

**Roads and Maritime Services**  
Western Sydney Infrastructure Plan  
The Northern Road Upgrade  
Glenmore Parkway, Glenmore Park to  
Mersey Road, Bringelly

Amended State Significant Infrastructure  
Application Report

February 2016

# Executive summary

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## **Introduction**

The Australian Government, in partnership with the NSW Government, has announced a ten-year road investment program worth over \$3.6 billion for western Sydney, the Western Sydney Infrastructure Plan. This amended State Significant Infrastructure (SSI) application relates to the following key elements of the plan:

- Upgrade of The Northern Road for up to eight lanes (six traffic lanes and two bus lanes) between Glenmore Parkway, Glenmore Park and Mersey Road, Bringelly, including a diversion around Luddenham village and the proposed Western Sydney Airport.

This project is part of an overall programme of work for The Northern Road upgrade, namely:

- Stage 1: 3.3km between The Old Northern Road, Narellan and Peter Brock Drive, Oran Park
- Stage 2: 10km between Peter Brock Drive, Oran Park and Mersey Road, Bringelly
- Stage 3: 10km between Littlefields Road, Luddenham and Jamison Road, Penrith
- Stage 4: 11km between Mersey Road, Bringelly and Littlefields Road, Luddenham
- A grade separated The Northern Road and Bringelly Road Interchange.

Stages 1 and 2 of The Northern Road were assessed and determined by a review of environmental factors (REF) in accordance with Part 5 of the *Environmental Planning & Assessment Act 1979* (EP&A Act). The grade separated The Northern Road and Bringelly Road Interchange is being similarly assessed, with the REF currently being prepared.

## **The SSI application**

On 30 June 2015, an SSI application was lodged to the NSW Department of Planning and Environment (DPE) for Stages 3 and 4. Roads and Maritime Services (Roads and Maritime) considered that approval under Part 5.1 of the EP&A Act was required due to the application of paragraph 1, Schedule 3 of State Environmental Planning Policy (State and Regional Development) 2011, as potential environmental impacts, particularly regarding biodiversity and heritage matters in the 'green-field' areas of the project, were considered to be likely to have a significant affect on the environment, thus requiring an environmental impact statement (EIS).

As Stages 3 and 4 were proposed to be delivered as a single project, it was considered appropriate to apply a single planning approval pathway for these stages of the programme. On 28 July 2015, the NSW Department of Planning & Environment (DPE) issued Secretary's environmental assessment requirements (SEARs).

Since lodging the SSI application, Roads and Maritime have reviewed the delivery model and planning pathway for the project and now consider that the northern section of Stage 3 between Glenmore Parkway, Glenmore and Jamieson Road, Penrith could be assessed and delivered as a separate, stand-alone activity. Regardless of the delivery of the remaining section of the upgrade, the section between Glenmore Parkway, Glenmore Park to Jamison Road, Penrith is required and will be able to deliver traffic benefits as a stand-alone project, particularly at Glenmore Parkway and the M4 interchange.

Furthermore, having regard to the environmental studies undertaken to date, Roads and Maritime is presently of the opinion that the section between Glenmore Parkway, Glenmore Park to Jamison Road, Penrith is not likely to have a significant effect on the environment and, therefore, can be assessed under Part 5 of the EP&A Act.

### ***Proposed Amended SSI project***

The amended project, as proposed, will be known as The Northern Road Upgrade, Glenmore Parkway, Glenmore Park to Mersey Road, Bringelly, as follows:

- From about 100 metres south of Glenmore Parkway, Glenmore Park to Littlefields Road, Luddenham would include widening the existing two lane corridor for up to eight lanes. It would include upgraded intersections at some intersections, widening of the existing road and changed accesses to improve safety. The upgrade is expected to include a range of infrastructure such as retaining walls, drainage, safety barriers, shared paths and lighting.
- From Littlefields Road, Luddenham to Mersey Road, Bringelly would include a realignment of the current The Northern Road to by-pass Luddenham and to avoid the site of the proposed Western Sydney Airport and similar work to the section from Littlefields Road, Luddenham to Glenmore Parkway, Glenmore Park.

The project may also require supporting facilities during construction, such as compounds, batching plant(s), stockpile sites, temporary accesses and sedimentation basins.

### ***Need***

The Northern Road Corridor Strategy (RTA 2009) forecast an increase in population and traffic (approximately seven per cent per year), which would exceed overall carrying capacity in peak periods, with almost all intersections providing inadequate service by 2026 and resulting in severe congestion.

Since that Strategy was prepared, further strategic and land use planning directions in the region have been advanced which will have a significant influence on future demand and functioning of The Northern Road. That includes: the proposed Western Sydney Airport at Badgerys Creek; the South West Priority Growth Area (SWPGA); and Broader Western Sydney Employment Area (BWSEA).

