the framework for assessment and mitigation of traffic noise and would determine the need and
performance of noise mitigation measures along the recommended corridor. Where required, land for noise mitigation measures such as noise walls and earth mounds has been provided within the boundary of the recommended corridor, should they be required.

To minimise future noise mitigation costs and to inform existing and potential property owners of noise impacts of a future motorway, noise development controls may be incorporated into the relevant local planning instruments to reasonably consider noise and vibration impacts on new planning proposals and rezoning applications. These noise standards and mitigation measures would be governed by the *Noise Mitigation Guideline* (Roads and Maritime, 2015) and *Development Near Rail Corridors and Busy Roads – Interim Guidelines* (Department of Planning, 2008).

### 7.4 Visual amenity, built form and urban design

#### 7.4.1 Existing environment

The eastern section of the recommended corridor runs directly between the Rural (LCZ 2) and Urban (LCZ 1) Landscape Character Zones. The urban areas lie directly to the south of the corridor with the land to the north of the corridor currently rural in character with an emerging pattern of changing land uses to commercial and residential around Marsden Park and Colebee. The low density rural areas are typically agricultural and pastureland activities that maintain the rural landscape character and environmental values of the area. The urban areas of Hassall Grove, Bidwill, Shalvey and Willmot sit directly adjacent to the corridor and have a variety of residential housing from a number of different eras. Vegetation is typically limited to pasturelands and fencelines in the rural zone, with a large tract of native vegetation in the former ASA site directly to the north of the recommended corridor at Shanes Park. Other areas north of the corridor, currently rural in character, will change as the future Marsden Park Industrial Precinct is developed as part of the North West Growth Area.

The central section of the recommended corridor runs primarily through the Rural Landscape Character Zone (LCZ 2) of the Hawkesbury-Nepean floodplains. The floodplains typically contain agricultural and pastureland activities that maintain the rural landscape character and environmental values of the area with a low density of rural residential lots. The area is also characterised by large areas of Bushland and Conservation Zones (LCZ 4) around Castlereagh and Wianamatta Nature Reserves.

#### 7.4.2 Strategic assessment of potential impacts

The visual impact of the recommended corridor on surrounding areas during the protection phase would be dependent on how the land is to be managed and the interim land use activities. This would also be dependent on land ownership.

The changes in the landscape could be marginal depending on the scenario and the type of land use, for example:

- There could be no change were the existing uses continue such as grazing or mowing
- In the case of rural land, it could gradually decline in visual quality over time due to lack of investment in improvements
- In the case of State owned corridor land, it could gradually improve in visual quality as the vegetation matures.

**Visual sensitivity**

Vegetation clearing in parts would increase the visibility of a future motorway from neighbouring rural residential properties and local traffic. The eastern section of the recommended corridor would represent the area of highest visual sensitivity of any section...
along the corridor, due to the proximity of largely rural residential (LCZ 2) and urban areas (LCZ 1).

The visual impact from the streets of Hassall Grove, Bidwill, Shalvey and Willmot (LCZ1) would be low where houses back onto the transport corridor and prevent views. However, some residents from these areas would have a moderate sensitivity to the proposed motorway as they currently enjoy views towards a rural landscape and woodland in the former ASA site. However, the potential for a motorway to be developed in this corridor has been known for some time as the recommended corridor in this location coincides with the existing Castlereagh Freeway road reservation which has existed since 1951.

Impacts to views from existing residential development at Colebee would be low as existing vegetation in the future Colebee Nature Reserve and along Eastern Creek and the golf course screens much of the M7 Motorway and the proposed interchange.

As the area north of the corridor changes from rural to industrial uses, so too will the visual outlook for both residents and future motorists, depending on the amount of vegetation screening that is retained and or introduced. Residents of the localities of Llandilo and Castlereagh (LCZ 2) would have a sensitivity to a future motorway as it would be visually exposed when existing vegetation is initially cleared prior to landscape treatment.

The corridor alignment would have a high degree of impact on some neighbouring properties through the central section of the corridor due to the number of properties that would be exposed (oblique alignment). However overall, due to the low lying topography, views to the future corridor from surrounding properties would be restricted or screened by existing vegetation in many instances.

Overall the visual sensitivity of any possible future motorway east of the Hawkesbury-Nepean River is rated as moderate.

**Magnitude of visual effect**

The magnitude of change would be concentrated around the proposed interchanges with the M7 Motorway at Dean Park, Castlereagh Road at Castlereagh and The Norther Road, Cranebrook Road and Londonderry Road at Cranebrook.

Any potential future motorway would also be visible to the residents of Llandilo and Shanes Park where it would be elevated across the South Creek floodplain at the interchange with the OSO.

The proposed bridge over the Hawkesbury-Nepean River would present a major visible element in the landscape and it would be visible from neighbouring rural residential properties.

Due to the urbanised character of the southern suburbs and the future industrial land uses of the northern areas, the low lying topography and often limited views from properties to the corridor alignment, the magnitude of visual effect is rated as moderate.

Overall the visual impact of a potential future motorway east of the Hawkesbury-Nepean River is rated as moderate.

**7.4.3 Summary of key issues and potential management measures**

The following key issues and management measures have been identified in relation to visual amenity:

- Impacts during the protection phase are difficult to identify as they would be dependent on the land ownership and management, on both private and public land.
- Due to the low lying topography and often limited views from properties to the corridor alignment, and the level of current and future urbanisation and industrialisation, the overall
visual impact of a future motorway east of the Hawkesbury-Nepean River is rated as moderate.

**Protection**

- A maintenance strategy should be developed for State owned land to ensure the visual amenity of the landscape is maintained.
- An early planting and revegetation strategy should be developed to visually screen the corridor along its boundaries, with particular focus on highly sensitive areas and areas that would experience a high magnitude of change.
- Maintenance of current land use and management practices within the corridor should be encouraged to retain the existing landscape character and visual setting.

**Future motorway design and construction**

- Adopt a process of iterative engineering and urban design running in parallel which optimises the integration of road elements, bridges and earthworks into the landscape to ensure a high visual quality, while also satisfying technical requirements.
- Seek to minimise the overall project footprint through an integrated multi-disciplinary design process.
- Maintain connectivity principles throughout design development.
- Maintain views where they exist to provide a sense of progress and an appreciation of the changing landscape through which the corridor passes.

### 7.5 Geology and soils

#### 7.5.1 Existing environment

**Geology and soils**

The geology of the eastern section of the BLoR-CC study area generally has relatively flat dips. Triassic rocks of the upper of the Narrabeen Group and the Wianamatta Group have been mapped to the east of Hawkesbury River.

The soils to the east of the Hawkesbury-Nepean River include soils associated with the Cumberland Lowlands physiographic region. This unit is characterised by low lying, gently undulating plains and low hills on Wianamatta Group shales and sandstone with a dense drainage network of predominantly northward flowing channels.

The soil landscapes east of the Hawkesbury-Nepean River have a generally low to moderate erosion potential as they tend to possess thicker and better developed soils with moderate cohesion.

**Acid sulfate soils**

Within the BLoR-CC study area to the east of the Hawkesbury River, acid sulfate soils (ASS) are generally associated with the Hawkesbury-Nepean River and its floodplain. NSW Natural Resources Atlas mapping indicated a high probability of occurrence of ASS associated with the main channel of the Hawkesbury River extending upstream to the general locality of Springwood Road near Agnes Banks. The mapping also indicated that there are extensive areas of low probability of occurrence of ASS on the floodplain, generally to the north and east of Richmond.
Salinity
The eastern part of the recommended corridor, including the North West Growth Area, is identified as having very high to high salinity risk. The area to the west of the North West Growth Area is identified as being of moderate to low salinity risk.

7.5.2 Strategic assessment of potential impacts
Generally, matters related to soils and geology are considered to have very limited bearing on the recommended corridor protection process but rather would be matters given attention during design development and construction of a future motorway.

ASS
The recommended corridor avoids all ASS areas as identified in the NSW Natural Resources Atlas mapping. ASS risk is not considered to be an issue of particular concern for protection of the recommended corridor. It may be a matter for consideration during design development and would be addressed as part of construction management, particularly in relation to managing risk of exposure of ASS and generation of acidic runoff (and consequent impacts on receiving water quality and aquatic habitats).

Salinity
The recommended corridor crosses land mapped as being of very high to high salinity risk in the eastern section near the North West Growth Area. Salinity risk is a broad landscape feature and would not be a material consideration with regard to protection of the recommended corridor, however it would require consideration in design development and construction.

Contamination
The recommended corridor avoids all known contaminated sites based on a search of the EPA’s Records of Notices.

With regard to other land use types with potential for contamination:

• The route of the recommended corridor crosses existing and former agricultural lands and there is potential to encounter contamination associated with past land uses
• The route of the recommended corridor avoids known existing and historic commercial landfill operations but would still have potential to intersect areas where waste was disposed of on site by landholders
• The route of the recommended corridor avoids identified wastewater treatment plants and disturbance of any associated land with localised contamination is considered unlikely.

As with other soils-related issues, the above matters are not considered to be of material relevance to the protection of the recommended corridor but would need to be appropriately considered during design development and construction of any future motorway project.

7.5.3 Summary of key issues and potential management measures
The protection of the recommended corridor would have no material impacts on soils and geology and no recommendations have been made in this regard.

However, there is a range of matters that would need to be given appropriate consideration for any future motorway within the recommended corridor. These include, but are not limited to:

• Land instability and landslip risk, particularly with regard to regions of Wianamatta Group shale outcrop.
• Reactive soils particularly with regard to soil conditions such as dispersivity, cracking (expansion and shrinkage), plasticity, non-cohesiveness, tunnelling, and sensitivity.
• Soil erosion risk.
• Landscape and soil limitations.
• Disturbance of sodic or saline soils/subsoils during construction.
• Potential to encounter contamination associated with historic land uses on current or former agricultural land, or from historic on-site waste management and disposal practices.

These are all common issues encountered during development of road transport infrastructure projects and could be managed through the design process.

7.6 Water quality and hydrology

7.6.1 Existing environment

Catchment context and waterway crossings

The eastern section of the recommended corridor is located in a flatter area of the catchment crossing the following major waterways from east to west:

• Bells Creek
• South Creek (at the Ropes Creek confluence)
• Rickabys Creek
• Nepean River.

There are also other unnamed drainage lines and minor creeks crossed by the eastern section of the recommended corridor.

Water quality

The major waterways crossed by the eastern section of the recommended corridor generally have very poor water quality due to clearing of vegetation and urban development in their catchment. South Creek, upstream of the crossing location of the eastern section of the recommended corridor, is the receiving waters for the discharge of treated wastewater from four large sewage treatment plants.

Groundwater

The eastern section of the recommended corridor crosses one groundwater source identified in the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources (NSW Office of Water, 2011), namely the Sydney Central Basin.

The Sydney Central Basin groundwater source is bounded by the main arm of the Hawkesbury River to the north and by the Nepean River to the west and south. Much of Sydney’s population is within this groundwater source (with a total area of approximately 3760 square kilometres), and bores are evenly distributed across the area. The geology consists of sedimentary sandstone and siltstone formations with intervening coal seams.

There are a number of other hydrogeological landscapes in the eastern section of the recommended corridor. Generally, these are not important groundwater sources and do not support high priority groundwater dependent ecosystems.
Flooding and drainage

The flood extents of most waterways in the eastern section of the recommended corridor are largely confined to the waterway and adjacent overbank areas. The exception to this is South Creek which has a substantial floodplain area in the location where the eastern section of recommended corridor crosses the creek. Indicative modelling at this location suggests that the 100 year ARI flood extent at this location could be up to approximately 1.5 kilometres in width.

Flood free access and evacuation

A number of residential areas within the vicinity of the eastern section of the recommended corridor are subject to flooding. McGraths Hill is severely affected in a 50 year ARI flood and virtually entirely inundated in a 100 year ARI flood. A large number of houses are affected in Windsor in the 50 year and 100 year ARI floods.\(^43\) Flood free access to these areas, and other areas within the floodplain, is required to ensure evacuation routes are available. Flood free access should ideally have sufficient road capacity to facilitate evacuation prior to inundation.

There are various flood evacuation routes within the vicinity of the eastern section of recommended corridor that provide access up to specified flood levels with Castlereagh Road being the last of the critical evacuation routes out of the Richmond area. Existing evacuation routes\(^44\) are shown on Figure 7-2 and include the M7 Motorway, Richmond Road, Llandilo Road, The Northern Road, Londonderry Road and Castlereagh Road.

Additional flood evacuation routes, to the south of the recommended corridor, include the Great Western Highway and the M4 Motorway.

A number of flood islands are present within the vicinity (downstream) of the eastern section of the recommended corridor. These are areas of high ground within the floodplain that can become isolated during flood events due to flood waters closing roads and other land access options. After closure of the roads the only access to the areas are by boat or by aircraft.\(^45\) Flood islands include McGraths Hill, Windsor, South Windsor, Bligh Park, Richmond, Hobartville and Windsor Downs.

The Hawkesbury area also includes a number of trapped perimeter areas on the fringe of the floodplain where the only practical road or overland access is through flooded land, resulting in an inability to retreat to high ground due to topography or impassable structures.\(^46\)

\(^43\) (Bewsher, 2012) *Hawkesbury Floodplain Risk Management Study and Plan.*
\(^44\) SES (2014) *Hawkesbury-Nepean Flood Emergency Sub Plan Volume 1.*
\(^45\) (Bewsher, 2012) *Hawkesbury Floodplain Risk Management Study and Plan.*
\(^46\) (Bewsher, 2012) *Hawkesbury Floodplain Risk Management Study and Plan.*
Figure 7-2  Flood evacuation routes and flood islands
7.6.2 Strategic assessment of impacts

Protection of the recommended corridor would not impact on water quality or hydrological patterns in any way.

**Construction and operation water quality**

Should a future motorway be constructed, a full assessment of water quality impacts would be required, based on the future design and subject to the policies and guidelines relevant at that time.

The greatest potential for impacts to water quality during construction would be in locations where the recommended corridor is in close proximity to or crosses waterways. The eastern section of the recommended corridor crosses waterways that drain to the Hawkesbury-Nepean River and provide drinking and agricultural water supplies.

The Strategic Concept Design on which the recommended corridor has been based, includes sufficient space to accommodate both construction and operational water quality basins and allowance for other water treatment measures.

The major potential sources of pollutants during construction would be erosion and sedimentation from areas disturbed by construction. Locations where substantial earthworks are required, such as cuttings and embankments, pose the greatest risk of erosion and sedimentation occurring. There would also be a risk of chemical and fuel spills from construction activities entering waterways. All of these impacts would impact downstream receiving waterways if not appropriately managed.

In terms of operation, a future motorway would introduce traffic to new areas and result in an increase in traffic growth on connecting roads. This would potentially lead to an increase in the load of hydrocarbons, heavy metals, and sediment entering adjacent and downstream waterways, depending on the nature of water quality controls that are implemented.

Traffic on a future motorway would include vehicles transporting a range of materials including fuels and chemicals thereby introducing the potential for spills if traffic incidents were to occur. Spill containment strategies would need to be considered where a future motorway crosses a major waterway.

**Groundwater**

Construction of a future motorway would involve constructing cuttings and embankments. Road cuttings have the potential to intersect the groundwater table and to result in drawdown that could impact on both the environment and water users. Large embankments have the potential to compact soils and cause barriers to groundwater. However, it should be recognised that the topography in the eastern section of the recommended corridor is relatively flat and therefore cuttings and embankments would generally be smaller than the recommended corridor west of the Hawkesbury River.

**Flooding**

When constructed, if not mitigated, the motorway has the potential to increase flooding impacts by:

- Acting as a dam across flow pathways and waterways resulting in increased flooding extents upstream of the motorway
- Concentrating flows from a number of natural drainage lines into a single location resulting in increased velocities and volumes of water discharged into localised drainage lines downstream.

The potential impacts would be similar for both construction and operation. The Strategic Concept Design has included allowance for immunity to flood events up to and including the
100 year ARI flood event and to not cause unacceptable increases in flood extents upstream of the motorway. Where the motorway alignment crosses areas that would be flooded in a 100 year ARI flood event, bridges, culverts or other drainage structures of appropriate capacity have been included in the Strategic Concept Design to minimise upstream flooding impacts.

While there may be minor increases in flood extents or levels upstream of the motorway these would be confined to the waterways or land that does not contain infrastructure or that has important economic value (eg agricultural land). The Strategic Concept Design has allowed for adequate protection such as rock lining for drainage lines or waterways downstream of the motorway that would experience increased flows and velocities.

**Flood free access and evacuation routes**

The BLoR-CC recommended corridor provides opportunities to contribute toward long term flood evacuation strategies for north-western Sydney. Apart from Llandilo Road, grade separated interchanges with the nominated flood evacuation routes have been proposed for a potential future motorway, and allowed for in the recommended corridor width at these locations. Grade separated interchanges at these locations would not affect the operation and capacity of the flood evacuation routes. A future motorway would also provide additional capacity and options for flood evacuation.

A future motorway would likely include a bridge over the motorway to maintain the Llandilo Road flood evacuation route.

It is noted that in the future, flood design standards may change due to a number of factors including altered hydrological conditions and climate change. Any future motorway would be designed to meet the standards and guidelines applicable at that time and consequently would be designed to avoid any increases in flooding or number of flood islands.

7.6.3 Summary of key issues and potential management measures

**Water quality**

The protection of the recommended corridor would not result in any specific water quality issues.

The greatest risk of water quality impacts would occur during construction, predominately from erosion and sedimentation of areas disturbed by construction. The risks of water quality impacts during construction can be appropriately managed through construction environmental management plans and preparation and implementation of soil and water management plans prepared in accordance with relevant guidelines such as *Managing Urban Stormwater: Soils and Construction (Including Volume 2D: Main Road Construction)* (DECC, 2008)) and Roads and Maritime environmental guidelines and specifications.

**Groundwater**

Mitigation measures for potential groundwater impacts during construction and operation would primarily consist of localised engineering measures which would be developed during the detailed design of a future motorway.

**Flooding**

As noted in the previous section the Strategic Concept Design has been developed to minimise any downstream and upstream flooding impacts. However, further assessment of potential flooding, development of flood mitigation measures and changes in design would be required in the future as:

- Land use adjacent to the eastern section of the recommended corridor may change – resulting in changes to flooding extents, hydrological profiles and areas requiring protection from flooding
• Climate change which is predicted to increase the frequency and severity of extreme rainfall events. This may result in the 100 year ARI flood event increasing in extent and may also change other design parameters such as the size of water quality treatment basins

• Hydrological modelling and data may change – the current hydrological data set and potentially models used to assess flooding are likely to change. This in turn may change the modelled extent of flooding in the 100 year ARI flood event

• Changes in the operation of Warragamba Dam and other upstream dams in the Nepean River catchment. These dams have a significant influence over the timing and extent of flooding in the Hawkesbury-Nepean River. It is noted that the NSW Government is proposing to increase the height of the Warragamba Dam wall which would reduce flooding downstream of the dam.

The Strategic Concept Design on which the recommended corridor has been based has allowed for sufficient land area to cater for future changes in design caused by changes in flooding impacts. These would be considered in the future when the need for the construction and operation of a future motorway is identified. Changes in design may include increased height and width of embankments, longer and higher bridges, higher capacity cross drainage infrastructure and larger water quality treatment basins.

**Flood free access and evacuation**

A future motorway in the eastern section of the recommended corridor would improve the capacity and options for flood evacuation. A review of all relevant flood evacuation routes should be undertaken during the design of the motorway to ensure that the new road network improves the capacity and operation of these routes.

### 7.7 Biodiversity

#### 7.7.1 Existing environment

The general existing environment has been described in Section 6.7, including a BLoR-CC study area wide discussion of threatened ecological species, wetlands and wildlife connectivity.

The largest remnant of vegetation in the BLoR-CC study area is in the Castlereagh – Londonderry area on low nutrient tertiary alluvials and gravels. This large remnant contains substantial areas of moderate to good condition Castlereagh Scribbly Gum Woodland, Castlereagh Swamp Woodland, Agnes Banks Woodland and Cooks River Castlereagh Ironbark Forest. Patches of Shale Gravel Transition Forest also occur here and extending further east, Cumberland Plain Woodland is the dominant vegetation type occupying the shale soils in the central and eastern part of the BLoR-CC study area.