### ***Planning and assessment process***

Roads and Maritime, as the determining authority, formed the opinion that the project would require an EIS under the EP&A Act and the project was declared SSI under clause 14 - Schedule 3, clause 1 of the State Environmental Planning Policy (State and Regional Development) 2011. Roads and Maritime's opinion remains the same in respect of the proposed amended SSI application and seeks the Secretary's approval to amend the SSI application under clause 192 of the Environmental Planning and Assessment Regulation 2000.

### ***Proposed scope of the environmental impact statement***

The purpose of this application report is to provide information in support of the application to amend the SSI application and assist the formulation of amended environmental assessment requirements by the Secretary under section 115Y of the EP&A Act, which would inform the preparation of the EIS.

This application:

- Describes the project
- Considers the potential environmental issues for the project
- Identifies key environmental issues for the project, including:
  - Traffic and transport
  - Hydrology and flooding
  - Ecology
  - Aboriginal heritage
  - Non-Aboriginal heritage
  - Noise and vibration
  - Socio-economic
  - Landscape and visual amenity
  - Land use
- Outlines other non-key environmental issues, including:
  - Soils, contamination and water quality
  - Air quality
  - Greenhouse gases and climate change
  - Resources and waste management.

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## Attachment

Attachment A: Requirements of the Environmental Planning and Assessment Regulation 2000

## Abbreviations and Glossary

AHIMS	Aboriginal Heritage Information Management System
AM	Ante Meridian
ARI	Average Recurrence Interval
BS	British Standard
BWSEA	Broader Western Sydney Employment Area
cl	clause
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
CMA	Catchment Management Authority
CSSI	Critical State Significant Infrastructure
Cwth	Commonwealth of Australia
DECCW	Department of Environment, Climate Change & Water (NSW)
DIRD	Department of Infrastructure and Regional Development (Cwth)
DoP	Department of Planning (NSW)
DPI	Department of Primary Industries (NSW)
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
EPA	Environmental Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwth)
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
kV	kilovolts
LEP	Local Environment Plan
LGA	Local Government Area
M	Motorway
NSW	New South Wales
OEH	Office of Environment and Heritage (NSW)
PACHCI	Procedure for Aboriginal cultural Heritage Consultation and Investigation
PAD	Potential Archaeological Deposit
PCL	Priority Conservation Land
PEI	Preliminary Environmental Investigation
PM	Post Meridiem
<sup>PM</sup>	Particulate Matter
PVC	Polyvinyl Chloride
REF	Review of Environmental Factors
Roads and Maritime	Roads and Maritime Services (NSW)
RTA	Roads and Traffic Authority (former) (NSW)
s	section
SEPP	State Environmental Planning Policy
SEPP 14	State Environmental Planning Policy No.14 – Coastal Wetlands
SKM	Sinclair Knight Merz
SRD SEPP	State Environmental Planning Policy (State and Regional Development 2011
SSI	State Significant Infrastructure
TfNSW	Transport for New South Wales (NSW)
<sup>TM</sup>	Trade Mark
TSC Act	<i>Threatened Species Conservation Act 1995</i>
<i>um</i>	micrometre
UXO	Unexploded Ordinance
VRZ	Vegetated Riparian Zone
WARR Act	<i>Waste Avoidance and Resource Recovery Act 2001</i>
WSIP	Western Sydney Infrastructure Plan

# 1 Introduction

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Roads and Maritime Services (Roads and Maritime) is seeking approval for The Northern Road Upgrade from Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park (hereafter known as 'the project'). This chapter provides an overview of the project and the purpose of this report.

## 1.1 Overview of the project

The Northern Road is a key 51 kilometre north-south road corridor between Narellan and Richmond, connecting the North West and South West Priority Growth Area. It is generally a two-lane undivided road carrying up to 45,000 cars per day in some sections.

This project is part of an overall programme of work for The Northern Road Upgrade, namely identified as:

- Stage 1: 3.3km between The Old Northern Road, Narellan and Peter Brock Drive, Oran Park
- Stage 2: 10km between Peter Brock Drive, Oran Park and Mersey Road, Bringelly
- Stage 3: 10km between Littlefields Road, Luddenham and Jamison Road, Penrith
- Stage 4: 11km between Mersey Road, Bringelly and Littlefields, Luddenham
- A grade separated The Northern Road and Bringelly Road Interchange.

Stages 1 and 2 of The Northern Road were assessed and determined under an review of environmental factors (REF) in accordance with Part 5 of the *Environmental Planning & Assessment Act 1979* (EP&A Act). The grade separated The Northern Road and Bringelly Road Interchange is being similarly assessed, with the REF currently being prepared.

The naming of these projects stages may change as the delivery strategies are developed further.