As described in Section 6.1 and shown in Figure 6-2, there are a number of environmental conservation areas located along the recommended corridor east of the Hawkesbury-Nepean River, namely the future Colebee Nature Reserve, the former ASA site, PCLs at Castlereagh, Wianamatta Nature Reserve and E2 conservation lands along the Hawkesbury-Nepean River.

#### 7.7.2 Strategic assessment of potential impacts

At this strategic stage, it is appropriate to consider biodiversity impacts of the recommended corridor at a high level, in the context of the regional setting and the changing values that are likely to occur over time. The development of the recommended corridor has sought to avoid sensitive environmental constraints where possible.
**Corridor protection**

The eastern section of the recommended corridor east of the Hawkesbury-Nepean River crosses through Cumberland Plain Woodland EEC, which is listed as Critically Endangered under both the TSC Act and EPBC Act. Between Shanes Park and the Hawkesbury-Nepean River, the corridor crosses through several TECs including Cooks River Castlereagh Ironbark Forest, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest. There is currently no critical habitat within the recommended corridor.

Vegetation communities, including threatened and endangered populations, fauna, migratory species, aquatic and riparian habitat and groundwater ecosystems would potentially benefit in the short term from the temporary conservation of existing remnant vegetation along the recommended corridor as a consequence of the additional controls introduced through the protection which would limit some forms of new development. However, it is noted that temporary protection of habitat in the short term may in the future be identified as Critical Habitat, as a consequence of biodiversity losses across other areas of Western Sydney.

Unless there is early offsetting and site management, protection of the recommended corridor long before it is required would allow time for the establishment of alternative habitat outside of the recommended corridor prior to any future construction scenario (advanced offsetting).

There may be a temporary increase in woodland cover which may act to naturally suppress the operation of certain key threatening processes (KTPs) eg discourage further weed infestations. However, in other areas ongoing weed management would be required.

**Future motorway construction and operation**

The future construction of a motorway along the recommended corridor would change the wider landscape context through the clearing of vegetation, alteration of waterways, construction of cuttings, tunnels and embankments. It may change existing surface and groundwater flows and associated geomorphological processes.

The native vegetation clearing for a future motorway would likely disrupt connectivity between currently contiguous vegetation communities, disturb fauna, remove habitat and contribute to KTPs such as clearing of native vegetation and alteration of flow regimes of rivers and streams, disrupt hydromorphological processes and groundwater processes with resulting potential impacts on groundwater dependent ecosystems. The corridor crosses South Creek and the Hawkesbury River both of which are identified as key fish habitat.

The majority of vegetation communities in the BLoR-CC study area have been identified to have a high potential for groundwater interaction and as a consequence are likely to have a moderate to high dependence upon groundwater at various times, including during low rainfall or drought periods. This would need to be further confirmed during any future environmental assessment for a motorway, and will need to take into account further site-specific hydrological assessment.

In the absence of appropriate mitigation measures, the operation of the recommended corridor has the potential to create a barrier for less mobile species between Castlereagh and Wianamatta Nature Reserves. The corridor could also provide a more general barrier to connectivity from the PCLs located between Castlereagh Road and Londonderry Road to both the south-west and also to the Hawkesbury River. Without appropriate mitigation, the corridor would also most likely sever an important connection between the former ASA site and Wianamatta Regional Park (both of which contain EECs).

Construction and operation of any future motorway could cause direct disruption to several small edge parcels of environmental conservation lands east of the Hawkesbury-Nepean River. This would further fragment these important areas as well as directly disrupt wildlife connectivity which may lead to further isolation of populations or communities within the landscape. In particular, there may be minor but direct impacts on the edges of the future
Colebee Nature Reserve, PCLs at Castlereagh and riparian vegetation along the Hawkesbury-Nepean River.

7.7.3 Summary of key issues and potential management measures

The following key issues and potential management measures have been identified for biodiversity east of the Hawkesbury-Nepean River.

**Corridor protection**

Protection of the recommended corridor would have the potential to generate a positive outcome for biodiversity conservation in the short term as existing stands of native vegetation could be protected from clearing and biodiversity values may potentially improve as a consequence. This would particularly apply to land already held by the State.

Controls over the spread of noxious weeds and pests within the recommended corridor should be enforced wherever possible.

A management strategy for the existing native vegetation within the recommended corridor should be developed.

**Future motorway design, construction and operation**

A full detailed biodiversity impact assessment would be required in accordance with the relevant legislation and guidelines to accompany a future application for infrastructure, taking into consideration the NSW Biodiversity Reforms and any future strategies, codes of practice and policies that are released.

Matters for consideration would include:

- Optimisation of motorway footprint to minimise clearing and maintaining the intact vegetation cover aspect of the landscape context as far as possible.
- Where possible, retain moderate to good condition native vegetation in the recommended corridor, particularly EECs.
- Manage threats to threatened species habitat including weed invasion, stormwater, and public access.
- Retain mature and hollow bearing trees where possible.
- Implement measures to reduce the operation of key threatening processes e.g. predation by invasive carnivores, habitat disturbance and competition for habitat resources.
- Explore options for improving wildlife movement across the corridor to enhance fauna movements generally, eg through under or overpasses, rope bridges, gliding poles and/or revegetation.
- Enhance likelihood of culvert use with fauna exclusion fencing to funnel wildlife towards culvert openings and promote tree growth near entrances to encourage use of culverts as wildlife underpasses and reduce barrier effect of the motorway.
- Minimise direct and indirect impacts to environmental conservation areas within and adjacent to the recommended corridor including on land managed by NSW National Parks and Wildlife Service.
- Minimise direct and indirect impacts to Cumberland Plain PCLs within and adjacent to the recommended corridor.

**Biodiversity offset strategy**

- In recognition of the fact that once constructed, any future motorway would require the clearing of considerable amounts of native vegetation, it is proposed that offsets would be sourced to compensate for this future loss. The offset sites could comprise the protection
or regeneration of similar habitat elsewhere within western Sydney, preferably in close proximity to existing environmental conservation lands. Due to the rate of development expected in western Sydney and the corresponding losses in native vegetation, particularly Cumberland Plain Woodland, there is some urgency in the timing of the identification of suitable sites.

- A biodiversity offset strategy would be developed in conjunction with the Office of Environment and Heritage to manage this process, and would likely include a proposal to identify and secure suitable offset sites in the short term as well as the long term management of the sites.

### 7.8 Aboriginal heritage

#### 7.8.1 Existing environment

**Known Aboriginal archaeological sites**

A total of 42 sites have been identified within 300 metres of the recommended corridor east of the Hawkesbury-Nepean River based on a search of the Aboriginal Heritage Information Management System (AHIMS) maintained by the Office of Environment and Heritage. These sites include artefacts, potential archaeological deposits (PADs), artefacts and stone quarries, grinding grooves and an Aboriginal Ceremony and Dreaming site, associated with the Blacktown Native Institution, described below.

It is likely that more Aboriginal sites and areas of archaeological potential are located along the recommended corridor than is indicated by the currently recorded AHIMS sites, including in areas that have been disturbed. Information on known sites is limited by prior investigations and as such, site data records are skewed towards areas where more development and archaeological investigations has been conducted, ie the eastern portion of the recommended corridor. The western portions of the recommended corridor are disproportionately under-represented with respect to previous archaeological investigations.

**Known areas of Aboriginal cultural significance**

- **Colebee and Nurragingy Land Grant** - Colebee and Nurragingy were Aboriginal guides who accompanied European punitive expeditions that Governor Macquarie had organised against Aboriginal people on the Cumberland Plain in 1816. For their assistance Macquarie granted Nurragingy and Colebee 30 acres of land in the area now known as Colebee. This grant was the first to be issued to Aboriginal people in Australia. The site has been assessed as demonstrating exceptional heritage significance and is listed on the NSW State Heritage Register (SHR). Since the mid-2000s part of the land has been subdivided and developed for residential purposes.

- **The Blacktown Native Institution at Oakhurst** has been assessed as demonstrating exceptional heritage significance and is listed on the NSW SHR. The Native Institution was first established by Governor Macquarie in Parramatta in 1814 as a school for Aboriginal children, and was relocated to Blacktown in 1823.

- **Plumpton Ridge**, located in the vicinity of Colebee and Dean Park, has been identified as an area of cultural significance to Darug groups and as an important source of silcrete for stone tool manufacture.

Overall, the entire area surrounding the recommended corridor is significant to the local Aboriginal community as a cultural landscape and area of occupation for Aboriginal people. It is likely that further areas of cultural significance would be identified following further Aboriginal stakeholder consultation and further investigations.
Areas of archaeological potential

The scope of the BLoR-CC study and the size of the recommended corridor precludes the preparation of a detailed predictive model of archaeological potential at this stage. Instead, general statements about the archaeological potential of the recommended corridor have been prepared that will guide later, more detailed investigations into the nature and location of areas of archaeological potential. This outline of archaeological potential is high level and based on desktop research only.

Archaeological potential is determined by landform, natural processes, location, human processes and levels of disturbance and the presence or absence of Aboriginal sites in the local context.

Certain landforms, such as gentle slopes, are conducive to occupation while others, such as steep slopes may not be as suitable. The location of appropriate landforms in relation to natural resources, in particular their proximity to a watercourse increases their sensitivity. Correlations between site location and proximity to a water source have been proven in numerous previous archaeological investigations. The number of sites and their densities is, in most cases, highest in close proximity to a permanent water source. In areas where there is high level of disturbance, however, the archaeological sensitivity is lowered. It is unlikely that surface finds in disturbed areas are in their original context and it is unlikely that subsurface archaeological deposits are intact. Previous archaeological investigations in the region have also demonstrated the potential for deep stratified deposits in contexts bordering the Nepean River and Hawkesbury River. This includes the oldest securely dated site at Shaws Creek and identification of potential Pleistocene deposits at Pitt Town and Aboriginal sites above the 1:100 year flood level at Windsor.

The former ASA site at Shanes Park has been identified as Commonwealth heritage listed for Shale Plains Woodland and also Non-Aboriginal heritage values. However the land has not been developed, contains one of the largest remnants of the natural vegetation of the Cumberland Plain, and is crossed by Little Creek. Consequently, the likelihood of intact surface and subsurface artefacts is increased. The site may also have significance as a cultural landscape.

Large scale sensitivity mapping for both the North West and South West Growth Areas was conducted in 2009. The North West Growth Area model highlighted the importance of higher order creeks and their surrounding lower slopes, flats and low elevation ridgelines for predicting the presence of archaeological material. South Creek and Eastern Creek are the major higher order creeks in the eastern portion of the recommended corridor and consequently have the potential to contain subsurface archaeological deposits.

Aboriginal archaeological potential in the central portion of the recommended corridor is generally associated with less disturbed areas (such as the Castlereagh and Wianamatta Nature Reserves), areas above the 1:100 year flood levels and the margins of water sources.

Major water sources in the central portion include South Creek, Rickabys Creek and the Nepean River. There is frequently a correlation between lower artefact densities associated with intermittent streams as opposed to higher artefact densities associated with more permanent water. Archaeological investigations along the Nepean and Hawkesbury Rivers have identified unique archaeological contexts and the potential for significant archaeological sites. One of the key features of the Nepean and Hawkesbury Rivers is the effects of flooding on the deposition and integrity of archaeological deposits. Areas above the 1:100 year flood level in close association with both the Nepean and Hawkesbury Rivers may therefore have high archaeological potential, depending on local levels of disturbance.

7.8.2 Strategic assessment of potential impacts

Strategic impacts of the long term protection of the recommended corridor are complex with regards to Aboriginal heritage. The act of reserving the corridor would inadvertently (though
temporarily) help protect large tracts of land, remnant vegetation, Aboriginal objects and cultural landscapes. Projected growth for the regions surrounding the recommended corridor, indicates that development and population densities will continue to rise.

Certain Aboriginal sites, such as artefact sites, are currently considered common throughout the Cumberland Plain. However, as urbanisation and development of the Cumberland Plain increases, the number of intact Aboriginal sites would decrease. Even the Aboriginal archaeological sites which are currently considered most common would be a swiftly depleting cultural resource.

The recommended corridor would potentially impact directly and indirectly on a number of known and PAD Aboriginal sites east of the Hawkesbury-Nepean River. At this stage, the nature and significance of the sites and the likely impacts is not fully understood.

Areas of exceptional cultural significance

The recommended corridor would be located immediately adjacent to the curtilage of the Blacktown Native Institution site, listed on the SHR. A recent environmental assessment for a separate project found that the eastern edge of the Blacktown Native Institution site is heavily disturbed and was assessed as having low or no archaeological potential. Consequently, no direct impact on the site is expected.

The recommended corridor would lie over the Colebee and Nurragingy Land Grant site listed on the SHR. However, the Strategic Concept Design proposes an elevated section of the motorway at this location, requiring possibly only a pier within the listed parcel of land. During the design development for a future motorway, opportunities to further reduce the impacts at this location could be explored. It is noted that the site is likely to have been disturbed from ongoing upgrades to Richmond Road and the subdivision development underway on the northern part of the land grant parcel.

The potential impacts to these sites with Aboriginal stakeholders, the Office of Environment and Heritage and other relevant stakeholders has been limited.

7.8.3 Summary of key issues and potential management measures

The following key issues and potential management measures have been identified in relation to Aboriginal heritage:

- It is likely that more Aboriginal sites and areas of archaeological potential are located along the recommended corridor than is indicated by the currently recorded AHIMS sites, including in areas that have been disturbed. Information on known sites is limited by prior investigations and as such, site data records are skewed towards areas where more development and archaeological investigations has occurred, ie the eastern portion of the recommended corridor.

It is recommended that:

- Ongoing consultation with Aboriginal stakeholders is conducted. Consultation would be conducted throughout the life of the project (ie during protection of the corridor, design of the motorway, planning and construction phases).

- Once construction methodology and detailed designs of the future BLoR-CC motorway are known, impacts to Aboriginal archaeological sites, areas of archaeological potential and Aboriginal cultural sites should be avoided or mitigated. Mitigation measures may include:
  - Consultation with Aboriginal stakeholders
  - Test excavation

47 Richmond Road Shared Path Review of Environmental Factors (Hill Consulting, 2016)
- Salvage excavation
- Detailed recording, reporting and artefact analysis.

- Any future development of a motorway would require the full investigation and assessment of the Aboriginal heritage impacts in accordance with the relevant guidelines at that time. The field survey should include, but not be limited to the following:
  - Ground-truth the findings of desktop research
  - Confirm the location and extent of recorded AHIMS sites
  - Identify unrecorded sites
  - Target areas which have been subject to relatively little background research and inform management strategies in these areas
  - Assess Aboriginal archaeological potential.

A mitigation strategy should be developed in consultation with the Aboriginal community and archaeologists based on a comprehensive collation and presentation of Aboriginal heritage values from the BLoR-CC study area. Examples of this may include commemorative signage, naming and establishing local museum exhibition(s).

**Areas of exceptional cultural significance**

The importance of the Colebee and Nurragingy Land Grant and the site of the Blacktown Native Institution is acknowledged and it is recommended that every effort be made to avoid impacts on these SHR listed sites. While the boundary of the recommended corridor indicates that the Land Grant site may be directly impacted, albeit marginally, the future design of the motorway would investigate opportunities to avoid these sites. This work would be undertaken as part of any project application for construction and operation of the motorway when it is required.

An anthropologist should be engaged during the preparation of a future environmental assessment to assist with detailed assessment of the cultural significance of these items in relation to the recommended corridor.

Recommendations presented in the *Blacktown Native Institution Cultural Management Plan* (GML, 2004) should be referred to in the development of any future motorway.

### 7.9 Non-Aboriginal heritage

#### 7.9.1 Existing environment

**Heritage listings**

The following sites within or adjacent to the recommended corridor to the east of the Hawkesbury-Nepean River that are on a statutory heritage list have been identified:

- The Llandilo International Transmitting Station and the Shale Woodlands on the former ASA site at Llandilo (Shanes Park) are listed on the Commonwealth Heritage List
- Two items, the Colebee and Nurragingy Land Grant, and Blacktown Native Institution (as discussed in Section 7.8) are listed on the SHR, and also on Blacktown LEP
- Three items listed on LEPs are located within or adjacent to the recommended corridor to the east of the Hawkesbury-Nepean River, and include Castlereagh Road.

#### 7.9.2 Strategic assessment of potential impacts

Impacts of the long term protection of the recommended corridor are complex with regard to non-Aboriginal (historic) heritage. The act of reserving the corridor could affect how
properties and heritage items are valued and maintained and may devalue some heritage items, for example, if heritage listed dwellings within the recommended corridor were bought as investments and left empty or rented in the lead up to construction of a future motorway. In such a scenario, the measurable impacts at the time of assessment prior to construction would likely be lower due to the lessened significance of the item.

However, different types of heritage items are likely to be affected in different ways. For instance, the Commonwealth Heritage listed Shale Woodland Llandilo which surrounds the (also Commonwealth Heritage listed) Llandilo International Transmitting Station would likely increase in value through its protection from development in the interim. The protected Shale Plains Woodlands on the site would increase in rarity as development and clearing increase in Western Sydney. Consequently, at such time as any future motorway is constructed, the measurable impacts would potentially be higher due to the increased quality of the listed site. However, it is noted that the Castlereagh Freeway corridor reservation are already in place over part of this site, so protection of the recommended corridor reservation would continue to serve as an additional interim heritage protection.

Protection of the recommended corridor would result in the following impacts to sites east of the Hawkesbury-Nepean River that are currently on a statutory register:

- Direct and indirect impacts on the Commonwealth heritage listed Llandilo International Transmitting Station and Shale Woodland Llandilo at Shanes Park
- Direct and indirect impacts on two SHR listed items, Blacktown Native Institute and Colebee and Nurrangingy Land Grant at Colebee, however the future design may avoid these
- Direct or indirect impacts on three local heritage listed items, including Castlereagh Road.

There is also the potential for further archaeological sites to be identified both on listed sites and on as yet unidentified sites along and adjacent to the recommended corridor.

Llandilo International Transmitting Station and Shale Woodland Llandilo at Shanes Park

The recommended corridor would cross the former ASA site at Shanes Park containing these two Commonwealth heritage listed sites. The Commonwealth Government is in the process of transferring the area of land to the NSW Government for the purposes of a National Park. Consultation regarding the impact of the transfer of the former ASA site is intended to be conducted in parallel with the exhibition of this draft SEA, as a separate activity.

Colebee and Nurrangingy Land Grant and Blacktown Native Institution

As noted in Section 7.8.2, the protection of the recommended corridor would abut the edge of the Colebee and Nurrangingy Land Grant site, although there is the potential to explore further options to reduce this impact when the design of a future motorway is developed. The recommended corridor would not impact directly on the Blacktown Native Institution however it would be located immediately adjacent to the curtilage. It is noted that both parcels of land are owned by Roads and Maritime and previous resumptions of parcels of land at both sites have occurred.

Local heritage items

In the short to medium term, protection of the recommended corridor could potentially result in a decline in heritage values if a decision is made to not invest in maintenance and upkeep of the listed sites. Once a future motorway is constructed, there would be a loss of heritage items that are directly impacted by the construction. As development pressures continue in Western Sydney, there is the potential that individual sites could become rarer examples and increase in significance as a consequence.
7.9.3 Summary of key issues and potential management measures

The following key issues and potential management measures have been identified in relation to non-Aboriginal heritage:

- The impacts of the long term protection of the recommended corridor are complex with regards to non-Aboriginal heritage as individual values can either increase or decrease over time, depending on management actions implemented in the interim. It would be up to the government authority responsible for the heritage listing to determine the appropriate interim management measures, if any, that may be required.

- The consultation outcomes of the transfer of the former ASA site from the Commonwealth to the NSW Government would be incorporated into the final SEA.

- The significance of the Blacktown Native Institute and the Colebee and Nurragingy Land Grant at Colebee has been identified and further understanding as to the values attached to the sites is required at the time of the design of the motorway, in order to fully characterise the extent of potential impact at these two sites as well as the potential spatial connection between the two sites.

- Any future proposal to construct and operate the BLoR-CC motorway would require the preparation of a heritage impact assessment in accordance with State and Commonwealth guidelines and would include consideration of direct and indirect physical, visual and social impacts. The heritage impact assessment would include field survey in order to:
  - ground-truth the findings of the desktop research conducted to date
  - confirm the location and extent of recorded heritage listed sites
  - identify unrecorded sites
  - target areas which have been subject to relatively little background research and inform management strategies in these areas
  - assess non-Aboriginal archaeological potential.

7.10 Socio-economic

7.10.1 Existing environment

Blacktown City is the largest LGA by population in NSW and covers an area of 246.9 square kilometres. It has a long history, with the first European settlement occurring at Prospect Hill in August 1791. It is rapidly changing from a largely rural community to a highly urbanised area to accommodate Sydney’s growing population. The City is highly diverse and multi-cultural and is home to the largest Aboriginal population of any suburb or township in NSW.

The municipality of Penrith was first incorporated in May 1871. Located on the western edge of Sydney, Penrith City covers 404 square kilometres. Around 80 per cent of the City is rural and rural-residential. Agriculture, including poultry farms, orchards, market gardens and horse breeding, contributes $64.6 million to Penrith’s economy. Penrith supplies cut flowers, Chinese vegetables and mushrooms to the Sydney markets. The City’s two major commercial centres are Penrith and St Marys. Kingswood is emerging as a ‘specialised’ centre, focusing on health and education. Most of the City’s urban area is residential, with some commercial and industrial land.

The recommended corridor interacts with the following suburbs east of the Hawkesbury-Nepean River: Dean Park, Glendenning, Oakhurst, Hassall Grove, Shalvey, Willmot, Colebee, Marsden Park Industrial, Marsden Park, Shanes Park, Llandilo, Cranebrook, Castlereagh and Agnes Banks.
Key socio-economic characteristics for communities east of the Hawkesbury-Nepean River include:

- High population growth in recent years
- High population and employment growth forecast for the next 20 to 30 years
- Low population mobility (i.e., time resident at same location)
- High dependency on private vehicle for main mode of transport
- Social infrastructure, including places of education, scout and community halls, located in proximity to the recommended corridor at Hassall Grove, Bidwill, Shalvey, Willmot, Llandilo and Castlereagh.

The amenity of the eastern section of the recommended corridor and surrounds has changed in recent years to become more urbanised in parts and increasingly industrial in Marsden Park. The M7 Motorway represents existing major transport infrastructure that influences the amenity of nearby communities. The existing Castlereagh Freeway corridor has been protected for a long period of time, but remains undeveloped and covered in natural vegetation, representing a buffer between the residential and other land uses.

The central section of the recommended corridor and surrounds generally comprises a semi-rural character, including rural residential development, small farms and light industrial uses. There are no major transport corridors in this section, however the north south corridors of The Northern Road, Londonderry/Cranebrook Road and Castlereagh Road contribute to the noise environment of the surrounding communities.

Within the BLoR-CC recommended corridor and adjacent land, local businesses include plant nurseries, light manufacturing, wholesalers, holiday accommodation, recreation, and restaurants. The BLoR-CC recommended corridor covers 203 hectares of land used for agricultural purposes particularly grazing land with the largest shares of agricultural land located in the east near Shanes Park, Llandilo and Castlereagh.

### 7.10.2 Strategic assessment of potential impacts

#### Population and demographic impacts

A review of the population forecasts for the LGAs crossed by the recommended corridor was undertaken as a baseline for assessing the potential impacts. It is observed that the population of Blacktown and Penrith LGAs is less mobile compared to Greater Sydney, indicating that the population characteristics are not expected to change significantly due to the protection of the recommended corridor.

Population growth across Blacktown and Penrith LGAs is largely expected to be driven by positive net overseas immigration and a high fertility rate. Growth near the BLoR-CC-Preferred Corridor is mostly expected to be located close to the North West Growth Area. Continued urbanisation and employment land expansion in western and north-western Sydney will stimulate job creation and population growth over the next 25 years (refer section 6.1 for further detail). Over time, the expected population increases will bring about the need for increased transport capacity. These changes are expected to occur even in the absence of corridor protection.

Corridor protection is not expected to change the population characteristics of the area or encourage a decrease in population. Over time, isolated cases of people leaving the area are expected, particularly where residential, business or agribusiness properties are directly affected by the corridor and where there are restrictions on the ongoing viability of the property. However, these movements could be within the LGA, or within north-western Sydney, with no net loss to population, employment or economic input for the region.

Furthermore, given the likely long lead time between the proposed corridor protection and
any future need for construction of a motorway, any displacement would be spread over a long period of time.

Once the future motorway is in operation, it could be expected that population and demographic changes would continue as anticipated on a steady growth basis, without any significant changes in growth in the population, net migration and demographic profiles.

**Business impacts**

Timely corridor protection provides numerous benefits to the public and private sector, communities and taxpayers. However, there are also disbenefits for the local community and businesses, directly and indirectly affected by the corridor protection, that need to be considered.

The effects of corridor protection and eventual operations on local businesses can be characterised by the following impacts:

- Uncertainty regarding project timing as well as disruptions to lifestyle, division of communities and loss of networks and relationships can cause severe anxiety and stress to affected property owners and local business owners and employees

- While existing uses may continue within the corridor, there is potentially decreased investment in business due to limitations on the expansion of development. Landowners may also perceive diminished property value during the interim period prior to government acquisition. This is because zoning limitations during the interim period may reduce land use options for potential buyers

- The relocation of affected businesses can result in reduced economic activity, employment, income and tax revenues within the proposed corridor. Local businesses are often family-run and heavily reliant on the local community network. The upheaval and relocation of these businesses may hamper their viability

Protection of the recommended corridor would impact both directly and indirectly on a number of local businesses. These impacts are defined as:

- A direct impact occurs where a local business is intersected by the recommended corridor; the property is considered severed and would no longer be viable once the motorway was constructed

- An indirect impact occurs where the local business property is not severed however the corridor would encroach on the property.

During corridor protection, businesses may continue to operate under existing use rights. However, modifications to existing development and new developments on business properties intersected by the recommended corridor would be limited by new development controls to ensure compatibility with future transport infrastructure. Businesses may be impacted in the short to medium term due to changing investment decisions and uncertainty regarding the timing of acquisition and construction of any future motorway.

A future application for infrastructure in the corridor will need to address potential issues affecting businesses.

**Agribusiness impacts**

The recommended corridor would cross agricultural land, particularly in the central section around Llandilo and Castlereagh. In some cases, the severance caused by the corridor, once the motorway is constructed, would likely impact on the viability of this land for agricultural production.

The impact of future infrastructure in the corridor for agricultural land use is expected to be driven by the following factors:
• A loss of productive land resulting in a reduction in the gross value of agricultural production, and therefore the necessary scale and size economies required to run an efficient agricultural enterprise

• Increased cost associated with operations, such as movement in livestock or farm machinery over, or under, the corridor

• Increased costs associated with change in whole-farm management plans, and re-deployment of infrastructure such as dams, sheds and other facilities.

Other effects as a result of the corridor protection and any future construction and operation scenario on agribusiness are expected to be similar to those identified for local businesses. That is, as a result of protection, agribusinesses are expected to experience:

• Uncertainty regarding project timing and finances as well as disruptions to lifestyle. However, this needs to be balanced against released Government policy such as Future Transport 2056 which identifies the BLoR-CC recommended corridor as being delivered as a visionary project beyond 20 year which will stimulate growth

• Potential reduced economic activity, within the recommended corridor over time

• Potentially reduced opportunities for expansion and/or growth of agricultural activity due to the potential limitations on further capital investments and development on properties that are intersected by the corridor.

Generally, protection of the recommended corridor is likely to have a small gradual negative impact on local businesses and agribusinesses over time, due to uncertainty over future timing of the motorway and restrictions on development and property improvements that would be permissible. However, it is noted that there are few businesses that would be directly or indirectly affected, so overall, the socio-economic losses that may eventuate would be a small percentage of the local and regional economy. Many of the small businesses operating within the recommended corridor are not site dependent and could be suitable for relocation.

Social infrastructure

The recommended corridor does not intersect directly with any social infrastructure. It does however intersect with the southern boundary of the outer playing fields at St Paul’s Grammar School. It is expected that the design of any future motorway within the recommended corridor could be amended to avoid any impact on the playing fields.

The recommended corridor passes within 500 metres of several including Willmot Primary School, Shalvey Primary School, Llandilo Primary School, St Paul’s Grammar School, Castlereagh Primary School, Castlereagh Community Hall, Castlereagh Anglican Church and Castlereagh Kindergarten. This may result in a reduction of amenity for the users of these facilities if the motorway is constructed due to changes in the noise and visual environment.

Although there are currently few social infrastructure facilities scattered along the recommended corridor, the increased development focus in north-western Sydney may potentially result in additional facilities being constructed in the period between protection of the corridor and any future construction and operation scenario. This may increase the number of noise sensitive receivers that would need to be mitigated as part of the future construction and operation scenario unless development controls to manage future development are enacted.

Amenity and community values

Following protection, the recommended corridor would have a gradual impact on local amenity as land use activities shift over time in response to the change of land use zoning. Generally, this is likely to maintain the semi-rural character of the corridor for longer than
may have otherwise been the case. However, once a decision is made to construct a future motorway, the amenity of the communities adjacent to the corridor would change as a result of the project. Mitigation strategies would be needed for potential amenity impacts as discussed in Sections 7.3.3 and 7.4.3. However, this will occur in the context of other changes and urbanisation across the wider Western Sydney region.

**Access and connectivity**

Protection of the recommended corridor would not alter local access and connectivity, which would continue under the existing arrangements. Due to the dispersed nature of residential dwellings and employment centres, cars would continue to be the predominant form of transport across north-western Sydney. The existing Castlereagh Freeway corridor already presents a vegetated barrier between the North West Growth Area and the established suburbs of Hassall Grove, Bidwill, Shalvey and Willmot.

Once constructed, a future motorway would present a barrier across the two affected LGAs east of the Hawkesbury-Nepean River, affecting north-south movements. As described in Chapter 4, local road connectivity has been considered in the Strategic Concept Design and connections across the motorway would be provided for many, but not all local roads. As discussed in the land use section (refer Section 7.1), access to individual properties has been considered in the development of the recommended corridor, however any future EIS and design would need to develop these details further.

A future motorway within the recommended corridor would not directly sever any identified community centres, characterised by zoning such as village, neighbourhood centre or local centre. However, it is acknowledged that the more dispersed rural communities may nevertheless have a strong sense of community, and are likely to experience a negative impact as a result of severance.

Once constructed, a future motorway would improve regional connectivity for residents across north west Sydney and across the Blue Mountains to central and western NSW.

**Flood evacuation**

Natural hazards including floods have the potential to threaten life and property and they impose social and economic costs on government and the community. Flooding is recognised as the costliest natural disaster in Australia.48 Planning to prepare for the eventuality of a severe to extreme flood in the Hawkesbury-Nepean Valley is a complex and on-going process, involving multiple agencies, strategies and approaches. Land transport support comprises only one component of the overall approach to managing flood risks however given the degree of vulnerability to flooding in the Hawkesbury-Nepean, provision of an additional flood evacuation, separately or in conjunction with other flood evacuation routes in the area, would provide economic and social savings for the community and government.

**Cumulative impacts**

Once constructed, the cumulative impact of loss of amenity, increased noise, changed traffic and access arrangements and changes in land use are likely to have a negative impact on residents and businesses in some locations across the region. Some decrease in amenity is to be expected with any new infrastructure project and overall would be offset by the benefits derived from the improved regional connectivity between the Blue Mountains, north-western Sydney, and the Sydney motorway network.

Further discussion of the cumulative impacts of multiple transport infrastructure projects being planned in north-western Sydney is presented in Chapter 9.

7.10.3 Summary of key issues and potential management measures

The following key issues and potential management measures have been identified in relation to socio-economic impacts:

- Over time, the protection of the recommended corridor would have a minimal impact on local amenity. Once constructed the amenity of the communities adjacent to the corridor would be negatively impacted by the introduction of a new motorway.

- Consideration of the *Development Near Rail Corridors and Busy Roads – Interim Guidelines* (Department of Planning, 2008) should be required for all future development applications within the vicinity of the recommended corridor.

- At any future EIS stage, opportunities to minimise the impact on the amenity of social infrastructure in the vicinity of the proposed motorway should be explored.

7.11 Air quality and greenhouse gases

7.11.1 Existing environment

Sensitive receivers, such as schools, residential dwellings or hospitals located in proximity to the recommended corridor are shown in Figure 6-1. Residential development is concentrated at the eastern end of the recommended corridor in the established suburbs of Dean Park, Glendenning, Oakhurst, Hassall Grove, Shalvey and Willmot and the recently developed suburbs of Ropes Crossing and Jordan Springs, and the Stonecutters Ridge development at Colebee. Rural residential development is scattered along the remainder of the recommended corridor east of the Hawkesbury-Nepean River, interspersed with large areas of native vegetation at Shanes Park, Wianamatta Regional Park, Castlereagh Nature Reserve, Winanamatta Nature Reserve and the PCLs at Castlereagh.

7.11.2 Strategic assessment of potential impacts

A large portion of land along the length of the recommended corridor is minimally developed and heavily vegetated, consisting largely of low density rural residential properties. Considering current land use within and adjacent to the recommended corridor, there are currently no significant air emissions pollutant sources.

Long term protection of the recommended corridor would have a negligible impact on air quality and greenhouse gases within the air shed as there would be no direct changes to emission sources.

Provision of infrastructure within the recommended corridor for operation of the completed motorway would generate potential air quality and greenhouse gas impacts assuming the current technology in use today. In the future, lower emission vehicles including greater use of electric and autonomous vehicles may reduce this potential impact.

Construction activities such as vegetation clearance, earthworks, fuel combustion and indirectly related energy consumption would generate short-term GHG emissions.

As any future construction phase would be relatively short-term and localised in nature, GHG emissions are not expected to impact climate change.

Particulate matter emissions produced from increased soil exposure and earthworks is expected to have the most potential to create air quality impacts within the air shed during any future construction phase due to magnitude of emissions and high existing background concentrations of both PM$_{10}$ and PM$_{2.5}$. However, the following factors mean any impacts due to construction of a motorway would be localised and short-term:

- The recommended corridor forms only a small portion of the entire Sydney air shed.
Any elevation of pollutant concentrations would be experienced in the near vicinity of the source, but would reduce in magnitude with distance from the source.

Construction would only occur over a short time-frame.

The operational phase of the motorway would generate GHG and air quality impacts. The following aspects of motorway operation would produce GHGs:

- Use of electricity for powering operational electrical systems including roadside lighting, communications, controls and electronic signage. Although the potential for greater use of solar panels may affect this impact.
- Combustion of fuel for operation of construction equipment and use of materials for road maintenance.
- Combustion of fuel from vehicles using a potential future motorway (noting that GHGs produced from this source do not contribute to the emissions calculations for any future assessment).

A comparison between GHGs produced during operation and construction phases of various major road projects demonstrates that emissions for both phases are typically equivalent when considering operational periods of between 40 years and 100 years. This finding shows that it is important to also calculate GHG emissions for the operational phase which are mainly due to electricity usage.

Pollutants considered to be emitted from motor vehicles include CO, NO₂, PM₁₀, and PM₂.₅. Existing CO and NO₂ levels are well below the criteria within the airshed. Therefore, it is unlikely that vehicles using a potential future motorway would cause exceedances of CO and NO₂ at locations adjacent to the corridor. Existing levels of PM₁₀ and PM₂.₅ within the airshed are typically close to the criteria, with exceedance of criteria occurring at times. This demonstrates that operation of any future motorway has potential to create exceedances of PM₁₀ and PM₂.₅ at locations close to the corridor, which could pose issues for sensitive receivers located in close proximity. Operation of any future motorway is not expected to create impacts for the entire airshed. Furthermore, technology is constantly changing, vehicles are getting cleaner and methods to manage emissions are evolving. The motorway is not proposed to be constructed for some time and, the conditions and context will inevitably be different in the future.

When the need for a motorway to be constructed is identified, air quality impacts would be further investigated as part of a future EIS.

7.11.3 Summary of key issues and potential management measures

The following key issues and potential management measures have been identified in relation to air quality and greenhouse gases impacts:

- Long term protection of the recommended corridor would have no impact on air quality and greenhouse gases within the airshed and therefore no mitigation measures are proposed.
- Provision of infrastructure within the recommended corridor for operation of the completed motorway would generate air quality and greenhouse gas impacts.
- Any future environmental assessments for the construction and operation of a future motorway would be conducted in accordance with the relevant guidelines and policies.

Air quality

Concentrations of pollutants emitted due to construction and operation of any future motorway would be most significant at locations close to the source (i.e., close to the construction site, and in the near vicinity to the motorway during operation). Pollutant concentration decreases with increased distance from the source. Air quality is assessable at
locations where people are likely to work or reside. Any potential air quality impacts are most effectively managed by maximising the distance between the recommended corridor and any existing sensitive receivers.

Air dispersion modelling of key operational pollutants (NO$_x$, PM$_{10}$, PM$_{2.5}$ and CO) should be conducted to establish predicted impacts of any future motorway both upon opening, and 10 years post-opening. This may require baseline monitoring, and monitoring post-construction, for calibration and validation of modelling methods. Mitigation of air quality impacts is difficult to implement however options to manage air quality impacts should be included in the future design of the motorway.

**Greenhouse gases**

Management of GHG emissions for the construction and operation of any future motorway in the recommended corridor would be an important consideration in minimising any future contribution towards climate change, acknowledging that climate change science, technology and management approaches are likely to progress and improve in the future.

Any future project level environmental impact assessments should include calculation of predicted GHG emissions for construction, and operation and maintenance of the motorway.
8. Strategic assessment of impacts of recommended corridor west of Hawkesbury-Nepean River

This chapter provides a strategic assessment of impacts of the recommended corridor to the west of the Hawkesbury-Nepean River (refer Figure 8-1). Impacts relating to the recommended corridor east of the river are discussed in Chapter 7.

8.1 Land use and property

8.1.1 Current land use

As described in Section 6.1, the recommended corridor crosses a diverse range of land use types. Key sensitive land uses west of the Hawkesbury-Nepean River include:

- Social land uses in Grose Wold, Grose Vale and Kurrajong
- Crown land at Kurrajong Heights
- Proximity to Greater Blue Mountains World Heritage Area
- North-south linear utilities infrastructures at Grose Vale.

8.1.2 Strategic assessment of potential impacts

Zoning

The recommended corridor would require the protection of a total of approximately 246 hectares of land west of the Hawkesbury-Nepean River, requiring the conversion of 238 hectares of land with the remaining 8.3 hectares representing existing SP2 zoning.

Residential and employment lands

West of the Hawkesbury-Nepean River, the recommended corridor would traverse land currently utilised for rural residential development and small lot primary production, generally comprising residential dwellings, hobby farms, some small industries and businesses. Existing use rights would permit the continuation of these land uses until such time as the motorway may be built. However, restrictions on new development and change of use of the land within the corridor is likely to limit any intensification of land use activity and in fact may result in a slight reduction in land use activity over time as landowners seek opportunities for acquisition. Due to the nature of a motorway corridor, with access limited to interchanges located at widely spaced intervals, it is not expected that protection of the recommended corridor would attract new land uses to the area. New development adjacent in the corridor would need to demonstrate compatibility with future infrastructure in the corridor.

In total, the recommended corridor would impact on 147 properties west of the river.

Further discussion on land use development controls is provided in Section 11. Further information on property acquisition is available at www.transport.nsw.gov.au.

Land use viability and future development potential

As described in Section 7.1.2, land use viability and future development potential for impacted parcels of land west of the river were examined for suitability of residual land for continuing or alternative uses and ongoing accessibility requirements and this has informed the development of the proposed recommended corridor.

The terrain west of the Hawkesbury-Nepean River has been one of the primary controlling factors in patterns of residential development. Council’s residential strategy has not identified
sites in the vicinity of the recommended corridor, most are located further north around Glossodia.

It is not expected that the recommended corridor would substantially change land use patterns west of the Hawkesbury-Nepean River.
Figure 8-1  Recommended corridor west of the Hawkesbury River
Environmental conservation land uses

The recommended corridor would impact on Crown land parcels located both east and west of Kurrajong Heights. The corridor would also be established in the vicinity of the World Heritage listed Blue Mountains National Park and it would be important to ensure that this presence is considered in any future motorway development proposal to ensure that the values are not diminished.

8.1.3 Strategic assessment of future land use opportunities

As previously described, western Sydney will grow faster than Sydney as a whole over the next 20 years, although Hawkesbury LGA is not projected to experience the same levels of growth as the LGAs east of the Hawkesbury-Nepean River.

The population projections and the implied dwellings for the Hawkesbury LGA are provided in Table 8-1, giving an indication of the growth in residential land use that can be expected over the next 20 years.