## 1.2 The SSI application

On 30 June 2015, an SSI application was lodged to the NSW Department of Planning and Environment (DPE) for Stages 3 and 4. Roads and Maritime Services (Roads and Maritime) considered that approval under Part 5.1 of the EP&A Act was required due to the application of paragraph 1, Schedule 3 of State Environmental Planning Policy (State and Regional Development) 2011, as potential environmental impacts, particularly regarding biodiversity and heritage matters in the 'green-field' areas of the project, were considered to be likely to have a significant effect on the environment, thus requiring an environmental impact statement (EIS).

As Stages 3 and 4 were proposed to be delivered as a single project, it was considered appropriate to apply a single planning approval pathway for these stages of the programme. On 28 July 2015, the NSW Department of Planning & Environment (DPE) issued Secretary's environmental assessment requirements (SEARs).

Since lodging the SSI application, Roads and Maritime have reviewed the delivery model and planning pathway for the project and now consider that the northern section of Stage 3 between Glenmore Parkway, Glenmore and Jamieson Road, Penrith could be assessed and delivered as a separate, stand-alone activity. Regardless of the delivery of the remaining section of the upgrade, the section from Glenmore Parkway, Glenmore Park to Jamison Road, Penrith is required and will be

able to deliver traffic benefits as a stand-alone project, particularly at Glenmore Parkway and the M4 interchange.

Furthermore, having regard to the environmental studies undertaken to date, Roads and Maritime is presently of the opinion that Stage 3 is not likely to have a significant effect on the environment and, therefore, can be assessed under Part 5 of the EP&A Act.

***Proposed Amended SSI project***

The amended project, as proposed, will be known as The Northern Road upgrade, Glenmore Parkway, Glenmore Park to Mersey Road, Bringelly, as follows:

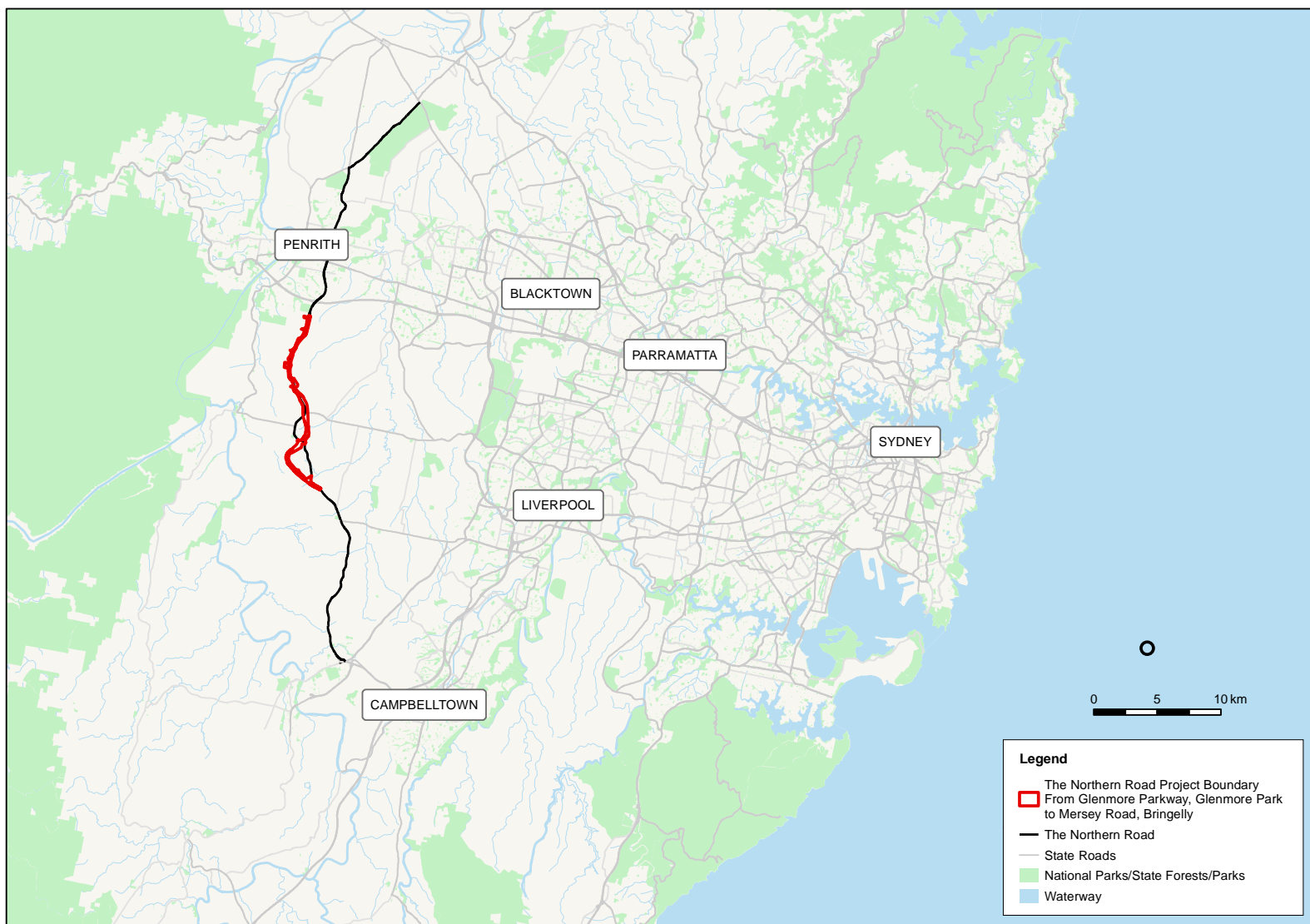
- From about 100 metres south of Glenmore Parkway, Glenmore Park to Littlefields Road, Luddenham would include widening the existing two lane corridor for up to eight lanes. It would include upgraded intersections at some intersections, widening of the existing road and changed accesses to improve safety. The upgrade is expected to include a range of infrastructure such as retaining walls, drainage, safety barriers, shared paths and lighting.
- From Littlefields Road, Luddenham to Mersey Road, Bringelly would include a realignment of the current The Northern Road to by-pass Luddenham and to avoid the site of the proposed Western Sydney Airport and similar work to the section from Littlefields Road, Luddenham to Glenmore Parkway, Glenmore Park.

The project may also require supporting facilities during construction, such as compounds, batching plant(s), stockpile sites, temporary accesses and sedimentation basins.

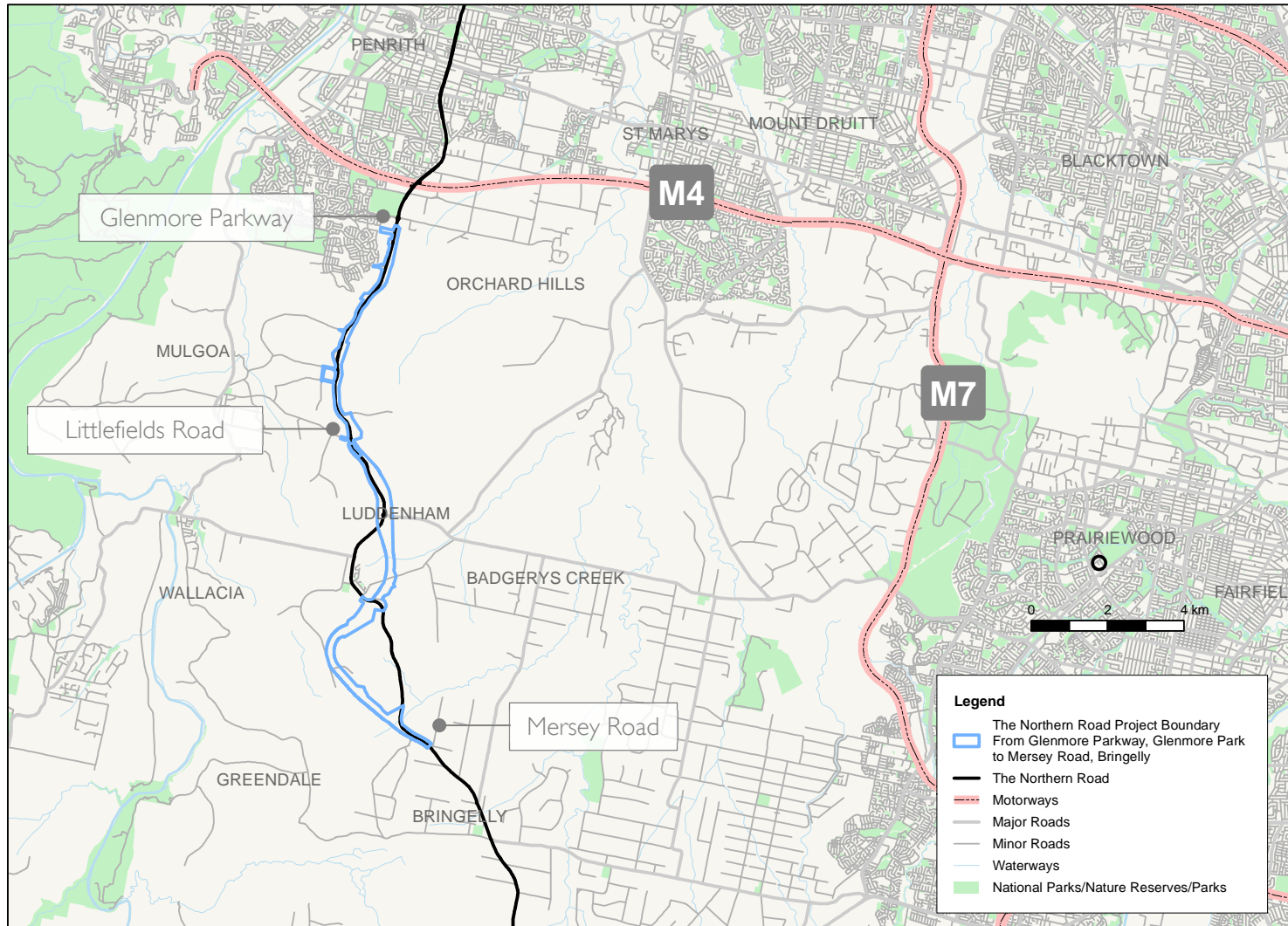
The entire remaining length of the upgrade will be designed for 90 kilometres per hour, but likely operated at 80 kilometres per hour.