Table 8-1 Population and dwelling projections in the Hawkesbury LGA

<table>
<thead>
<tr>
<th>LGA</th>
<th>2011</th>
<th>2016</th>
<th>2021</th>
<th>2026</th>
<th>2031</th>
<th>2036</th>
<th>Total change</th>
<th>Total % change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawkesbury (population)</td>
<td>64,350</td>
<td>67,800</td>
<td>71,000</td>
<td>74,800</td>
<td>79,400</td>
<td>85,050</td>
<td>20,700</td>
<td>32.2</td>
</tr>
<tr>
<td>(implied dwellings)</td>
<td>24,450</td>
<td>26,400</td>
<td>28,100</td>
<td>29,900</td>
<td>31,950</td>
<td>34,400</td>
<td>9,950</td>
<td>41.0</td>
</tr>
</tbody>
</table>

Source: Department of Planning and Environment (2016) NSW State and Local Government Area Household Projections and Implied Dwelling Requirements, Population Projections.

Housing and job growth potential

West of the Hawkesbury-Nepean River there is currently only one major development proposed in the vicinity of the recommended corridor but it is not impacted. The Redbank development at North Richmond, managed by the North Richmond Joint Venture, is located on the northern side of Grose Vale Road and immediately to the west of the North Richmond residential area and Peel Park, east of the Belmont Grove rural residential area and south of Redbank Creek. The development covers an area of 180 hectares and would ultimately deliver around 1,400 dwellings.

Minor rezonings for rural residential development are likely to continue to occur across the Hawkesbury LGA at the initiative of private developers regardless of corridor protection. The intensity of future development will depend on proximity to facilities and services, the availability of service infrastructure, the capability of the land and the amenity of established areas. However, it is expected that the opportunities for housing and job growth west of the Hawkesbury-Nepean River as direct consequence of the protection of the recommended corridor would be low to moderate.

Key locations

As described in Section 4.1, the recommended corridor has been developed based on the Strategic Concept Design for a future motorway. Principles used in the design of motorways provide guidance with respect to distances between interchanges and the number of access opportunities onto the motorway, in the interests of safety and operational efficiency. Furthermore, motorways typically require the supporting arterial road network to be setback at a distance of around one kilometre from interchanges in order to realise land use development opportunities. Typically, the primary benefit of motorways is derived from improvements to regional connectivity not local access improvements. Consequently, along
the recommended corridor integration opportunities are limited and land use opportunities may be restricted to proximity to the proposed interchanges.

Opportunities for intensification of land use activities are typically informed by:

- Current zoning and future land use planning strategies
- Topography
- Environmental constraints
- Ownership
- Access.

While a strategic appraisal of potential future land use opportunities has been undertaken, the likelihood of any opportunities being taken up depends upon strategic planning undertaken by the Greater Sydney Commission. West of the Hawkesbury-Nepean River, the land in the vicinity of the BLoR-CC recommended corridor is identified in the Draft Western City District Plan as metropolitan rural area and no future urban areas have been identified.

Therefore, the strategic appraisal of potential future land use opportunities must be considered in relation to this designation as rural area. Table 8-2 provides a strategic appraisal of potential future land use opportunities that could be investigated at each location, noting that such suggestions are indicative only and would require additional planning and assessment, including potential rezoning, should the relevant authorities choose to pursue such opportunities. Ownership has not been considered as land holdings around the proposed interchanges are generally in private ownership.

Table 8-2 Strategic appraisal of potential future land use opportunities west of the Hawkesbury-Nepean River

<table>
<thead>
<tr>
<th>Interchange location</th>
<th>Current zoning</th>
<th>Topography</th>
<th>Environmental constraints</th>
<th>Potential opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grose Vale Road RU4</td>
<td>Steep terrain in foothills of Blue Mountains – narrow ridgelines and deep gullies</td>
<td>EECs and local heritage</td>
<td>Steep terrain and the rural nature of this area would not be conducive to intensification of land use in the short term.</td>
<td></td>
</tr>
<tr>
<td>Bells Line of Road (northern tie-in) RU2</td>
<td>Generally level</td>
<td>Blue Mountains National Park and Wollemi National Park (adjacent to lots immediately along existing road corridor)</td>
<td>The tie-in location is in a rural area in the vicinity of national parks and a World Heritage area. Intensification of land use in this area would be difficult.</td>
<td></td>
</tr>
</tbody>
</table>

8.1.4 Summary of key issues and potential management measures

The following key issues and potential management measures have been identified in relation to land use and property:

- The recommended corridor would require the protection of a total of approximately 246 hectares of land west of the Hawkesbury-Nepean River, requiring the conversion of 238 hectares of land with the remaining 8.3 hectares representing existing SP2 zoning.
• It is not expected that the recommended corridor would open up new opportunities for land use development west of the Hawkesbury-Nepean River in the short term.

• The land use and property management measures to the west of the Hawkesbury-Nepean River would be similar to those described in Section 7.1.4.

8.2 Traffic and transport

8.2.1 Existing environment

As has been previously emphasised, the existing Bells Line of Road plays an important role in providing a second east-west crossing of the Blue Mountains, connecting Sydney and Central West NSW. Key findings from the Bells Line of Road Long Term Strategic Corridor Plan are summarised below to provide the context for the future need for a motorway.

Approximately 16,200 vehicles per day (2011) were recorded on the Bells Line of Road at North Richmond and about 12,150 vehicles per day near Comleroy Road at Kurrajong. This compares to about 4,800 vehicles per day near Coach House Road at Kurrajong Heights and 4,000 vehicles per day further west at Bilpin.

In 2011, Bells Line of Road at Richmond Bridge carried around 27,000 vehicles per day, which included around 1,500 heavy vehicles and the bridge is close to saturation levels, with the operation of Richmond Bridge being adversely affected during the morning and afternoon peaks. A $48 million package of works is currently being delivered on Bells Line of Road west of Kurrajong Heights to improve road safety and traffic efficiency.

Analysis of the existing LOS found that:

• Generally, the central and western sections of Bells Line of Road are operating at a good LOS, with A through to C being typical

• The eastern section of Bells Line of Road operates at poorer levels of service, with congestion on the approaches to North Richmond.

Traffic on Bells Line of Road has generally grown by 1.0-1.5 per cent per annum over the five year period to 2014, with the exception of Kurrajong which was growing at up to three per cent per annum over the same period.

Future traffic environment

The Bells Line of Road Long Term Strategic Corridor Plan contained traffic volume forecasts for 2030 and 2050 based on growth rates of between one and three per cent. By 2030, LOS for the Bells Line or Road of LOS C or better are expected, with the exception of locations east of Kurrajong Heights where the LOS was forecast at between LOS D/E. By 2050, the LOS was predicted to be LOS D/E in peak traffic periods along the eastern section of the road. LOS D indicates that the road is approaching unstable flow conditions and the freedom of manoeuvre is restricted and LOS E represents forced flow, with frequent stopping and queuing.

With the predicted growth in population and employment in the BLoR-CC catchment, the performance of the Bells Line of Road is expected to worsen and will require an upgrade particularly for the eastern section. The terrain of the Bells Line of Road is a limiting factor to increased capacity. Bells Line of Road features rolling and mountainous terrain with many locations where lengths of grades exceed the Austroads desirable maximum lengths for new roads. One of the steepest sections is at Bellbird Hill near Kurrajong Heights with a 600 metre section of road at 12.5 percent grade and another 1.1 kilometre section at 10.0 percent.
Road network constraints also affect freight traffic operation over the Blue Mountains (B-Doubles over 19 metres are not permitted east of Lithgow on either the Great Western Highway or Bells Line of Road) and overtaking opportunities are limited. As freight demand continues to grow, this will place an increasing constraint on economic growth across markets in NSW unless capacity is addressed.

8.2.2 Strategic assessment of potential impacts

Generally, the traffic and transport impacts would be similar to those described in Section 7.2.2.

Local road network

In the future, when the need for a future motorway to be constructed is identified, further traffic modelling, analysis and assessment would be carried out that would provide a quantitative analysis of impacts on the road network at that time.

At a strategic level, it is expected that a future motorway would improve the efficiency of freight transport through and into the BLoR-CC study area via the motorway itself and the proposed interchanges between the arterial road network.

Drivers on Bells Line of Road between Richmond Bridge and Kurrajong currently experience significant levels of congestion, particularly during peak periods. As motorists change their travel patterns and divert onto the proposed motorway, traffic volumes would be expected to reduce on some of the existing local roads, with flow on benefits to alternate routes via some of the local through-roads.

The recommended corridor may also generate the possibility for other future extensions of the road network, such as upgrades to Grose Vale Road, and Bells Line of Road, improving access to new and existing residential areas serviced by these roads.

If constructed, a future motorway would cross a number of existing roads on the local road network. The Strategic Concept Design developed to inform the recommended corridor has considered the potential local road treatments that would be required to support the ongoing function of the local road network. Appendix B contains details of the proposed bridge treatments for both major and minor roads along the recommended corridor west of the Hawkesbury-Nepean River. Should a future motorway be constructed, it would not be appropriate to connect it with all local roads so alternative local road connections may be required in some locations. The connections would ensure that local communities remain connected and that the motorway does not result in adverse accessibility impacts.

At this stage the patterns of usage on local roads and the likely impacts of the proposed future arrangements have not been fully assessed. Furthermore, these would undoubtedly change over time, particularly in the context of the projected growth in north-western Sydney over the longer term.

Regional connectivity

As discussed in Chapter 2, the long-term need for a motorway connecting the second Blue Mountains crossing (i.e. Bells Line of Road) to the Sydney motorway network has been established. The primary benefit expected from the future BLoR-CC motorway would be the improvement in regional connectivity. As road journey numbers, both passenger and freight, are forecast to increase over time, future governments will require options to manage transport solutions. Securing a corridor now, in the context of the rapid change that is currently occurring in north-western Sydney, will provide efficiency and savings for future transport decision making.

The proposed connection between Bells Line of Road at Kurrajong Heights with a future motorway within interchanges with the OSO at Llandilo would enable greater connectivity and transport efficiency across regional NSW.
8.2.3 Summary of key issues and potential management measures

The traffic and transport management measures to the west of the Hawkesbury-Nepean River would be similar to those described in Section 7.2.3.

The full length of any potential future motorway within the recommended corridor is unlikely to be required in the near future, however some sections may be required earlier, depending on land use and traffic demand. Some sections may be required earlier than others, depending on the rate of development in north-western Sydney and the timing of the realisation of the increased traffic demand. An indication of potential staging scenarios is provided in Section 4.4.

A full traffic and transport impact assessment would be prepared in the future, when the need to construct and operate a future motorway is identified. This would allow for the assessment to incorporate the traffic environment at the time of development more accurately and to appropriately identify mitigation measures to reduce potential connectivity issues.

8.3 Noise and vibration

8.3.1 Existing environment

Background noise levels along the recommended corridor are influenced by a range of noise sources. These include localised sources such as motor vehicles, public transport, construction activities, residential properties, farming and agricultural activities and some commercial and industrial activities. Other more significant sources of noise include:

- Movements of aircraft associated with the Richmond RAAF Base operations
- Arterial roads within the BLoR-CC study area.

The aircraft movements associated with the future Western Sydney Airport would be a future noise source. Also, the continuing urban development of land adjacent to the recommended corridor would increase background noise levels over time.

Noise-sensitive receivers adjacent to the recommended corridor is presented in Figure 6-1.

Current land use in the area adjacent to the western section of the recommended corridor is mainly small primary production lots and rural residential areas. The small rural townships of Yarramundi and Kurrajong would have the largest number of sensitive receivers adjacent to the western section of the recommended corridor. Existing background noise levels in this area would be low.

8.3.2 Strategic assessment of potential impacts

Due to the low existing background noise levels west of the Hawkesbury-Nepean River, the impacts of any future motorway construction and operation, while similar in nature to those described in Section 7.3.2, would have a more noticeable impact and it is likely that the recommended construction and operation noise guidelines could be exceeded in some locations.

8.3.3 Summary of key issues and potential management measures

The noise and vibration management measures to the west of the Hawkesbury-Nepean River would be similar to those described in Section 7.6.3.
8.4 Visual amenity, built form and urban design

8.4.1 Existing environment

The north-western boundary of the BLoR-CC study area lies within the Mountain Escarpment Zone (LCZ 3). The escarpment around Kurrajong Heights tends to be heavily vegetated with occasional private properties and small commercial premises such as sporting recreation and restaurants perched on the face of the escarpment capitalising on the views eastwards across the Hawkesbury River basin.

Further down the escarpment around the undulating terraces of Kurrajong, the pattern of land uses changes to areas of pastureland with large properties typically running small numbers of cattle or horses.

The topography continues to descend from the edge of the Blue Mountains escarpment to undulating terraces towards river and creek banks, crossing Grose River and Hawkesbury-Nepean River to Yarramundi. Land is largely undeveloped in the escarpment regions with a small number of rural properties on the lower terraces of Grose Vale and Grose Wold. The escarpment is densely vegetated with forest and woodland with cleared pastureland and pockets of native vegetation on lower terraces and limited remnant vegetation and riparian vegetation on the banks of the Hawkesbury-Nepean River. There are agricultural and larger commercial activities that maintain the existing rural landscape quality.

8.4.2 Strategic assessment of potential impacts

As stated in Section 7.4, the protection of the recommended corridor would not have a visual impact on the landscape. There may be a slight, gradual shift over time in land use patterns and level of activity, as discussed in Section 8.1.2, that would become evident over time, however it would be dependent on land ownership and maintenance activities undertaken by private and public landholders.

Visual sensitivity

The landscape character of LCZ 3 would have a high sensitivity to any future motorway due to the scenic qualities of the valleys, undulating hills and mountain escarpment. Both residents of the area and tourists visiting or travelling through the areas would be impacted by the proposed works.

The highly scenic quality of the undulating landscape and mountain backdrop of the rural residential areas in the vicinity of Grose Vale Road, would be dominated by a road bridge and/or significant areas of fill at either end as well as vegetation removal along the valley floors.

In some instances, the existing vegetation may screen any future motorway from adjoining properties and motorists on Grose Vale Road and Grose Wold Road while vegetation clearing would be the most visible element in some areas.

Any future motorway would be highly visible where it passes through the more open rural landscape areas, due to the steeply undulating corridor and limited areas of existing vegetation to screen the proposed motorway. The undulating landform would provide some level of screening in some areas.

The residential development of Yarramundi would be screened from a future motorway by the density of existing vegetation cover along Springwood Road.

The overall visual sensitivity west of the Hawkesbury-Nepean River is likely to be high due to the high sensitivity to change of the scenic Mountain Escarpment Zone.
Magnitude of visual effect

The most visible element of any future motorway would be the major embankments and road bridges in many parts of the western section of the recommended corridor due to the undulating to steeply undulating topography of the area.

The proposed tunnel in the vicinity of Kurrajong Heights would reduce the visual impact in this area.

Any future motorway and associated infrastructure such as ramps, would be highly visible from the existing Bells Line of Road in the vicinity of Bilpin, and also around Enniskillen Orchard, associated with the proposed interchange with Grose Vale Road.

The proposed road bridge over Springwood Road, the associated embankments and vegetation removal would be highly visible for motorists in both directions.

The proposed bridge over the Grose River would be highly visible, particularly from some neighbouring rural residential properties.

Vegetation clearing for any future motorway would likely comprise one of the most visible elements in some areas.

Overall, it is anticipated that the visual impact in the western section of the recommended corridor would be high.

8.4.3 Summary of key issues and potential management measures

Due to the scenic qualities of the valleys, undulating hills and mountain escarpment of the recommended corridor west of the Hawkesbury-Nepean River, the overall visual impact of a future motorway west of the Hawkesbury-Nepean River is rated as high.

The visual impact management measures to the west of the Hawkesbury-Nepean River would be similar to those described in Section 7.6.3.

8.5 Soil and geology

8.5.1 Existing environment

Geology and soils

To the west of the Hawkesbury River land stability issues are more common due to the sharp increase in slope, rising from approximately 10 metres above sea level at the Hawkesbury River to 600 metres above sea level at Kurrajong Heights.

Problems associated with weathered landforms can occur when an old land surface and a relatively steep topography occur. This is especially apparent in the incised gorge sections of the Hawkesbury and Grose Rivers, on the Lapstone Monocline escarpment, and in the Blue Mountains. Here loosening and outward tilting of large sandstone blocks on hillsides is commonplace.

The soils of the BLoR-CC study area to the west of the Hawkesbury River predominately consist of those associated with the Blue Mountains Plateau physiographic region. This unit is characterised by deeply incised Hawkesbury Sandstone surface overlying Narrabeen sandstone. The area immediately to the west of the Hawkesbury River includes soils associated with the Cumberland Lowlands physiographic region. This unit is characterised by low lying, gently undulating plains and low hills on Wianamatta Group shales and sandstone with a dense drainage network of predominantly northward flowing channels.
ASS
West of the Hawkesbury River, ASS are generally associated with the Hawkesbury River and its floodplain. There is potential for acid sulfate materials (ASM) and ASS to occur in the western part of the BLoR-CC study area.

Salinity
The area to the west of the Hawkesbury River is considered to be of low to very low salinity risk.

8.5.2 Strategic assessment of potential impacts
Generally, the findings for geology and soil impacts discussed in Section 7.5.2 would also apply to the section of the recommended corridor west of the Hawkesbury-Nepean River.

The geology and soil conditions would be a matter for consideration during the design development and construction of a future motorway and would have no implications for the protection process.

8.5.3 Summary of key issues and potential management measures
The geology and soil management measures to the west of the Hawkesbury-Nepean River would be similar to those described in Section 7.6.3.

8.6 Water quality and hydrology

8.6.1 Existing environment

Catchment context and waterway crossings
The western section of the recommended corridor is located in and adjacent to the foothills of the Blue Mountains and consequently crosses numerous major rivers and creeks draining the Blue Mountains area including:

- Nepean River
- Rivatts Creek
- Mahons Creek
- Grose River
- Straight Creek
- Woods Creek (upper tributaries)
- Redbank Creek
- Little Wheeny Creek
- Blue Gum Creek.

There are also many other unnamed drainage lines and minor creeks crossed by the western section of the recommended corridor.

The main waterways within the vicinity of the western section of the recommended corridor are shown on Figure 6-4.
Water quality

The Grose River is a major tributary of the Hawkesbury-Nepean River and its upper reaches are designated as a ‘Wild River’ catchment (as defined by the National Parks and Wildlife Act 1974). A Wild River declaration provides a high level of protection and conservation to some of the least disturbed watercourses in NSW. Four kilometres of the western section of the recommended corridor would be located in the area of the Grose River catchment which is designated a Wild River catchment. Figure 6-4 shows the Grose River Wild River catchment area in relation to the recommended corridor.

The other major creeks in the western section of the recommended corridor would generally have good water quality as their catchments contain areas of natural bushland and are lacking substantial urban development. However, agricultural development in their catchments would adversely impact their water quality.

Based on the current boundaries, the western section of the recommended corridor is within about 200-300 metres of the Greater Blue Mountains World Heritage Area, to the west of Kurrajong Heights, however there would be no direct impact.

Groundwater

The western section of the recommended corridor crosses one groundwater source identified in Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources (NSW Office of Water, 2011), namely the Hawkesbury Alluvials (western).

The Hawkesbury Alluvium Groundwater Source comprises the alluvial deposits of the Hawkesbury River, extending downstream of Warragamba Dam to the township of Spencer, and covering an area of approximately 122 square kilometres. While the alluvial deposits are broadest in the Windsor to Wilberforce area, a large proportion of licensed bores occur further downstream (over 13 kilometres away from the recommended corridor) along the thinner alluvial deposits associated with meanders of the Hawkesbury River. Water quality (particularly salinity in several areas) may limit its potential uses.

There are a number of other hydrogeological landscapes in the western section of the recommended corridor. Generally, these are not important groundwater sources and do not support high priority groundwater dependent ecosystems.

Flooding and drainage

The flood extents of waterways in the western section of the recommended corridor are largely confined to the waterway and adjacent overbank areas due to the steeper topography of the terrain in this area. This is unlike further east and south along the Hawkesbury-Nepean River and its tributaries, where flooding extents are substantial due to flatter topography and extensive floodplain areas.

While the flooding extents of waterways in the western section of the recommended corridor are not substantial, the velocities of the flood flows and the risk of localised flash flooding are higher due to the steeper topography.