The general location of the project is shown in Figure 1-1 while the specific locations of the project stages, represented by the blue and pink lines are presented in Figure 1-2.





**Figure 1-1: Regional context of the project (source: Roads and Maritime 2016)**



**Figure 1-2: Project location (source: Roads and Maritime 2016)**

### 1.3 Statutory process - NSW

Roads and Maritime formed the opinion that the project is likely to significantly affect the environment and requires the preparation of an EIS under the EP&A Act. Roads and Maritime's opinion remains the same in respect of the proposed amended SSI application and seeks the Secretary's approval to amend the SSI application under clause 192 of the Environmental Planning and Assessment Regulation 2000.

The project is permissible without consent under clause 94 of State Environmental Planning Policy (Infrastructure) 2007 (ISEPP), meaning it is an activity as defined in Part 5 of the EP&A Act and that Roads and Maritime is the determining authority.

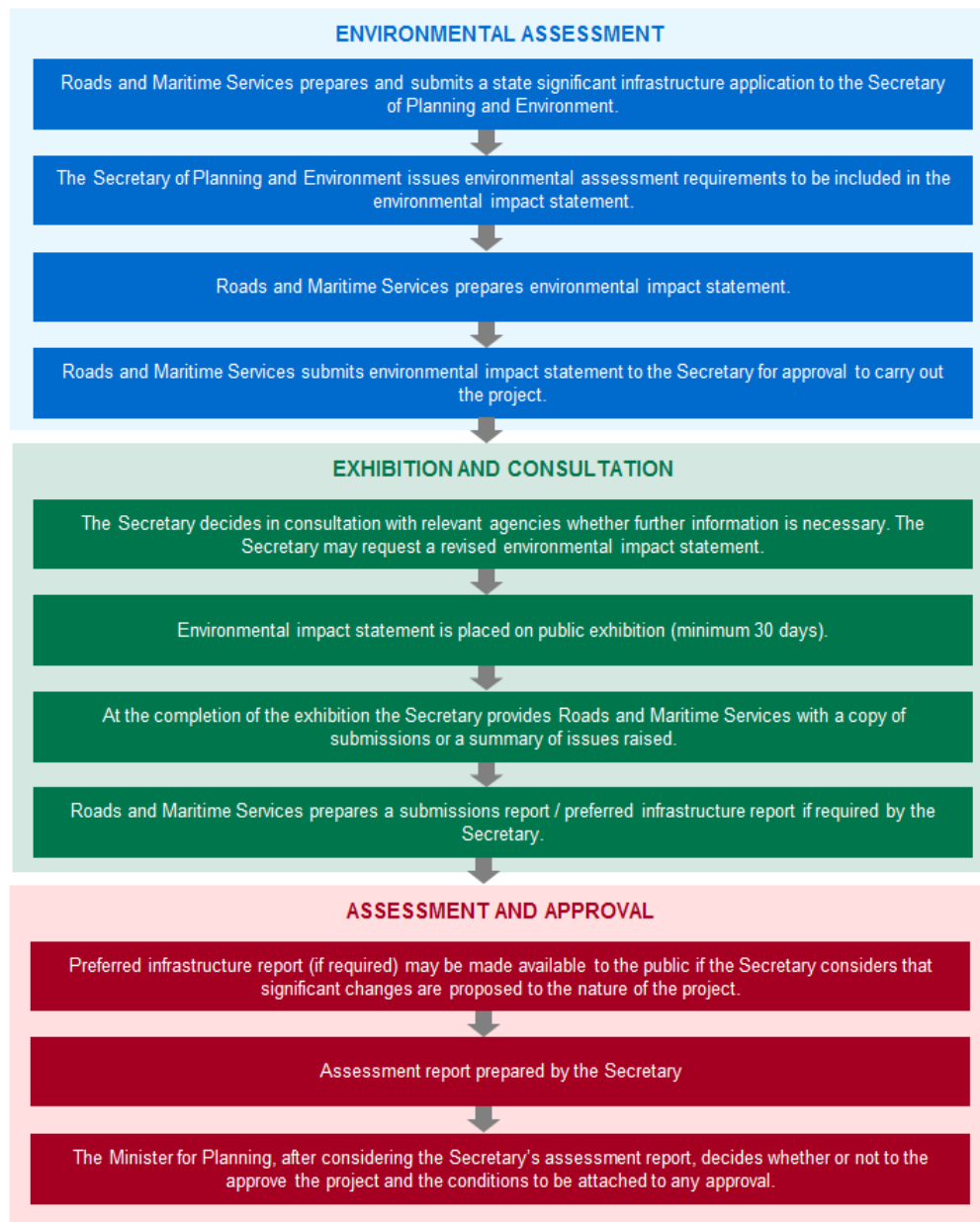
By virtue of the operation of s 115U of the EP&A Act and Schedule 3, Clause 1 of State Environmental Planning Policy (State and Regional Development) 2011, the project, therefore, remains as SSI, with the approval pathway in Figure 1-3.

The requirements of clause 192 of the Environmental Planning and Assessment Regulation 2000 for applications seeking approval of the Minister for Planning to carry out SSI are addressed in attachment A to this report.

### 1.4 Statutory process – Commonwealth

At this stage, it has not been determined if the project is a 'controlled action' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and will be considered during the EIS process.

In particular, there are areas of Commonwealth land that may be affected by the proposal. That includes lands currently included as part of the future Western Sydney Airport site and along the western boundary of the Orchard Hills Defence Establishment site. Roads and Maritime is continuing consultation with the Australian Government on these aspects of the proposal to confirm applicable requirements of the EPBC Act. The relationship and impacts of the proposal to these lands will be confirmed and assessed during preparation of the EIS.



**Figure 1-3: State significant infrastructure approval process**

## 1.5 Purpose of this report

The purpose of this report is to provide information in support of the application to amend the SSI application and assist the formulation of amended environmental assessment requirements by the Secretary under section 115Y of the EP&A Act, which would inform the preparation of the EIS. The application report does the following:

- Describes the amended project
- Considers the potential environmental issues for the amended project
- Identifies key environmental issues for the amended project.

This report and the amended SEARs will inform the preparation of an EIS for the project. The form and content of the EIS would be in accordance with clauses 6 and 7 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

## 2 Background

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This chapter describes why the project is needed, the project objectives, consistency with strategic planning, and the process of options assessment and short-listing route alignment options for The Northern Road Upgrade from Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park.

### 2.1 Project need

The Northern Road is one of the principal transport corridors in the south west region of Sydney. While the existing configuration of The Northern Road has generally provided adequate service to local and regional communities up to this point in time, there are a number of key current and emerging issues which will necessitate upgrading to meet the needs of existing and future road users.

The Northern Road Corridor Strategy (RTA 2009) forecast an increase in population and traffic (approximately seven per cent per year) that would exceed overall carrying capacity in peak periods, with almost all intersections providing inadequate service by 2026 resulting in severe congestion. Existing operational concerns within The Northern Road are increasingly evident with a number of intersections currently performing at low levels of service, with severe queuing and congestion occurring during both AM and PM peaks. The current two-lane nature of the road provides minimal overtaking opportunities and has a poor safety record.

Since The Northern Road Corridor Strategy was completed a number of large scale planning initiatives have progressed that will also lead to significant increases in traffic demand. These include:

- Development of the South West Priority Growth Area (SWPGA) – which is about 17,000 hectares in size, includes parts of the Liverpool, Camden and Campbelltown local government areas and will contain about 110,000 new dwellings for 300,000 residents
- Establishment of the Broader Western Sydney Employment Area (BWSEA) – which will provide an area of 6,300 hectares of new employment land, with employment predominantly in freight and logistics
- Planning for the proposed Western Sydney Airport at Badgerys Creek.

Upgrading The Northern Road would address areas of emerging poor performance and its strategic long-term importance. Specifically, it would:

- Increase the road capacity of The Northern Road corridor. This would respond to traffic demand resulting from future planned development and land use change
- Improve accessibility to the proposed Western Sydney Airport, SWPGA and BWSEA
- Provide economic benefits that are well in excess of the expected costs, as a result of increased efficiency of freight and reduced travel times
- Cater for population growth in the region
- Resolve a number of existing operational issues
- Improve safety, efficiency and amenity of the road network
- Promote sustainability through provision for public and active transport links.