Flood free access and evacuation

There are no flood evacuation routes or flood free access requirements for the western section of the recommended corridor.

8.6.2 Strategic assessment of potential impacts

Construction and operation water quality

The greatest potential for impacts to water quality during construction would be in locations where the recommended corridor is in close proximity or crosses waterways. The western section of the corridor crosses waterways that drain to environmentally sensitive areas and
provide drinking and agricultural water supplies (including the Greater Blue Mountains World Heritage Area, the Nepean River and the Grose Wild River Catchment). These areas are of high priority when considering potential water quality impacts.

The major potential sources of pollutants would include erosion and sedimentation of areas disturbed by construction. Locations where substantial earthworks are required such as cuttings and embankments pose the greatest risk of erosion and sedimentation occurring. A future motorway in the recommended corridor would involve about 44 cuttings including large cuttings in the western zone (associated with the crossing of Gross Vale Road, in the vicinity of the Mountain Avenue overbridge, as well as a number of other locations in the mountainous western zone) and significant embankments. There is also a risk of chemical and fuel spills from construction activities entering waterways. All of these impacts would impact downstream receiving waterways if not appropriately managed.

In terms of operation, a future motorway would introduce traffic to new areas and result in an increase in traffic growth on connecting roads. This would potentially lead to an increase in the load of hydrocarbons, heavy metals, and sediment entering adjacent and downstream waterways, depending on the nature of water quality controls that are implemented.

Traffic on a future motorway would include vehicles transporting a range of materials including fuels and chemicals thereby introducing the potential for spills if traffic incidents were to occur. Strict spill containment strategies would need to be considered, in particular in areas where the western section of recommended corridor crosses waterways that drain to environmentally sensitive areas and/or waterways known to provide water supplies (including the Greater Blue Mountains World Heritage Area, the Nepean River and the Grose Wild River Catchment).

Groundwater

Construction of a future motorway would involve a number of significant cuttings and embankments. Road cuttings would be up to 35 metre deep in some areas (including near Gross Vale Road). The motorway is also likely to include a tunnel at the western end of the recommended corridor which is expected to be up to approximately 150 metre deep.

Road cuttings and the tunnel have the potential to intersect the groundwater table and to result in drawdown that could impact on both the environment and water users. Large embankments have the potential to compact soils and cause barriers to groundwater.

Flooding

The flooding impacts of a future motorway west of the Hawkesbury River would be similar to those described in Section 7.6.2.

The potential impacts would be similar for both construction and operation. The Strategic Concept Design has included allowance for immunity to flood events up to and including the 100 year ARI flood event and to not cause unacceptable increases in flood extents upstream of the motorway. Where the motorway alignment crosses areas that would be flooded in a 100 year ARI flood event, bridges, culverts or other drainage structures of appropriate capacity have been included in the Strategic Concept Design to minimise upstream flooding impacts.

While there may be minor increases in flood extents or levels upstream of the motorway these would be confined to the waterways or land that does not contain infrastructure or that has important economic value (eg agricultural land). The Strategic Concept Design has allowed for adequate protection such as rock lining for drainage lines or waterways downstream of the motorway that would experience increased flows and velocities.
8.6.3 Summary of key issues and potential management measures

The water quality and hydrology management measures to the west of the Hawkesbury-Nepean River would be similar to those described in Section 7.6.3.

8.7 Biodiversity

8.7.1 Existing environment

The general existing environment has been described in Section 6.7, including a BLoR-CC study area wide discussion of threatened ecological species, wetlands and wildlife connectivity.

As described in Section 6.1 and shown in Figure 6-2, there are fewer environmental conservation areas located along the recommended corridor west of the Hawkesbury-Nepean River, however the World Heritage listed Blue Mountains National Park is in proximity to the corridor at the western end.

There are large patches of remnant bushland across Grose Vale, Grose Wold and between Kurrajong and Kurrajong Heights which are important fauna habitat. Community consultation and the Office of Environment and Heritage have identified that patches of remnant vegetation around Yarramundi and the Grose River are of value and should be protected.

The Western Sydney Dry Rainforest EEC remnants present in the escarpment near Kurrajong are listed under both the TSC and EPBC Acts.

8.7.2 Strategic assessment of potential impacts

Corridor protection

Generally, the selection of the recommended corridor has sought to avoid direct impacts on TECs and environmental conservation areas.

The biodiversity impacts west of the Hawkesbury-Nepean River would be similar to those described in Section 7.7.2.

Future motorway construction and operation

Impacts of a future motorway construction and operation on biodiversity west of the Hawkesbury-Nepean River would be similar to those described in Section 7.7.2.

West of the Hawkesbury-Nepean River, the recommended corridor would further fragment existing remnants of native vegetation within the foothills of the Blue Mountains, with corresponding impacts on connectivity and habitat.

The recommended corridor would cross several TECs including Turpentine Ironbark Forest and Shale Sandstone Transition Forest, however it largely avoids known TECs at the western end with the exception of a very small amount of Sandstone Ridgetop Woodland at Kurrajong Heights.

The recommended corridor would cross key fish habitat on the Grose River and on some tributaries of the Hawkesbury-Nepean River.

Generally, the recommended corridor would act as a barrier to movement of certain species between the Blue Mountains and the Hawkesbury-Nepean River and the northern Cumberland Plain. At the western end, the corridor would affect north-south fauna movements to the east and west of Kurrajong Heights.

The recommended corridor has been selected to avoid TECs where possible and has been shifted away from the escarpment to minimise edge impacts where possible. It is not
expected that the proximity to the Blue Mountains National Park and Wollemi National Park would have a direct impact on ecological values of this World Heritage listed area.

### 8.7.3 Summary of key issues and potential management measures

The biodiversity management measures to the west of the Hawkesbury-Nepean River would be similar to those described in Section 7.7.3.

Opportunities to maximise biodiversity connectivity issues from the Blue Mountains across the river to the PCLs should be considered.

Little detail is known about the extent and quality of TECs to the west of the Hawkesbury-Nepean River on private property. It is recommended that some field verification of the existing data be undertaken in order to further understand the biodiversity conditions. It may be appropriate to consider this activity in conjunction with the proposed biodiversity offset strategy preparation.

### 8.8 Aboriginal heritage

#### 8.8.1 Existing environment

**Known Aboriginal archaeological sites**

Only one site has been identified within 300 metres of the recommended corridor west of the Hawkesbury-Nepean River, based on an AHIMS search.

It is likely that more Aboriginal sites and areas of archaeological potential are located along the recommended corridor than is indicated by the currently recorded AHIMS sites, including in areas that have been disturbed. Information on known sites is limited by prior investigations and as such, site data records are skewed towards areas where more development and archaeological investigations has been conducted, ie the eastern portion of the recommended corridor. The western portions of the recommended corridor are disproportionately under-represented.

**Known areas of Aboriginal cultural significance**

There are no known areas of Aboriginal cultural significance west of the Hawkesbury-Nepean River.

**Areas of archaeological potential**

Aboriginal archaeological potential in the western portion of the recommended corridor varies as the landforms vary from the edge of the Cumberland Plain (near the Nepean and Grose Rivers) to the steep and incised foothills of the Blue Mountains (near Kurrajong Heights).

Aboriginal archaeological potential near the Grose River is generally associated with less disturbed areas, areas above the 1:100 year flood zone and the margins of water sources.

The western most extent of the recommended corridor has been subject to the least previous investigation. The lack of recorded sites in this region is therefore not indicative of less Aboriginal activity and archaeological record, rather of fewer studies having been conducted. The foothills of the Blue Mountains feature expanses of relatively intact vegetation and natural landscapes, having been subject to significantly less agricultural and development activity. The foothills and slopes of the Blue Mountains at the western end of the recommended corridor are likely to contain sandstone shelter sites, engravings and grinding grooves, wherever sandstone outcrops suitable for these site types occur.

Areas of pristine bushland are likely to retain intact Aboriginal sites. It is also likely that the foothills of the Blue Mountains may include sites that are not commonly found in the remainder of the recommended corridor (such as culturally modified trees, rock shelters,
grinding grooves, art and engraving sites) as a result of the natural resources which occur and remain in these areas. Associated areas of archaeological potential are likely to be identified on raised areas near reliable water sources.

Water sources in the Hawkesbury LGA include the Grose River, the Hawkesbury River, Woods Creek, Philip Charley Creek, Stinsons Creek, Redbank Creek and numerous unnamed tributaries which originate in the foothills of the Blue Mountains. Typically, there is a correlation between lower artefact densities associated with intermittent streams as opposed to higher artefact densities associated with more permanent water. Overall landscapes associated with higher order streams were found to have higher artefact densities, higher maximum densities, and more continuous distribution that lower order intermittent streams.

It is likely that areas bordering the Grose and Hawkesbury Rivers which are raised above the 1:100 year flood levels would have higher potential for in situ archaeological deposits.

8.8.2 Strategic assessment of potential impacts

The recommended corridor would potentially indirectly impact PAD Aboriginal sites west of the Hawkesbury-Nepean River. At this phase the nature and significance of the sites and the likely impacts is not fully assessed.

It is likely that more sites would be identified when field investigations are undertaken.

8.8.3 Summary of key issues and potential management measures

The lack of recorded sites west of the Hawkesbury-Nepean River is not indicative of less Aboriginal activity and archaeological record, rather of fewer studies having been conducted. The foothills of the Blue Mountains feature expanses of relatively intact vegetation and natural landscapes, having been subject to significantly less agricultural and development activity. The foothills and slopes of the Blue Mountains at the western end of the recommended corridor may contain sandstone shelter sites, engravings and grinding grooves, wherever sandstone outcrops suitable for these site types occur.

The potential management measures recommended for Aboriginal heritage east of the Hawkesbury-Nepean River would equally apply to land west of the river.

The Aboriginal heritage management measures to the west of the Hawkesbury-Nepean River would be similar to those described in Section 7.8.3.

8.9 Non-Aboriginal heritage

8.9.1 Existing environment

Heritage listings

The following sites within or adjacent to the recommended corridor to the west of the Hawkesbury-Nepean River that are on a statutory heritage list have been identified:

- The Greater Blue Mountains World Heritage Area is located approximately 150 metres from the recommended corridor at Kurrajong Heights (at its closest point)
- The Greater Blue Mountains is also inscribed on the National Heritage List
- Eight items listed on LEPs are located within or adjacent to the recommended corridor to the west of the Hawkesbury-Nepean River
- Two items on the Section 170 register are located within the recommended corridor at the western end at Kurrajong Heights.
8.9.2 Strategic assessment of potential impacts

As discussed in Section 7.9.2, the short to medium term impact on heritage items are difficult to quantify and would be subject to the management approach adopted by the relevant government agencies. Protection of the recommended corridor would result in the following impacts to sites east of the Hawkesbury-Nepean River that are currently on a statutory register:

Protection of the recommended corridor would result in the rezoning of the following sites to the west of the Hawkesbury-Nepean River that are currently on a statutory register:

- Potential indirect impacts on World Heritage listing and National heritage listing
- Direct or indirect impacts on eight local heritage listed items and two s170 items.

8.9.3 Summary of key issues and potential management measures

The non-Aboriginal heritage management measures to the west of the Hawkesbury-Nepean River would be similar to those described in Section 7.9.3.

8.10 Socio-economic

8.10.1 Existing environment

Hawkesbury City Council is the largest LGA in metropolitan NSW. It covers an area of 2,793 square kilometres. It is divided by four river valleys and contains fertile flood plains and wetlands, undulating hills, timbered ridges, steep gorges and towering escarpments. The Hawkesbury is made up of many small townships and localities. The major centres are Windsor, Richmond and North Richmond. Some 70 per cent of the Hawkesbury LGA is national parks and wilderness areas and is home to the World Heritage listed Blue Mountains.

The recommended corridor interacts with the following suburbs west of the Hawkesbury-Nepean River: Yarramundi, Grose Wold, Grose Vale, Kurrajong, Kurrajong Hills and Kurrajong Heights.

Key socio-economic characteristics for communities west of the Hawkesbury-Nepean River include:

- Lower population growth in recent years
- Modest population and employment growth forecast for next 20 to 30 years
- Low population density
- High proportion of agricultural land
- High dependency on private vehicles for their main mode of transport
- Social infrastructure, including places of education, scout and community halls, located in proximity to the recommended corridor at Grose Wold, Grose Vale, and Kurrajong Heights.

The amenity of the western section of the recommended corridor and surrounds generally holds a rural character, comprising rural residential development, small farms and some small business uses. As the topography steepens to the foothills of the Blue Mountains, the rural character and amenity increases. The existing Bells Line of Road, as an important east-west transport corridor, contributes to the noise environment of the surrounding communities.
8.10.2 Strategic assessment of potential impacts

Population and demographic impacts

The population in the Hawkesbury LGA is less mobile compared to Greater Sydney as a whole, indicating that the population characteristics are not expected to change significantly due to the protection of the recommended corridor.

Population growth in Hawkesbury LGA is largely expected to be driven by a high fertility rate but will not be as high as LGAs to the east of the Hawkesbury-Nepean River. Over time, the expected population increases will bring about the need for increased transport capacity. These changes are expected to occur even in the absence of the corridor protection.

The protection of the recommended corridor is not expected to change the population characteristics of the area or encourage a decrease in population. Over time, isolated cases of people leaving the area are expected, particularly where residential, business or agribusiness properties are directly affected by the corridor and the restrictions this places on the ongoing viability of the property. However, these movements could be within the LGA, or within north-western Sydney, with no net loss to population, employment or economic input for the region.

A previous study\(^{49}\) observed that shorter travel times between the Central West region would not only have beneficial economic flow on effects but would also potentially improve the attractiveness of the Central West for workers to commute to Sydney, and open up affordable housing opportunities and the associated flow on economic development effects that could be generated.

Business and agribusiness impacts

As for the eastern section, protection of the recommended corridor would have direct and indirect impacts on several local businesses, including agribusinesses, located within and adjacent to the corridor.

During corridor protection, modifications to and new developments on business properties intersected by the recommended corridor would be limited by new development controls. Businesses may be impacted in the short to medium term due to changing investment decisions and uncertainty regarding the timing of acquisition and construction of a future motorway.

During operation, the severance of business properties could result in the cessation of the businesses’ ongoing viability. Non-severed businesses in the vicinity of the recommended corridor could experience an indirect impact on their ongoing viability and productivity through:

- Reduced accessibility for the businesses’ customer base
- Disruption to the businesses’ supply chain
- Changes to the characteristics of the area (e.g., noise, landscape and remoteness).

Generally, protection of the recommended corridor is likely to have a small gradual negative impact on local businesses and agribusinesses over time, due to uncertainty over future timing of the motorway and restrictions on development and property improvements that would be permissible. However, it is noted that there are few businesses that would be directly or indirectly affected, so overall, the socio-economic losses that may eventuate would be a small percentage of the local and regional economy. Many of the small business operating within the recommended corridor are not site dependent and could be suitable for relocation.

Social infrastructure

The recommended corridor intersects with two rural fire brigade locations at Yarramundi and Grose Vale, however it is not expected that the construction of a future motorway within the recommended corridor would impact on the buildings or operations of these facilities. The recommended corridor does pass within 500 metres of a number of places of education, places of worship, community halls and scout halls, which could result in a reduction of amenity for the users of these facilities when the motorway is constructed. In particular, the recommended corridor would pass close to the Grose View Public School and Benedict XVI Retreat Centre, both at Grose Wold, and the Grose Vale First Scout Hall at Grose Vale.

Although there are currently few social infrastructure sites scattered along the recommended corridor, there is the potential that additional facilities may be constructed in the period between protection of the corridor and any future construction and operation scenario. This would increase the number of noise sensitive receivers that would be vulnerable to noise as part of any future motorway construction and operation scenario.

Amenity and community values

Similar to the eastern section, following protection, the recommended corridor would have a gradual impact on local amenity to the west of the Hawkesbury-Nepean River as land use activities shift over time in response to the development restrictions that would be in place. Generally, this is likely to maintain the semi-rural character of the corridor for longer than may have otherwise been the case. However, once a decision is made to construct a future motorway, the amenity of the communities adjacent to the corridor would be negatively impacted by the introduction of a motorway, presenting a barrier to movement in some locations, an increase in noise, and a visual barrier that could influence perceptions of local community and character. The terrain in the foothills of the Blue Mountains is likely to distribute the impact over a much wider area than in flatter areas, particularly with regard to noise disbursement and visual impacts.

Access and connectivity

Impacts to access and connectivity west of the Hawkesbury-Nepean River would be similar to those described in Section 7.10.2.

The recommended corridor does not directly sever any identified community centres, characterised by zoning such as village, neighbourhood centre or local centre. However, it is acknowledged that the more dispersed rural communities west of the Hawkesbury-Nepean River nevertheless have a strong sense of community, and are likely to experience a negative impact as a result of severance. The proposed tunnel under Kurrajong Heights would remove the risk of severance of this village.

Cumulative impacts

Once constructed, the cumulative impact of loss of amenity, increased noise, changed traffic and access arrangements and changes in land use are likely to have a negative impact on residents and businesses in some locations across the region. Some decrease in amenity is to be expected with any new infrastructure project and overall would be offset by the benefits derived from the improved regional connectivity between the Blue Mountains, north-western Sydney, and the Sydney motorway network.

Further discussion of the cumulative impacts of multiple transport infrastructure projects under planning in north-western Sydney is presented in Chapter 9.

8.10.3 Summary of key issues and potential management measures

Recommendations for future potential management measures provided in Section 7.10.3 would equally apply to the section west of the river.
8.11 Air quality and greenhouse gas

8.11.1 Existing environment
Sensitive receivers, such as schools, residential dwellings or hospitals along the recommended corridor are shown in Figure 6-1. Rural residential development in the communities of Grose Vale, Grose Wold and Kurrajong Heights is scattered along the recommended corridor west of the Hawkesbury-Nepean River, with a small residential community adjacent to the corridor at Yarramundi.

8.11.2 Strategic assessment of potential impacts
As stated in Section 7.11.2, the long term protection of the recommended corridor would have a negligible impact on air quality and greenhouse gases within the air shed as there will be no direct changes to emission sources.

Provision of infrastructure within the recommended corridor for operation of the completed motorway would generate air quality and greenhouse gas impacts.

Adverse health effects, such as those associated with fine particulates for example, would likely be a perceived issue of concern particularly in relation to nearby sensitive receivers such as childcare centres and schools. Given the low level of current development in some sections of the recommended corridor west of the Hawkesbury-Nepean River, there is likely to be heightened concerns in some communities regarding the future change in air environment.

The recommended corridor contains a tunnel under the village of Kurrajong Heights, which would reduce the exposure of this community to any change in air emissions.

As described in Section 7.11.2, air quality and greenhouse gas impacts during any future construction and operation scenario would be subject to a full assessment in accordance with the relevant guidelines and policies.

8.11.3 Summary of key issues and potential management measures
The air quality and greenhouse gas management measures to the west of the Hawkesbury-Nepean River would be similar to those described in Section 7.11.3.
9. Cumulative impacts and interactions

Cumulative impacts are the successive, incremental and combined impacts of one, or more, activities on society, the economy and the environment. Such impacts can be both positive and negative and can vary in intensity as well as in spatial and temporal extent. Cumulative impacts may be generated through the aggregation or interaction of impacts.

When considered in isolation, a particular impact from one project may be considered minor, but when the impact of multiple projects on the same receivers is considered, the impacts may be much more substantial.

The Draft Future Transport Strategy and the Draft Greater Sydney Region Plan and associated District Plans have considered the cumulative impacts and interactions of future plans across Greater Sydney. This includes identifying objectives in the Draft Greater Sydney Region Plan to address cumulative impacts, as follows:

- Objective 2 identifies the cumulative development costs associated with funding growth
- Objective 25 recognises the cumulative impacts of strategic planning on drinking water catchments, water protections for aquatic ecosystems and climate change. The Office of Environment and Heritage and the Environmental Protection Authority promote the use of a risk-based decision framework across catchments to help improve the health of catchments and waterways
- Objective 37 recognises cumulative impacts associated with exposure to natural and urban hazards. In this regard, it has been identified that future infrastructure within the BLoR-CC recommended corridor would need to be designed to achieve the 100 year ARI.