## 2.2 Consistency with strategic planning

The project would be consistent with strategic planning directions, as documented in the following reports:

- *Western Sydney Infrastructure Plan*: The plan has been prepared to support the development of the proposed Western Sydney Airport, Broader Western Sydney Employment Area and the South West Priority Growth Area through road development including The Northern Road upgrade, Bringelly Road upgrade, a new motorway between the M7 and The Northern Road and the Werrington Arterial Road Stage 1 upgrade.
- *The NSW Long Term Transport Master Plan (TfNSW, 2012)*: The project supports the Plan's vision by providing infrastructure to sustain growth and improve accessibility in greater Sydney. The upgrade project is consistent with this plan as it would cater for predicted increases in traffic and provide accessibility into the SWPGA.
- *The State Infrastructure Strategy 2012-2032 (NSW Government, 2012a)*: The strategy recognises the importance of the South West Priority Growth Area in catering for future population growth in the Sydney region and identifies a number of projects to cater for this growth, including The Northern Road upgrade.
- *NSW Bike Plan*: The NSW Bike Plan is a comprehensive plan to encourage people to ride more often and more safely in NSW. Provision would be made for pedestrian and cycle facilities as part of The Northern Road Upgrade from Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park.
- *A Plan for Growing Sydney (DPE, 2014)* – the Plan provides the framework for strengthening Sydney's global competitiveness and delivering strong investment and jobs growth in Western Sydney. The Northern Road upgrade is identified as one of the major transport projects needed to support delivery of the Plan.
- *The Metropolitan Transport Plan – Connecting the City of Cities (DoP, 2007b)*: The plan aims to effectively link Sydney's land use planning with its transport network in the long term. The Northern Road upgrade aims to meet the demand of projected traffic growth associated with the development of the SWPGA, BWSEA, and the proposed Western Sydney Airport. It would provide improved connectivity for road and freight routes while also improving facilities for pedestrians, cyclists and public transport.
- *Sydney South West Sub-Regional Strategy (NSW Government 2007)*: The Plan and associated strategy recognise the major arterial road networks require upgrades and extension to service the SWPGA. The strategy sets out the vision for the management and development of the sub-region to 2031, by providing a framework for the long-term development of the area, guiding government investment and linking local and state planning issues.
- *The Northern Road Corridor Strategy (RTA, 2009)*: The project supports the implementation of effective and integrated regional transport systems, with a focus on road, bus and freight movement.
- *Broader Western Sydney Employment Area Draft Structure Plan*: The Northern Road provides a key connection between Mersey Road and Elizabeth Drive to provide access to the BWSEA.
- *Broader Western Sydney Employment Area Draft Structure Plan – Transport Planning – Preliminary Analysis Report*: The Preliminary Transport Analysis identifies The Northern Road as providing a north-south link along the western boundary of the BWSEA which services connectivity into the region primarily from the M4 Motorway and to a lesser extent from Bringelly Road and the southern end of The Northern Road.

## 2.3 Project objectives

The project will deliver a combination of new, additional and renewed infrastructure. Primary project objectives have been developed to ensure the preferred option maximises the benefits of the project, while considering the broader strategic context. They also address the identified existing operational risks and strategic need for the project. Supporting project development criteria have been developed in conjunction with these objectives to inform the final preferred options.

The Northern Road upgrade from Littlefields Road, Luddenham to Glenmore Parkway, Glenmore Park project objectives are to:

- Improve transport connections from the Penrith region and M4 Motorway to the proposed Western Sydney Airport and surrounding developments including the SWPGA and BWSEA
- Improve road safety
- Support freight movement to efficiently address the growing freight task
- Cater for future traffic demand to improve the flow of traffic to provide reliable journeys
- Improve facilities for public and active transport to promote sustainable and efficient journeys.

The supporting project development criteria are to:

- Minimise environmental impacts
- Deliver a cost effective proposal.

The Northern Road Upgrade from Mersey Road, Bringelly to Littlefields Road, Luddenham project objectives are to:

- Realignment of The Northern Road around the proposed Western Sydney Airport site to allow construction and facilitation of the proposed airport
- Improve transport connections to the proposed Western Sydney Airport and surrounding developments including the SWPGA and BWSEA
- Cater for future traffic demand to improve the flow of traffic to provide reliable journeys
- Improve facilities for public and active transport to promote sustainable and efficient journeys.

The supporting project development criteria are to:

- Minimise environmental impacts
- Deliver a cost effective proposal
- Improve road safety
- Maintain arterial road function
- Provide access to the south western end of the proposed Western Sydney Airport.



## 2.4 Selection of the preferred route

### *Littlefields Road, Luddenham to Glenmore Parkway, Glenmore Park*

The upgrade will utilise the existing alignment, with widening to the east of the current road corridor. An options assessment was conducted through an Options and Scoping Value Management Workshop on 23 March 2015.

The workshop, and subsequent investigations, determined the preference is to expand the road to the eastern side of the existing corridor for up to eight lanes.

### *Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park*

The existing alignment of the upgrade between Littlefields Road, Luddenham and Mersey Road, Bringelly crosses a substantial portion of the proposed Western Sydney Airport site; therefore, Roads and Maritime have investigated alternative route options to bypass the proposed Western Sydney Airport site, while maintaining the north-south road corridor.

The strategic route option study identified twelve route alignment options (Figure 2-1). These were shortlisted to four route alignment options during a strategic route options short-listing workshop (Figure 2-2). The four options were:

- Town Centre
- Campbell Street
- West Luddenham
- East Luddenham.