While the Draft Greater Sydney Region Plan and relevant District Plans address cumulative impacts at a macro level, it is the guidelines and planning controls that minimise the cumulative impacts at a local level. These include:

- Avoiding placing new communities in areas exposed to existing and potential natural hazards
- Managing growth in existing neighbourhoods that are exposed and vulnerable to natural hazards
- In exceptional circumstances, reducing the number of people and the amount of property vulnerable to natural hazards, through the managed retreat of development
- Using buffers to limit exposure to hazardous and offensive industries, noise and odour
- Designing neighbourhoods and buildings that minimise exposure to noise and air pollution in the vicinity of busy rail lines and roads, including freight networks
- Cooling the landscape by retaining water and protecting, enhancing and extending the urban tree canopy to mitigate the urban heat island effect.50

These guidelines and policies would be considered in the planning and detailed design for development proposed within the corridor.

The Draft Future Transport Strategy considers the cumulative impacts associated with climate change by addressing the environmental sustainability of the transport system including greenhouse emissions for NSW.

---

50 Greater Sydney Commission (2017b) Draft Greater Sydney Region Plan, Pg 154
Considerable discussion has been made in this draft SEA of current and future development within and along the recommended corridor and changes in land use activity that are likely to occur, with or without the project.

Major new development for residential, employment and recreation will occur in the Growth Areas and new transport infrastructure projects will be required to support them. Projects currently underway are identified in the Western Sydney Infrastructure Plan and include:

- An upgrade of The Northern Road to a minimum of four lanes from Narellan to the M4 Western Motorway (M4)
- Construction of a new east-west motorway to the airport between the M7 Motorway and The Northern Road (known as the M12)
- Upgrade of Bringelly Road to a minimum of four lanes between The Northern Road and Camden Valley Way
- A $200 million package for local road upgrades.
- Sydney Metro Northwest

The program of works in the Infrastructure Plan will be continually updated as development continues and new projects come on line.

Future infrastructure projects that are currently in various stages of planning and investigation include:

- OSO road and freight rail corridor
- New Werrington Arterial Road
- Future Western Sydney Airport
- Badgerys Creek Aerotropolis
- South West Rail extension
- North-South train link in Western Parkland – Western Sydney Airport-Badgerys Creek Aerotroplis to St Marys and Cudgegong Road
- Bells Line of Road improvements.

The cumulative impacts of the continuing development in Western Sydney are likely to comprise:

- Broader scale losses of ecological diversity, particularly of TECs such as the Cumberland Plain Woodland
- Progressive urbanisation of the landscape, shifting from largely rural to increasingly urban, with the corresponding loss of agricultural land uses and changes to economic activity
- Alterations in traffic flows, pinch points and demand as a result of both new transport infrastructure but also new traffic generating areas from residential and employment developments
- Agglomeration of individual smaller scale impacts such as air shed changes, watershed alterations or climate change that collectively trigger regional sensitivity criteria
- Potential agglomeration of construction impacts, depending on the timing of construction, which may include air, noise and water quality impacts.

Two future corridor projects, the OSO and the North-South Rail line between St Marys and Cudgegong Road, intersect with the recommended corridor in the BLoR-CC study area.
The BLoR-CC and OSO corridors are proposed to intersect at Shanes Park, to the west of the former ASA site. The interchange at this location is likely to change land use patterns, including the loss of the existing low density residential development at this location.

The North-South Rail line is shown indicatively on the Draft Future Transport Strategy, and the Draft Greater Sydney Regional Plan and District Plans. The indicative location suggests that the North-South Rail line is likely to cross the BLoR-CC to the east of the former ASA site, however, the future location of the rail corridor is yet to be determined and will need to be integrated with the BLoR-CC corridor.

The BLoR-CC, the OSO and the North South Rail line are identified as visionary initiatives in the Draft Future Transport Strategy with timeframes of 20 years or beyond. Likely cumulative impacts would be subject to further investigation and analysis, however, it could be expected that:

- Potential for property and business impacts associated with future acquisition would see landowners request earlier buy out from the government
- Depending on construction timing, there is the potential for residents to experience a protracted period of construction and the associated negative impacts to the amenity of their area.

Future work regarding the proposal will include further investigation and analysis on potential cumulative impacts in line with the Draft Future Transport Strategy 2056 and the Draft Greater Sydney Plan with supporting plans.

**Recommendations**

Careful consideration of the joint management of the design development, property acquisition and construction staging of the future infrastructure projects at Shanes Park will be required to ensure cumulative impacts are appropriately considered.

It is recommended that a regional oversight approach is adopted, particularly in relation to biodiversity, in order that a proper assessment of the cumulative impacts is achieved. This could include monitoring and regional wide reporting of impacts and opportunities.
10. Economic impact of potential future infrastructure

This chapter outlines the potential economic impacts associated with the early protection of a corridor and potential future provision of infrastructure associated with the protection of the BLoR-CC. The following summarises the existing economic environment of the BLoR-CC study area:

- Economic growth in Greater Sydney will be commensurate with population growth. Increasing productivity, global competitiveness and exports are expected to increase economic activity to $655 billion with 817,000 new jobs by 2036.
- The BLoR-CC study area Gross Regional Product amounted to $33.2 billion in 2014, nearly 7 per cent of overall NSW Gross State Product.
- In 2016, 370,200 jobs were located within the Western Sydney District in 2016. Nearly 340,000 people were employed in the BLoR-CC study area in 2011, with the highest employing industries being ‘manufacturing’ and ‘retail’, followed by ‘health care and social assistance’, ‘construction’, and ‘public administration and safety’.
- The economic base is well developed and dominated by the ‘construction’ industry, followed by ‘rental, hiring and real estate services’, and ‘professional scientific and technical services’. In 2014 there were an estimated 55,800 businesses in the LGAs in the BLoR-CC study area.
- The average annual wage for the LGAs in the BLoR-CC study area varied between $49,185 in Hawkesbury to $50,459 in Penrith.
- The centre job target ranges include: Greater Parramatta 139,000 – 151,000, Blacktown 17,000 – 19,500 and Marsden Park 5,000-10,000 by 2036.
- The centre job target ranges for Richmond-Windsor are 12,000-16,500 by 2036.
- The Central City District will have 28 per cent of total new housing for Greater Sydney, comprising 725,000 dwellings by 2036 and the Western City District will have 25 per cent of new housing.

The projected future environment of the LGAs crossed by the recommended corridor is described in Section 6.10. Generally, the LGAs crossed by the recommended corridor, and in particular, east of the Hawkesbury-Nepean River, are expected to experience larger than average increases in population and employment over the next 20 to 30 years.

10.1 Expected economic growth potential

The future provision of road infrastructure in the BLoR-CC is expected to have a direct economic contribution to the economy (economic growth as measured by gross value added) and employment (as measured by full time equivalent jobs). Expenditure during the construction phase would inject economic stimulus benefits into the local, regional and State economies.

The total economic contribution (including direct and indirect) is as follows:

- The construction of a future motorway, would be expected to contribute between $420 million and $560 million in gross value added (GVA) per annum in 2016 dollars (refer

---

51 Draft Central City District Plan, October 2017, pg 9
52 Draft Western City District Plan, October 2017, pg 9
53 Draft Central City District Plan, October 2017, pg 12
54 Draft Western City District Plan, October 2017, pg 12
This is expected to support, in total, between 3,010 and 4,010 full time equivalent (FTE) jobs per annum (refer Figure 10-2) during an approximately 5 year construction period. The largest share of GVA and FTE labour requirements, as a result of increased economic activity during construction, is expected to be in NSW.

- During operation, a future motorway is expected to contribute between $60 million and $90 million in GVA per annum in 2016 dollars (refer Figure 10-3). This is expected to support, in total, between 420 and 650 FTE jobs per annum (refer Figure 10-4). The increase in GVA for NSW is expected to range between $40 million and $70 million per annum, and could support between 300 and 470 FTE jobs within NSW.

10.2 Potential impact on economic growth if future infrastructure project is not delivered

There are benefits and costs of failing to proceed with the corridor protection of the BLoR-CC. A review of the available literature with supporting case studies on road corridor protection was undertaken to identify the benefits and costs of failing to protect a corridor.
The findings suggest that the potential benefits of reserving a corridor for a future motorway outweigh the potential costs.

The costs of not proceeding with reserving a road corridor may include, but are not limited, to the following:

- Higher property acquisition costs (i.e. as well as increases in land value over time, there would also be increases resulting from property improvements)
- Higher displacement impacts (i.e. increased costs associated with relocating businesses, residents and utilities)
- Asymmetric information (i.e. investment decisions made by landowners without knowledge of possibility of a future motorway)
- Less strategically planned transport network and reduced optimal road alignment because opportunities for alternative alignments are reduced as development occurs in the intervening years
- Reduced opportunity for flood evacuation
- Higher risks of project delays
- Constraints on alignment options.

The main benefits of not proceeding with the protection of a road corridor include, but are not limited to, the following:

- Reduced disruption for affected community
- Continuation of local businesses and reduced uncertainty for business decisions
- Reduced risks of incurring unrecoverable costs
- Avoidance of overestimated acquisition and severance costs.

On balance, the potential costs of non-protection outweigh the benefits of non-protection of a future transport corridor. There would therefore be merit in supporting the protection of the corridor.

This conclusion is supported by a study undertaken by Infrastructure in July 2017, entitled Corridor Protection: Planning and investing for the long term. Of relevance to the BLoR-CC corridor, the study found:

- Failure to appropriately protect corridors could hold substantial costs and risks. A lack of interest could result in corridors being ‘built out’, project costs rising due to the need for tunnels or longer, more indirect routes, and projects being delayed or cancelled
- Rising demand for land is likely to drive continued growth in the costs of acquisitions
- Corridor protection is expected to provide substantial savings for taxpayers

### 10.3 Potential impact on related infrastructure projects

The implementation of the recommended corridor protection and the future operation of a motorway, is expected to indirectly affect related infrastructure projects in Western Sydney.

As described in Chapter 9, there are a number of infrastructure projects in various stages of planning across Western Sydney. Several are identified in the Western Sydney Infrastructure Plan and other important future infrastructure projects include:

- OSO corridor protection
- Western Sydney Airport
The majority of the projects identified in the *Western Sydney Infrastructure Plan* are expected to be implemented during the first couple of years following the protection of the recommended corridor, as shown in Figure 10-5. The surrounding infrastructure projects in Western Sydney, with the exception of the OSO, are in varying stages of planning, design or construction, with operation likely to commence between 2016 and the mid-2020s. Construction and operation of a future motorway in the recommended corridor is not expected until considerably later, subject to traffic demand and changes to surround land uses.

Nevertheless, the recommended corridor is expected to bring about indirect impacts on the surrounding infrastructure projects due to their close interface. The indirect impacts include:

- **Protection impact:** The protection of the recommended corridor may impose the requirement for future physical interfaces, resulting in the need for new roads intersections or interchanges to be planned or considered. These could be factored into the planning and design of related infrastructure projects.

- **Operational impact:** The improved road connectivity and transport efficiency brought about by the recommended corridor may further enhance or optimise road utilisation or accessibility on other road infrastructure projects in the overall transport network in western Sydney.

The protection impact and operational impact on each of the surrounding infrastructure projects are rated based on a high, medium, or low rating criteria. Table 10-1 summarises the assessment findings.

---

**Figure 10-5**  *BLoR-CC and the expected implementation timeline of surrounding infrastructure projects – subject to change*
### Table 10-1 Summary of indirect impacts of BLoR-CC on surrounding infrastructure projects in Western Sydney

<table>
<thead>
<tr>
<th>Infrastructure projects</th>
<th>Potential impact on related infrastructure projects by a future BLoR-CC motorway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer Sydney Orbital Corridor</td>
<td>High operational impact. Direct interface. Enable greater connectivity and transport efficiency between the OSO and regional areas west of Sydney. Both the BLoR-CC and OSO would be critical infrastructure in the integrated transport network to support regional development and economic growth in Western Sydney. Both corridors are following a similar program for planning and protection and would require direct engagement to develop compatible grading, alignment and project staging.</td>
</tr>
<tr>
<td>Future Western Sydney Airport Badgerys Creek Aerotropolis</td>
<td>High operational impact. Indirect interface. BLoR-CC would provide future transport capacity for the growing population that require access to employment areas. The BLoR-CC would enable faster connectivity and accessibility to employment areas and support economic growth and productivity for the Western Sydney Airport project.</td>
</tr>
<tr>
<td>New east-west motorway M12</td>
<td>Medium operational impact. Indirect interface. BLoR-CC would provide a direct link between north-western Sydney and the Sydney motorway network, expanding the integrated motorway network and potentially alleviating some of the congestion on the M12.</td>
</tr>
<tr>
<td>Upgrade of The Northern Road</td>
<td>High operational impact. Indirect interface. BLoR-CC would increase the demand and use of The Northern Road as a result of increased traffic between the north-west and key employment areas in south-west Sydney and the new airport. While an interchange with The Northern Road is proposed as part of the recommended corridor, it is noted that the proposed upgrade ends at the M4.</td>
</tr>
<tr>
<td>New Werrington Arterial Road</td>
<td>Medium operational impact. Indirect interface. BLoR-CC is expected to cause a minor increase utilisation of the Werrington Arterial Road and improve connections for the regional towns.</td>
</tr>
<tr>
<td>Upgrade of Bringelly Road</td>
<td>Low operational impact. Indirect interface. There may be minor increase in the utilisation of the Bringelly Road due to increased traffic flow from The Northern Road, which connects to BLoR-CC in north west Sydney.</td>
</tr>
<tr>
<td>North-South Rail Line</td>
<td>High operational impact. Direct interface. There will need to be a crossing over or under the rail line which will need to be determined as planning for the proposed rail line progresses. Both BLoR-CC and the rail line will be critical infrastructure in the integrated transport network to</td>
</tr>
<tr>
<td>Infrastructure projects</td>
<td>Potential impact on related infrastructure projects by a future BLoR-CC motorway</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>support regional development and economic growth in Western Sydney with the rail line focused on mass transport of passengers whereas BLoR-CC catering for both private road vehicles and freight within the metropolitan area and with regional links to the central west NSW.</td>
</tr>
</tbody>
</table>
| Bells Line of Road upgrades | High operational impact.  
Direct interface.  The upgrades on the Bells Line of Road have been focused on improving road safety and traffic efficiency west of Kurrajong Heights.  These upgrades are compatible with the future provision of infrastructure within the BLoR-CC corridor. |

The OSO corridor is anticipated to have the most significant interface impact with the BLoR-CC corridor due to the physical overlap between the two projects. The direct connection between the two projects, with the provision of a grade separated interchange, would enable greater connectivity and transport movement to support regional development and economic growth in Western Sydney. It would also provide new opportunities for flood evacuation routes.

The provision of BLoR-CC corridor would also be a key enabler for road-users accessing the future Western Sydney Airport for both employment and airport users in the future.

The other surrounding infrastructure projects are expected to have less of a direct interface with BLoR-CC during protection. However, together with the BLoR-CC corridor, these projects are expected to collectively support the efficient movement and growth in employment in the western Sydney region over time. The protection of OSO and BLoR-CC provide certainty to communities, businesses and land owners, and reduce the cost of providing infrastructure in the long term.
11. Statutory planning considerations

This chapter identifies the existing statutory planning framework that applies to the recommended corridor and adjacent lands. Strategic plans relevant to the recommended corridor are described in Sections 2.1 and 2.2. Recommendations for potential statutory controls to manage the corridor protection, as well as adjacent land uses, are proposed.

11.1 Introduction

The primary objective of this draft SEA is to justify the protection of land for the BLoR-CC Corridor which will in the future provide an essential transport link connecting the Sydney motorway network to Bells Line of Road and the second crossing of the Blue Mountains.

It is anticipated that this would be achieved through the preparation of a new SEPP that would introduce appropriate zonings and controls to protect a corridor. It is likely that the recommended corridor would be protected as SP2 (Reserved Infrastructure Corridor). The outcome of the protection would be to:

- Safeguard land for the purpose of delivering a future motorway within the recommended corridor
- Inform current and future land use and transport planning in north-western Sydney
- Affirm the NSW Government’s commitment to delivering this important piece of infrastructure in the future when it is required
- Manage ongoing uses of the recommended corridor and adjacent lands prior to the delivery of a future motorway to avoid redundant or conflicting development
- Provide clarity for the NSW Government and councils, and provide greater confidence for existing residents and development in the area.

11.2 Objectives for the protection of the BLoR-CC recommended corridor

The objectives for reserving the BLoR-CC recommended corridor under the relevant environmental planning instruments (EPIs) include:

- Providing certainty for the planning and development of adjoining land and key centres which may later benefit from the connections to the future transport infrastructure
- Clearly outlining the NSW Government’s long term plans and intentions for the affected land, which would minimise the need for reactive or ad-hoc provision of infrastructure in the future
- Informing and influencing Government and commercial investment decisions in land use and transport planning
- Allowing for the strategic planning and project appraisal that would support the identification of the most suitable location for the proposed future infrastructure and allowing sufficient time to conduct the required cost-benefit analysis for the delivery of the project
- Guiding and informing the delivery of other transport infrastructure in north-western Sydney
- Enabling Federal, State and local governments to program and forward fund the provision of other infrastructure, which may in turn reduce overall costs for the future delivery of the proposed motorway
• Helping prioritise Government investment in the delivery of transport infrastructure, and help avoid underinvestment

11.3 Current planning framework

11.3.1 Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment Act 1979 (EP&A Act) is the prevailing planning legislation that applies to all development and environmental assessment within NSW. Part 3 of the Act provides for the making of environmental planning instruments which establish the framework for land use planning and development.

The Act provides for two types of environmental planning instrument:

• SEPPs, which deal with matters of State or regional environmental planning significance

• LEPs, which are made by councils to guide planning decisions for LGAs through zoning and development controls to manage the ways in which land is used. Implementation of LEPs is facilitated through Development Control Plans (DCPs) which provide detailed planning and design guidelines. A DCP typically identifies additional development controls and standards for addressing development issues at a local level and can be applied more flexibly than a LEP.

Given the strategic importance of any future transport corridor, it is anticipated that protection of the corridor would be provided through a new SEPP and subsequently reflected in the relevant LEPs.

The following sections of the EP&A Act are key to the proposed corridor protection:

• Section 26(1)(c) allows for the preparation of an EPI for the purposes of reserving land for a public purpose, such as a road

• Section 27 outlines provisions for owner-initiated acquisition of land protected for public purposes in accordance with the Land Acquisition (Just Terms Compensation) Act 1991

• Section 37 allows the NSW Governor to make EPIs (to be called SEPPs) for the purpose of environmental planning by the state

• Part 4 Division 10 sets out the provisions for “existing use”, which is defined in Section 106 as:

   (a) the use of a building, work or land for a lawful purpose immediately before the coming into force of an environmental planning instrument which would, but for Division 4 of this Part, have the effect of prohibiting that use, and

   (b) the use of a building, work or land:

      (i) for which development consent was granted before the commencement of a provision of an environmental planning instrument having the effect of prohibiting the use, and

      (ii) that has been carried out, within one year after the date on which that provision commenced, in accordance with the terms of the consent and to such an extent as to ensure (apart from that provision) that the development consent would not lapse.

11.3.2 Other relevant NSW legislation

Table 11-1 identifies the NSW statutes that are relevant to the proposed corridor protection.
### Table 11-1 Relevant NSW statutes for corridor protection

<table>
<thead>
<tr>
<th>NSW statute</th>
<th>Objectives and relevant sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roads Act 1993</td>
<td>The Roads Act 1993 establishes the regulatory framework for various matters related to the provision of public roads in NSW including the procedures for the opening and closing of public roads; the classification of roads; the declaration of Roads and Maritime and other public authorities as roads authorities for classified and unclassified roads, and to confer certain functions on these roads authorities and regulating the carrying out of various activities on public roads. Part 12 of the Roads Act 1993 provides for the acquisition of land for the purposes of the Act.</td>
</tr>
<tr>
<td>Land Acquisition (Just Terms Compensation) Act 1991</td>
<td>The Land Acquisition (Just Terms Compensation) Act 1991 provides a framework for the acquisition of land by a public authority where that land is not publicly available (i.e., for sale). It establishes a process for the equitable compensation of landowners whose land is acquired and for the amount of compensation to be not less than the market value of the land (unaffected by a proposal) at the date of acquisition. Section 23 of the Act allows of owners of land designated for acquisition to apply to the relevant authority for hardship if there is any delay in the acquisition of the land under this Act.</td>
</tr>
<tr>
<td>Threatened Species Conservation Act 1995</td>
<td>The TSC Act provides for the conservation of threatened species, populations, and ecological communities of animals and plants. The Act sets out a number of specific objects relating to the conservation of biological diversity and the promotion of ecologically sustainable development. The Cumberland Plain Recovery Plan has been prepared under the EPBC Act and the NSW TSC Act to promote the recovery of threatened species, populations, and ecological communities on the Cumberland Plain. While not a statutory protection, given the high ecological significance under the TSC and EPBC Acts, these areas are to be considered as highly sensitive.</td>
</tr>
<tr>
<td>National Parks and Wildlife Act 1974</td>
<td>The NPW Act sets out the requirements for the conservation of nature, ecosystems, biological diversity, landscapes, and landforms and for objects, places or features of cultural value (particularly Aboriginal heritage) within the landscape. The NPW Act also sets out the responsibilities for the management of national parks. Revocation of land dedicated as national park (s37(1)), nature reserve (s52(1)) or regional park (s47ZB) requires an Act of Parliament to revoke a dedication or protection. No direct impacts on national parks estate would occur, however a section of the recommended corridor would be located immediately adjacent to Wianamatta Nature Reserve which may have implications for future assessments. A section of land designated for the future Colebee Nature Reserve would be impacted, however this could be managed prior to the gazettal of the nature reserve.</td>
</tr>
<tr>
<td>Crown Lands Act 1989</td>
<td>The Crown Lands Act 1989 is intended to ensure that Crown land is managed for the benefit of the people of NSW. The Act sets out the</td>
</tr>
</tbody>
</table>
**NSW statute**  |  **Objectives and relevant sections**  
---|---
Crown land can be either ‘reserved’ or ‘dedicated’ for public purpose, and therefore unavailable for private uses. Dedication can only be revoked with the agreement of both Houses of the NSW Parliament (s84), whereas Crown land that has been reserved, can be revoked by the Minister (s90) without the matter being considered by Parliament. Several parcels of Crown land would be impacted by the recommended corridor.

**Heritage Act 1977**  
The *Heritage Act 1977* sets out the legislative framework for the management of environmental heritage (natural and cultural) in NSW. Under the Act, ‘items of environmental heritage’ include places, buildings, works, relics, moveable objects and precincts identified as significant based on historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic values. State significant items are listed on the NSW State Heritage Register and are given automatic protection under the Act against any activities that may damage an item or affect its heritage significance.

### 11.3.3 State Environmental Planning Policies

**State Environmental Planning Policy (Infrastructure) 2007**

State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP) aims to facilitate the effective delivery of infrastructure across the State through a range of mechanisms, particularly where the infrastructure is being delivered by or on behalf of a public authority. Part 3, Division 17 relates to ‘road infrastructure facilities’ (as defined in clause 93).

Clause 94 provides that ‘development for the purpose of a road or road infrastructure facilities may be carried out by or on behalf of a public authority without consent on any land’. This clause includes several caveats with regard to land protected under the NPW Act.

Clause 102 requires that a consent authority must not grant consent for development that is on land in or adjacent to the road corridor for a freeway unless it is satisfied that appropriate measures will be taken to ensure specified noise outcomes are achieved.

The Infrastructure SEPP is not directly applicable to the protection of corridors, as envisaged within the *Planning Guidelines for Major Infrastructure Corridors* (Department of Planning and Environment, 2016).

The Department of Planning and Environment is currently considering if further amendments to the Infrastructure SEPP would be beneficial to better reflect the future planning controls for the protection of these corridors.

Any future development of a motorway would likely be supported by the provisions of the Infrastructure SEPP or its equivalent at that time.

**State Environmental Planning Policy (Exempt and Complying Development Codes) 2008**

The Exempt and Complying Development Codes SEPP aims to provide State-wide streamlined assessment processes for development that does not need planning of building approval (exempt development) and streamlined development consents for development that complies with specified development standards (complying development).
To be considered complying developed for the General Housing Code or the Rural Housing Code, development must not be carried out on land that is protected for a public purpose by an EPI. Consequently, land within the recommended corridor would not be able to be developed under a complying certificate only, a development application would need to be made to the relevant local council.

State Environmental Planning Policy (Sydney Region Growth Centres) 2006

The Growth Centres SEPP aims to co-ordinate the release of land for residential, employment and other urban development in the two defined growth centres with the North West Growth Area (formerly North West Growth Centre) being of principal interest to the BLoR-CC study. The SEPP includes a number of other aims that seek to balance development with protection of environmental and cultural heritage values.

The strategic planning of the Growth Areas is being managed through a process of precinct planning which coordinates the planning and delivery of utilities, infrastructure and transport and other services in time to service new communities. Land Use and Structure Plans are prepared for each precinct, similar to LEPs, to guide development and inform the establishment of zoning controls.

As part of the development of the Growth Centres, amendments were made to the TSC Act in order to allow for biodiversity certification of land in these areas to manage conversion of native vegetation on a regional level. This ‘biocertification’ identifies areas where clearing may be undertaken, even within areas designated as EECs, without the need for offsetting or preparing a Species Impact Statement. For land designated as non-certified, clearing may only be undertaken if an equivalent (or greater) area is protected elsewhere within the Growth Centres.

Selected areas within the non-certified areas of the Growth Centre are designated as high conservation areas, as shown by red hatching in the Biodiversity Certification Order 2007. Clearing on these areas must not be undertaken unless it is in accordance with a plan of management or is specifically agreed to by the NSW Office of Environment and Heritage (condition 12 of the Order). This includes the former ASA site at Shanes Park and the future Colebee Nature Reserve. Impacts to non-certified land would require suitable offset sites to be identified in accordance with the relevant policies.

Precinct plans have been prepared under the Growth Centres SEPP for the following Precincts that are located along the recommended corridor. These serve a similar role to the LEPs discussed below.

The following Precinct Plans apply to land located in the vicinity of the recommended corridor:

- Marsden Park Industrial Precinct Plan 2010 (Appendix 5 to the Growth Centres SEPP)
- Blacktown Growth Centres Precinct Plan 2013 (for Marsden Park Precinct) (Appendix 12 to the Growth Centres SEPP)
- Schofields Precinct Plan 2012 (Appendix 7 to the Growth Centres SEPP).

Shanes Park, the fourth precinct in the North West Growth Area that would be crossed by the recommended corridor, has not yet been released for planning. It is currently zoned RU4 (Primary Production Small Lots) under the Penrith LEP 2010.

11.3.4 Local Environmental Plans

The Standard Instrument (Local Environmental Plans) Order 2006 sets out the form and content of a principal local environmental plan for an area for the purposes of section 33A of the EP&A Act. It sets out the mandatory provisions and other provisions to be included in an LEP.
The recommended corridor extends across three LGAs: Hawkesbury, Blacktown and Penrith with land use development regulated through the following LEPs:

- Blacktown Local Environmental Plan 2015
- Hawkesbury Local Environmental Plan 2012
- Penrith Local Environmental Plan 2010.

LEPs typically consist of a written instrument and LEP maps which establish the land use controls applicable to the LGA. Land use controls are defined in Part 2 of an LEP, identifying what types of development are permitted with or without consent or prohibited. Roads are typically permissible in most zones under the Standard Instrument.

Part 5 of an LEP contains miscellaneous provisions, some of which are compulsory while others are optional. Clause 5.1 of an LEP identifies the relevant acquisition authority for acquiring land for public purposes, if the land is required to be acquired under Division 3 of Part 2 of the Land Acquisition (Just Terms Compensation) Act 1991 (the “owner-initiated acquisition provisions”).

Clause 5.1(3) requires that “development on land acquired by an authority of the State under the owner-initiated acquisition provisions may, before it is used for the purpose for which it is reserved, be carried out, with development consent, for any purpose.” This would allow the continuation of existing (lawful) uses until such time as a future motorway is built.

---

### 11.4 Considerations in reserving land for the BLoR-CC recommended corridor

#### 11.4.1 Rezoning and existing use rights

It is likely that the recommended corridor would be protected as SP2 (Reserved Infrastructure Corridor). Typically, the objectives of this zone are:

- To provide for infrastructure and related uses
- To prevent development that is not compatible with or that may detract from the provision of infrastructure.

Typically, development permitted with consent in this zone includes:

- Roads – the purpose shown on the Land Zoning map, including any development that is ordinary incidental or ancillary to development for that purpose
- Environmental protection works
- Flood mitigation works
- Recreation areas and facilities.

Consequently, unless otherwise managed, land uses such as residential, business or agriculture would be deemed prohibited under the SP2 zoning. However, the existing use rights provisions established in ss106-109B of the EP&A Act and Clause 5.1(3) of the Standard Instrument would enable the continuation of current approved uses until such time as a future motorway is built.

Some restrictions on new development activity would need to be in place in order to ensure that any development approval decisions are not incompatible with the future intent for the recommended corridor.

Where new development is proposed, the consent authority, such as the local council, will need to consider whether or not the proposed development:
Could have been carried out on the land prior to the land being rezoned for the corridor

Is consistent with the objectives of the environmental planning instrument

Will compromise, restrict or otherwise prevent the future use of the land for transport infrastructure.

Subdivision, that is the dividing of a lot into two or more lots, would likely not be permitted within the recommended corridor as it has the potential to hinder future infrastructure development.

It is expected that major development proposals over a nominated value would be referred to Department of Planning and Environment. This would allow the appropriate consideration of impacts of a development application on the future corridor to be completed.

The concurrence authority would need to consider several factors given the long term nature of the infrastructure project, including:

- The need for the proposed development
- The timing of the proposed development in relation to the construction of transport infrastructure within the corridor
- Potential additional costs in construction of the transport infrastructure because of the proposed development.

Clauses could also be included in the relevant EPIs to guide decision makers in their consideration of development applications on land within the recommended corridor.

### 11.4.2 Potential land use controls adjacent to the recommended corridor

It is recommended that development controls be provided for land adjacent to the SP2 (Reserved Infrastructure Corridor). The objective of recommending controls for development adjacent to the recommended corridor is to ensure that:

- New development does not compromise the effective future operation and function of the motorway
- To prevent or reduce the potential impact of future traffic noise and vehicle emission on development adjacent to a future motorway.

Given that there may be a long period between the protection and operation of the corridor, planning controls that take into account changes over time will be necessary.

Controls may be included in relevant EPIs to consider the potential noise and vibration impacts of a future motorway in the recommended corridor, should it become operational. Controls could include noise standards and measures to reduce noise for new planning proposals and rezoning requests in an area within an identified vicinity of the corridor, which would be mapped in the relevant EPIs.

These noise standards and mitigation measures would be expected to be governed by the Noise Mitigation Guideline ( Roads and Maritime, 2015) and Development Near Rail Corridors and Busy Roads – Interim Guidelines (Department of Planning, 2008).

It is anticipated that excavation within and adjacent to the recommended corridor would only be permissible with the approval of Transport for NSW and subject to certain conditions. These conditions would be similar to those for road corridors under the Infrastructure SEPP. It is anticipated that conditions will be placed on excavation that involves penetration of ground to a depth of at least two metres below existing ground level.
11.5 EPIs to be amended by the new SEPP

The proposed SEPP is expected to include the necessary planning controls to give effect to the protection of the recommended corridor and to outline interim uses and permissible development, as well as to establish any referral requirements for approval by the relevant State Government agency, as shown in Table 11-2.

*Table 11-2  Environmental planning instruments that may be amended to support the BLoR-CC recommended corridor*

<table>
<thead>
<tr>
<th>Environmental Planning Instrument</th>
<th>Rezoning</th>
<th>Potential development controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marsden Park Industrial Precinct Plan 2010 (Appendix 5 to the Growth Centres SEPP)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Blacktown Growth Centres Precinct Plan 2013 (for Marsden Park Precinct) (Appendix 12 to the Growth Centres SEPP)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Schofields Precinct Plan 2012 (Appendix 7 to the Growth Centres SEPP).</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Blacktown Local Environmental Plan 2015</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Hawkesbury Local Environmental Plan 2012</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Penrith Local Environmental Plan 2010</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Penrith Local Environment Plan 201- Rural Lands</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

The recommended corridor could be shown on the relevant maps in the above EPIs. This would enable landowners, and future landowners, to identify whether a protection applies to their land.
12. Environmental risk analysis

12.1 Overview

At the commencement of the BLoR-CC corridor study, a constraints review process was undertaken to identify the environmental issues of most importance to the study. Input was also sought from the community and key stakeholders through consultation on constraints and opportunities across the study area.

Together with the SEA guidelines issued by Department of Planning and Environment, the findings of the constraints review process formed the basis of this draft SEA. As required by the Guidelines, the process of environmental risk analysis continued during the course of preparing this draft SEA, using desktop information gathered during the SEA process to review the environmental aspects of the study, and to iteratively identify if there were any gaps in information or additional issues that arose. More specifically the analysis:

- Identified environmental issues, including key issues in the SEA guidelines, and any other issues
- Examined potential impacts and proposed mitigation measures in relation to the identified issues
- Identified the nature and extent of impacts likely to remain after the application of the proposed mitigation measures.

Based on this analysis, an environmental risk category (refer Table 12-1) was assigned to each potential impact. This enabled the identification of any matters that might be considered as additional key issues, and provided a basis for an appropriately detailed assessment of these additional key issues in this draft SEA.

<table>
<thead>
<tr>
<th>Risk category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key issue</td>
<td>High or moderate impact (actual or perceived) requiring further investigation.</td>
</tr>
<tr>
<td>Other issue</td>
<td>Moderate or low impact that can be managed effectively.</td>
</tr>
</tbody>
</table>

12.2 Strategic environmental risk analysis

A summary of the strategic environmental risk analysis is provided in Table 12-2. The environmental risk analysis confirms that the SEA guidelines included all key issues. No additional key issues were identified.
<table>
<thead>
<tr>
<th>Issue</th>
<th>Key issue in SEA guidelines</th>
<th>Main potential adverse impacts</th>
<th>Main potential adverse impacts remaining following application of strategic mitigation measures</th>
<th>Residual risk category following analysis</th>
<th>SEA reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land use and property impacts</td>
<td>Yes</td>
<td>Changes in permissible land use activities once protection in place. Major property acquisition impacts over time. Interim land use development incompatible with future motorway.</td>
<td>Moderate impact on land use activity over the protection period. Phased property acquisition impacts. Likely to remain a key concern for the community. Land use development controls can be used to manage interim and adjacent land uses.</td>
<td>Key issue</td>
<td>Section 7.1, 8.1 and 11.4, Chapter 11</td>
</tr>
<tr>
<td>Traffic and transport</td>
<td>Yes</td>
<td>No impact during protection. Impacts on local roads, barrier to north-south movements.</td>
<td>Local road access patterns and north-south movements would change if a future motorway is developed. No residual significant impacts are anticipated.</td>
<td>Key issue</td>
<td>Section 7.2 and 8.2</td>
</tr>
<tr>
<td>Noise and vibration</td>
<td>Yes</td>
<td>No impact during protection. Introducing future noise generating infrastructure.</td>
<td>The noise amenity would be impacted for both existing residents and any new residents and visitors to the area. Likely to remain a key concern for the community.</td>
<td>Key issue</td>
<td>Section 7.3 and 8.3</td>
</tr>
<tr>
<td>Issue</td>
<td>Key issue in SEA guidelines</td>
<td>Main potential adverse impacts</td>
<td>Main potential adverse impacts remaining following application of strategic mitigation measures</td>
<td>Residual risk category following analysis</td>
<td>SEA reference</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Visual amenity, built form and urban design</td>
<td>Yes</td>
<td>No impact during protection. Introducing new highly visible built element into the landscape.</td>
<td>Visual impact could be reduced in some places but would remain a visible element in the landscape. No residual significant impacts are anticipated.</td>
<td>Key issue</td>
<td>Section 7.4 and 8.4</td>
</tr>
<tr>
<td>Soils and geology</td>
<td>Yes</td>
<td>No impact during protection. Constraint on future design development.</td>
<td>Early consideration of soils and geology constraints in future design development would still be required. No residual significant impacts are anticipated.</td>
<td>Other issue</td>
<td>Section 7.5 and 8.5</td>
</tr>
<tr>
<td>Water quality and hydrology</td>
<td>Yes</td>
<td>No impact during protection. Changes to flooding and hydrology regime, particularly across the floodplains.</td>
<td>Flooding would remain an issue in the area but a future motorway would be designed to achieve flood immunity and not contribute detrimentally to the wider flooding issues.</td>
<td>Key issue</td>
<td>Section 7.6 and 8.6</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>Yes</td>
<td>No adverse impacts during protection. Impact on EECs, threatened species and habitats.</td>
<td>Regional consideration of impacts on EECs required. Offsetting strategy and early identification of suitable sites would be required. Ongoing management</td>
<td>Key issue</td>
<td>Section 7.7 and 8.7</td>
</tr>
<tr>
<td>Issue</td>
<td>Key issue in SEA guidelines</td>
<td>Main potential adverse impacts</td>
<td>Residual risk category following application of strategic mitigation measures</td>
<td>SEA reference</td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------------------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td>Heritage</td>
<td>Yes</td>
<td>No impact during protection. Impacts on Aboriginal and non-Aboriginal heritage sites, artefacts and places.</td>
<td>Destruction or disturbance of Aboriginal and non-Aboriginal heritage items if a future motorway is developed. Possible impact on SHR listed sites at Colebee would remain a concern that needs further investigation. Further understanding of Aboriginal and non-Aboriginal cultural heritage values would be required.</td>
<td>Key issue</td>
<td>Sections 7.8, 7.9, 8.8, 8.9</td>
</tr>
<tr>
<td>Air quality</td>
<td>Yes</td>
<td>No impact during protection. Consideration for future design development.</td>
<td>Early consideration of air quality management during future design development would still be required. No residual significant impacts are anticipated.</td>
<td>Other issue</td>
<td>Section 7.11 and 8.11</td>
</tr>
<tr>
<td>Social and economic</td>
<td>Yes</td>
<td>Gradual impact on local amenity over time during protection. Community severance, loss</td>
<td>Gradual changes to the communities and businesses would occur in the context of broader patterns of development</td>
<td>Key issue</td>
<td>Section 7.10 and 8.10</td>
</tr>
<tr>
<td>Issue</td>
<td>Key issue in SEA guidelines</td>
<td>Main potential adverse impacts</td>
<td>Main potential adverse impacts remaining following application of strategic mitigation measures</td>
<td>Residual risk category following analysis</td>
<td>SEA reference</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------------</td>
<td>--------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>of local businesses.</td>
<td></td>
<td></td>
<td>across Western Sydney. Likely to remain a concern for the local community.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greenhouse gas and climate change</td>
<td>No</td>
<td>No impact during protection.</td>
<td>Early consideration of greenhouse gas emissions and climate change in future design development would still be required. No residual significant impacts are anticipated.</td>
<td>Other issue</td>
<td>Section 7.11 and 8.11</td>
</tr>
</tbody>
</table>
13. Corridor justification and conclusion

North-western Sydney is set to grow dramatically over the next 30 years. The NSW Government has set targets for residential and employment growth and the land release program is already well underway. In addition, road user demands for commuters, freight and transport are also expected to grow exponentially.

A future need for a new connection between the M7 Motorway at Dean Park and Bells Line of Road in the vicinity of Kurrajong Heights has been identified in a number of strategic plans, initially in the Bells Line of Road Long Term Strategic Corridor Plan and subsequently supported in the Long Term Transport Master Plan, Draft Future Transport Strategy 2056, A Plan for Growing Sydney, Draft Greater Sydney Region Plan, and the State Infrastructure Strategy. The corridor represents a missing link in the Sydney motorway network and would provide an important new east-west connection between Sydney and central and western NSW.

Given the rapid expansion of development in north-western Sydney, early protection of a corridor is vital to ensure that there is sufficient land available in the future to provide options for future infrastructure development. With the expected change in patterns of land use, early protection of a corridor will be beneficial in providing certainty around land use, minimising acquisition costs, avoiding redundant development, and providing new opportunities for land use and economic development that would perhaps not otherwise be realised. By reserving the corridor now, the NSW Government is securing the opportunity to address future transport needs in the longer term when traffic volumes require it. Protection of the corridor now would also guide and inform the delivery of other transport projects and associated infrastructure that could occur in the region and clearly outline the NSW Government’s long term plans and intentions, which would minimise the need for reactive or ad-hoc provision of infrastructure in the future.

Protection of a transport corridor and the ultimate operation of a future motorway would meet growing population needs in north-western Sydney, contribute to reduced congestion costs, increased accessibility and provide infrastructure to efficiently move freight and people through the BLoR-CC study area as well as improve regional connectivity in the long term.

It would also provide clarity for the NSW Government and councils, and provide greater confidence for existing residents and development in the area.

Protection of the BLoR-CC recommended corridor represents an integrated transport solution that balances infrastructure benefits and opportunities with land use and environmental impacts and meets the stated objectives of Australian, NSW and local strategic policies and plans.

Next steps

The next steps toward protecting the BLoR-CC recommended corridor are:

1. Consult with the community and stakeholders on the recommended corridor and the strategic assessment of impacts associated with the protection of the corridor for future transport needs.

2. Prepare a draft State Environmental Planning Policy to zone the recommended corridor for future infrastructure purposes and identify appropriate land use planning controls for the use of adjoining land to protect the future operational integrity of the future infrastructure.
14. References


Blacktown City Council (2017) Our Blacktown 2036: Community Strategic Plan.


DECCW (2011b) NSW Road Noise Policy.


Department of Planning and Environment (2016) Planning Guidelines for Major Infrastructure Corridors.

Department of Planning and Environment (2017a) Central West and Orana Regional Plan.

Department of Planning and Environment (2017b) North West Priority Growth Area: Land Use and Infrastructure Implementation Plan.

Department of Transport and Regional Services and NSW Roads and Traffic Authority (2005) Bells Line of Road Corridor Study.


Infrastructure Australia (2016) Australian Infrastructure Plan: Priorities and reforms for our nation’s future.
Infrastructure Australia (2017) Corridor Protection: Planning and investing for the long term.
NSW Agriculture (2002) NSW Agriculture Land Classification Report
NSW Environmental Protection Authority (2005) Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.
Penrith City Council (2017) Community Plan
SKM (1998) *Penrith to Orange Transport Corridor Study.*
Transport for NSW (2012) *NSW Long Term Transport Master Plan.*
Appendix A SEA Guidelines Checklist
<table>
<thead>
<tr>
<th>SEA Requirements</th>
<th>Where addressed in this report</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. The strategic justification:</strong></td>
<td>Chapter 2</td>
</tr>
<tr>
<td>- an outline of the objectives of the corridor, including a description of the strategic need for infrastructure; and justification, objectives and intended long term outcomes for the proposed future infrastructure. This should take account of existing and proposed transport infrastructure and services within the adjoining subregions and regions, and as relevant, outcomes and objectives of relevant strategic planning and transport policies, and other major Government infrastructure programs.</td>
<td></td>
</tr>
<tr>
<td>- a strategic analysis of alternative options to the carrying out of the future project and objectives of reserving the corridor. This should include an assessment of the strategic costs and benefits of reserving the corridor relative to alternatives and the consequences of not reserving the corridor.</td>
<td>Section 2.6</td>
</tr>
<tr>
<td><strong>2. The infrastructure project and its components</strong></td>
<td>Chapter 4</td>
</tr>
<tr>
<td>- a description of the potential future infrastructure project and its components that may potentially be built in the corridor and therefore affect the design of the corridor alignment, including location and width. This includes all potential transport modes, such as road, rail, cycleway, and key interchanges/connections needed.</td>
<td></td>
</tr>
<tr>
<td><strong>3. Corridor alignment options</strong></td>
<td>Chapter 3, Section 6.1, 7.1 and 8.1</td>
</tr>
<tr>
<td>- strategic corridor area scoping and analysis of:</td>
<td></td>
</tr>
<tr>
<td>- environmental opportunities and constraints within the corridor; and</td>
<td></td>
</tr>
<tr>
<td>- existing land uses within the corridor area</td>
<td></td>
</tr>
<tr>
<td>- identification and strategic assessment of corridor alignment options.</td>
<td></td>
</tr>
<tr>
<td><strong>4. Preferred corridor alignment</strong></td>
<td>Section 4.1-4.3</td>
</tr>
<tr>
<td>- a description of the preferred corridor alignment, including:</td>
<td></td>
</tr>
<tr>
<td>- proposed corridor (or corridors if the preferred alignment not known);</td>
<td></td>
</tr>
<tr>
<td>- location of likely interchanges (such as interchanges with the M7 Motorway, Richmond Road, The Northern Road, Londonderry Road, Castlereagh Road, Comleroy Road and The Bells Line of Road) the relationship and/or interaction with other infrastructure networks, including existing or planned road networks and public transport services (including rail and bus and rail and bus stops), or any other major infrastructure networks</td>
<td>Section 4.3</td>
</tr>
<tr>
<td>- the implications of the preferred corridor alignment (or corridor options if the preferred alignment is not known) in relation to the key issues outlined below.</td>
<td>Chapters 7 and 8</td>
</tr>
<tr>
<td>- Whether the preferred corridor allows for staged implementation or upgrading of infrastructure</td>
<td>Section 4.4</td>
</tr>
<tr>
<td>- detail how the preferred corridor alignment integrates with the relevant strategic plan (such as A Plan for Growing Sydney).</td>
<td>Chapter 2 and Section 7.1.3</td>
</tr>
<tr>
<td>SEA Requirements</td>
<td>Where addressed in this report</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>including supporting identified growth objectives and other objectives with the relevant strategic land use plans.</td>
<td></td>
</tr>
<tr>
<td>The Strategic Environmental Assessment must also address the following specific matters:</td>
<td>Sections 6.1, 7.1 and 8.1</td>
</tr>
<tr>
<td><strong>Land use and property impacts</strong> within the corridor and adjacent to the corridor – including but not limited to:</td>
<td></td>
</tr>
<tr>
<td>- current land use controls in the corridor;</td>
<td></td>
</tr>
<tr>
<td>- potential impacts to residential and industrial lands and impacts to Crown land;</td>
<td></td>
</tr>
<tr>
<td>- potential impacts to open space, reservations, national parks;</td>
<td></td>
</tr>
<tr>
<td>- potential impacts to major other infrastructure networks such as utility networks and</td>
<td></td>
</tr>
<tr>
<td>- potential impacts on key strategic geographical locations.</td>
<td></td>
</tr>
<tr>
<td><strong>Future land use opportunities</strong> surrounding the corridor:</td>
<td></td>
</tr>
<tr>
<td>- commentary on the housing and job growth potential as a result of the future infrastructure project, including identifying likely areas of change and how this aligns with regional and sub-regional planning;</td>
<td></td>
</tr>
<tr>
<td>- commentary on potential opportunities to effectively integrate new infrastructure with surrounding land uses (either economic, environmental or residential land uses), and how this aligns with regional and sub-regional planning; and</td>
<td></td>
</tr>
<tr>
<td>- identification of key locations including potential key interchanges and connections with other future major infrastructure projects.</td>
<td></td>
</tr>
<tr>
<td><strong>Economic impacts</strong> of potential future infrastructure as well as potential impacts of limiting current land uses within and around the corridor – including but not limited to:</td>
<td>Chapter 10</td>
</tr>
<tr>
<td>- commentary on the expected economic growth potential created from the future infrastructure project;</td>
<td></td>
</tr>
<tr>
<td>- potential impact on economic growth of failing to deliver the future infrastructure project as planned; and</td>
<td></td>
</tr>
<tr>
<td>- impact on related infrastructure projects such as the Outer Sydney Orbital corridor and the Western Sydney Airport.</td>
<td></td>
</tr>
<tr>
<td><strong>Traffic and transport</strong> — including but not limited to:</td>
<td>Sections 6.2, 7.2 and 8.2</td>
</tr>
<tr>
<td>- details of how the alignment will meet the traffic and transport objectives of the corridor, taking into account adjacent sensitive land uses and future growth areas as identified in existing and proposed strategic plans; and</td>
<td></td>
</tr>
<tr>
<td>- strategic assessment of traffic and transport impacts on the regional, State, and National road network, and local roads (where known), including identifying future extensions to the network made possible by the implementation of the preferred corridor alignment.</td>
<td></td>
</tr>
<tr>
<td><strong>Noise and vibration</strong> — including but not limited to:</td>
<td>Sections 6.3, 7.3 and 8.3</td>
</tr>
<tr>
<td>- any location along the corridor or future land uses that may be sensitive to noise or vibration and may be affected by the infrastructure within the corridor.</td>
<td></td>
</tr>
<tr>
<td><strong>Visual amenity, built form and urban design</strong> — including but not limited to:</td>
<td>Sections 6.4, 7.4 and 8.4</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SEA Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Where addressed in this report</th>
</tr>
</thead>
<tbody>
<tr>
<td>identifying strategic visual or built form impacts of the proposed future infrastructure and how these could be mitigated or minimised.</td>
<td>Sections 6.5, 6.6, 7.5, 7.6, 8.5 and 8.6</td>
</tr>
</tbody>
</table>

**Soils and Water** - including but not limited to:
- strategic water quality issues to be considered, or known impacts, including a strategic assessment of:
  - potential impact on bulk water supply including water storage locations and major pipelines; and
  - identification of areas of acid sulphate soils.
- hydrological impacts, including the identification and a strategic assessment of the following:
  - location and nature of flood regimes affecting the corridor;
  - any known contaminated land within the corridor.

**Biodiversity** — including but not limited to:
- a strategic assessment of potential ecological impacts of the project with specific reference to vegetation and habitat clearing, connectivity, edge effects, riparian and aquatic habitat impacts and soil and water quality impacts;
- outline circumstances where future detailed assessments would be required;
- the impacts to adjoining waterways, riparian vegetation and aquatic habitats, including consideration of water quality, marine vegetation, fish passage and habitat, soil types (including salinity), erosion and sedimentation, and ongoing water management;
- avoidance, mitigation and management measures, including details of alternative options considered, and proposed arrangements for long term management; and
- details of any offset strategies for ecological impacts and native vegetation clearing, taking into account the *Principles for the use of biodiversity offsets in NSW* (Office of Environment and Heritage 2014).

The assessment should also take into account:
- *Threatened Species Assessment Guidelines* (Department of Environment & Climate Change 2007);
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (Department of Environment and Conservation 2004);
- *Policy and Guidelines for Fish Habitat Conservation and Management – Update 2013* (Department of Primary Industries 2013)

Note - A detailed assessment of the ecological impacts should be undertaken only if the corridor (irrespective of the final alignment) has a known impact.

**Heritage** – including but not limited to:
- potential impacts to State and local heritage (including heritage items, conservation areas, and archaeology) and potential impacts to Aboriginal heritage (including cultural and archaeological significance) and
- outline circumstances where a future detailed assessment would be required.

Sections 6.7, 7.7 and 8.7
<table>
<thead>
<tr>
<th>SEA Requirements</th>
<th>Where addressed in this report</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air quality</strong> — including but not limited to:</td>
<td>Sections 6.11, 7.11 and 8.11</td>
</tr>
<tr>
<td>• potential for impacts on local and regional air quality, including impacts on sensitive receivers.</td>
<td></td>
</tr>
<tr>
<td><strong>Social and economic</strong> — including, but not limited to:</td>
<td>Sections 6.10, 7.10 and 8.10</td>
</tr>
<tr>
<td>• strategic assessment of the potential social and economic impacts on the community and community facilities directly impacted by the corridor and the future infrastructure project.</td>
<td></td>
</tr>
<tr>
<td><strong>Environmental Risk Analysis</strong> — notwithstanding the above key assessment requirement, the Strategic Environmental Assessment must include an environmental risk analysis to identify potential environmental impacts associated with the future infrastructure, and the proposed strategic mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures. Where additional key environmental impacts are identified through this environmental risk analysis, an identification of the stage in which issues will be addressed should be identified.</td>
<td>Chapter 12</td>
</tr>
<tr>
<td><strong>Consultation</strong></td>
<td>Chapter 5</td>
</tr>
<tr>
<td>During the preparation of the Strategic Environmental Assessment, there is an expectation that the agency will consult with the relevant local, State and/or Commonwealth Government authorities, service providers, community groups and affected landowners. This may involve:</td>
<td></td>
</tr>
<tr>
<td>• Local, State, and Commonwealth government authorities; including engaging with the Department of Planning &amp; Environment about the preparation of the Subregional Plans or Regional Plans;</td>
<td></td>
</tr>
<tr>
<td>• specialist interest groups, including Local Aboriginal Land Councils and others Aboriginal stakeholders;</td>
<td></td>
</tr>
<tr>
<td>• relevant utilities and Environmental Assessment service providers; and</td>
<td></td>
</tr>
<tr>
<td>• the public, including community groups and adjoining and affected landowners.</td>
<td></td>
</tr>
<tr>
<td>The Strategic Environmental Assessment should describe the consultation process and the issues raised and identify where the corridor alignment has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.</td>
<td></td>
</tr>
<tr>
<td><strong>Statutory planning considerations</strong></td>
<td>Chapter 11</td>
</tr>
<tr>
<td><strong>Current planning framework</strong> - The Strategic Environmental Assessment should identify the existing Environmental Planning Instruments that apply to the corridor, and relevant sections that will be affected by potential statutory planning controls. This includes identifying all:</td>
<td></td>
</tr>
<tr>
<td>• existing Local Environmental Plans within the corridor;</td>
<td></td>
</tr>
<tr>
<td>• existing relevant State Environmental Planning Policies and structure plans; and</td>
<td></td>
</tr>
<tr>
<td>• other relevant plans, policies and strategies.</td>
<td></td>
</tr>
</tbody>
</table>
### SEA Requirements

<table>
<thead>
<tr>
<th>Where addressed in this report</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Statutory:</strong> The Strategic Environmental Assessment may make recommendations on potential draft clauses or instructions for the reservation of the corridor. This includes identifying if and where preservation controls should differ along the corridor. Where land is to be reserved, the Strategic Environmental Assessment may also identify what appropriate interim uses should be considered.</td>
</tr>
<tr>
<td><strong>Other:</strong> The Strategic Environmental Assessment may make recommendations about appropriate land uses surrounding the corridor for considerations within other planning documents (such as Subregional Plans, Regional Plans, structure plans or master plans) that are, or will be, prepared within the corridor. The Strategic Environmental Assessment may also identify if and where sites are recommended to be &quot;reserved&quot; for the purposes prescribed in section 26(1)(c) and 27 of the <em>Environmental Planning and Assessment Act 1979</em>.</td>
</tr>
</tbody>
</table>

### Other considerations

The Strategic Environmental Assessment may want to identify if there is a proposal in place for:

- voluntary owner-initiated land acquisition for the corridor;
- a possible buy back scheme for land for the corridor;
- any implications on property owners or commercial activity that may occur as a result of the corridor;
- any current holding arrangements for those sites; and
- any plans for potential interim uses that could be appropriate for acquired sites within the corridor.  

Chapter 11
Appendix B Additional detail on strategic concept design
The Strategic Concept Design for the recommended corridor provides detail of how a future motorway could be provided within the corridor. The Strategic Concept Design includes details on likely bridges required to cross existing major and minor roads as well as flood plains and water courses.

**Existing major roads**

The recommended corridor crosses a number of existing major roads. Depending on the alignment of the motorway and the existing road, the crossing could be either motorway twin bridges over the major roads or the major road on a single bridge over the motorway. The proposed form of the bridge at each location is described in Table 14-1.

<table>
<thead>
<tr>
<th>Bridge location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Richmond Road</td>
<td>Twin motorway bridges over Richmond Road with single bridges for two ramps linking to the M7 Motorway. The bridges are combined with floodplain crossings of Bells Creek</td>
</tr>
<tr>
<td>Stony Creek Road</td>
<td>Twin motorway bridges over Stony Creek Road</td>
</tr>
<tr>
<td>Second Avenue</td>
<td>Single bridge over the motorway</td>
</tr>
<tr>
<td>The Northern Road</td>
<td>Twin motorway bridges over The Northern Road as part of the interchange</td>
</tr>
<tr>
<td>Cranebrook Road</td>
<td>Twin motorway bridges over Cranebrook Road combined with a flood plain crossing of Rickabys Creek as part of the interchange</td>
</tr>
<tr>
<td>Castlereagh Road</td>
<td>Single bridge over the motorway as part of the interchange</td>
</tr>
<tr>
<td>Springwood Road</td>
<td>Twin motorway bridges over Springwood Road and Mahons Creek flood plain</td>
</tr>
<tr>
<td>Grose Vale Road</td>
<td>Singe bridge over the motorway as part of the interchange</td>
</tr>
<tr>
<td></td>
<td>Single bridge over the motorway</td>
</tr>
<tr>
<td>Bells Line of Road</td>
<td>Single bridge over the motorway west of Kurrajong Hills</td>
</tr>
<tr>
<td></td>
<td>Single bridge over the motorway as part of the interchange</td>
</tr>
</tbody>
</table>

**Existing minor roads**

The recommended corridor crosses a number of existing minor roads. Depending on the alignment of the motorway and the existing road, the crossing could be either motorway twin bridges over the local roads or the local road on a single bridge over the motorway. The proposed form of the bridge at each location is described in Table 14-2.
Table 14-2  Existing minor roads crossed by the recommended corridor

<table>
<thead>
<tr>
<th>Bridge location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Creek Road</td>
<td>Twin bridges over South Creek Road as part of the South Creek flood plain crossing</td>
</tr>
<tr>
<td>Seventh Avenue</td>
<td>Twin bridges over Seventh Avenue as part of the South Creek flood plain crossing</td>
</tr>
<tr>
<td>Sixth Avenue</td>
<td>Twin bridges over Sixth Avenue as part of the South Creek flood plain crossing</td>
</tr>
<tr>
<td>Fourth Avenue</td>
<td>Single bridge over the motorway</td>
</tr>
<tr>
<td>Terrybrook Road</td>
<td>Twin motorway bridges over Terrybrook Road</td>
</tr>
<tr>
<td>Taylor Road</td>
<td>Single bridge over the motorway</td>
</tr>
<tr>
<td>Tadmore Road</td>
<td>Twin motorway bridges over Tadmore Road</td>
</tr>
<tr>
<td>Church Street</td>
<td>Twin motorway bridges over Church Street</td>
</tr>
<tr>
<td>Hinxman Road</td>
<td>Twin motorway bridges over Hinxman Road</td>
</tr>
<tr>
<td>Post Office Road</td>
<td>Twin motorway bridges over Post Office Road</td>
</tr>
<tr>
<td>Mountain Avenue</td>
<td>Single bridge over the motorway</td>
</tr>
<tr>
<td>Avoca Road</td>
<td>Single bridge over the motorway</td>
</tr>
<tr>
<td>Cabbage Tree Road</td>
<td>Single bridge over the motorway</td>
</tr>
<tr>
<td>Willow Glen Road</td>
<td>Single bridge over the motorway</td>
</tr>
<tr>
<td>Springrove Lane</td>
<td>Twin motorway bridges over Springrove Lane</td>
</tr>
</tbody>
</table>

Interaction with existing and planned local road network

The proposed BLoR-CC motorway would cross a number of existing local roads. Traffic connectivity has been considered at each location and where a bridge is not proposed, add potential appropriate treatments are recommended in Table 14-3.

Table 14-3  Proposed interaction with existing and planned road network

<table>
<thead>
<tr>
<th>Road</th>
<th>Treatment to adjacent to corridor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shanes Park Road</td>
<td>Cul-de-sacs either side of corridor</td>
</tr>
<tr>
<td>Fifth Avenue</td>
<td>Cul-de-sacs either side of corridor</td>
</tr>
<tr>
<td>Road</td>
<td>Treatment to adjacent to corridor</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>Fourth Avenue</td>
<td>Cul-de-sac on north side of corridor. Fourth Avenue is proposed to be linked to Third Avenue on the south side of the corridor</td>
</tr>
<tr>
<td>Jolly Street/Sheredan Road</td>
<td>Local road diversion on the north side of the corridor to link Jolly Street to Sheredan Road</td>
</tr>
<tr>
<td>Sheredan Road/Hinxman Road</td>
<td>Local road diversion on the south side of the corridor to link Sheredan Road to Hinxman Road</td>
</tr>
<tr>
<td>Devlin Road</td>
<td>Cul-de-sacs either side of corridor</td>
</tr>
<tr>
<td>Jackets Road</td>
<td>Cul-de-sac on north side of corridor. Properties located on the south side of the corridor are proposed to be linked to Scotts Farm Road</td>
</tr>
<tr>
<td>Baileys Lane</td>
<td>Cul-de-sac on north side of corridor. Properties located on the south side of the corridor are proposed to be linked to Springgrove Lane</td>
</tr>
</tbody>
</table>