These options were displayed to the community in July and August 2015 to:

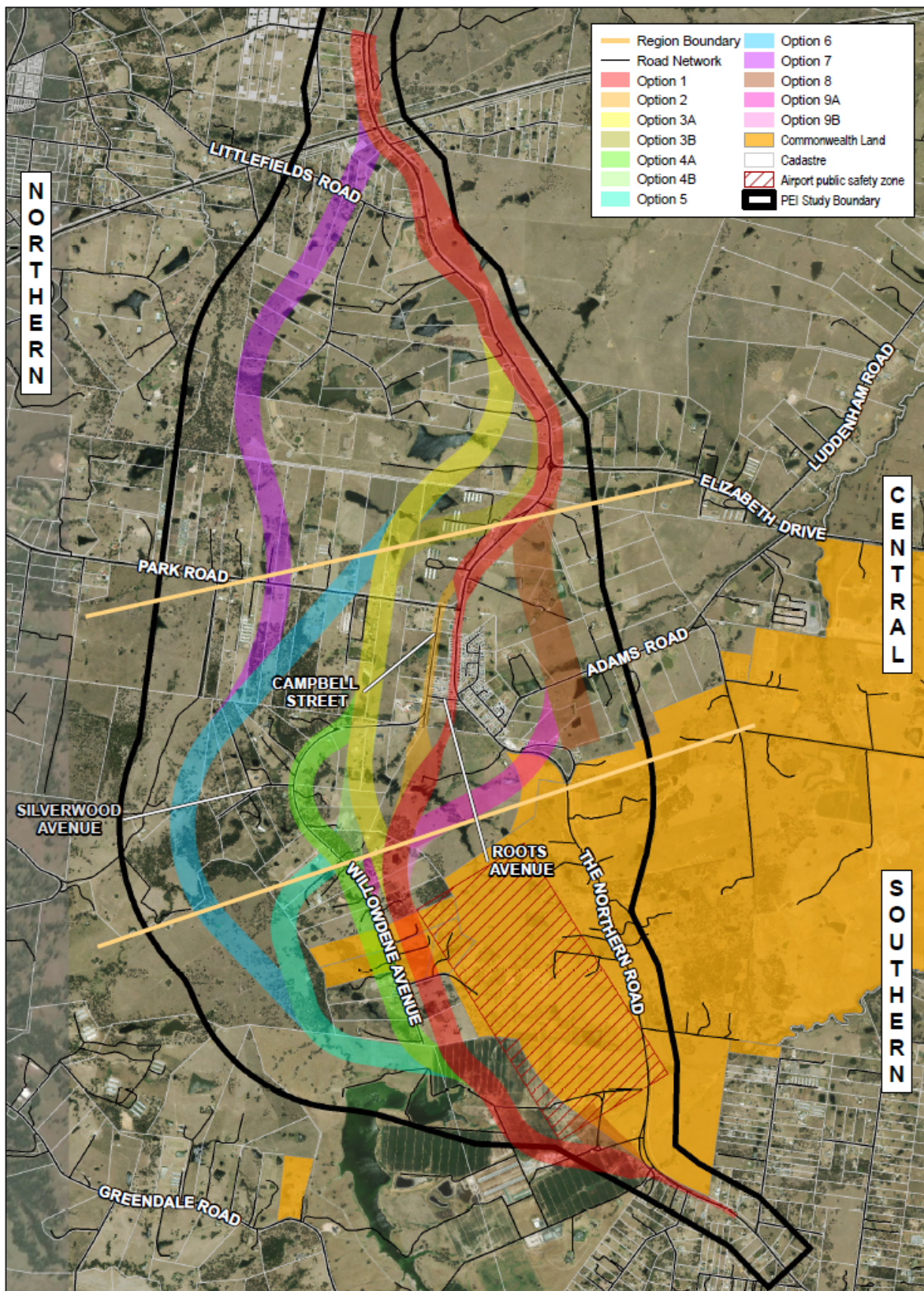
- Raise awareness of the project
- Engage with key stakeholders and affected local communities early in the planning process, so issues raised can help inform the concept design
- Allow face to face dialogue between community members and the project team
- Engage early with property owners about the potential need for property acquisition for the construction and operation of the bypass.

Field investigations were commenced in July 2015. Economic analysis, further design work and costing commenced in May 2015. A preferred option workshop was conducted in September 2015, which assessed the four options and the community feedback. The eastern option (Figure 2-3) was selected and the subsequent report provides details of the selection process for the preferred route – <http://www.rms.nsw.gov.au/documents/projects/sydney-west/infrastructure-plan/wsip-community-consultation-report-1510.pdf>.

Updates will be made available to the community as the project progresses on the Roads and Maritime project website at

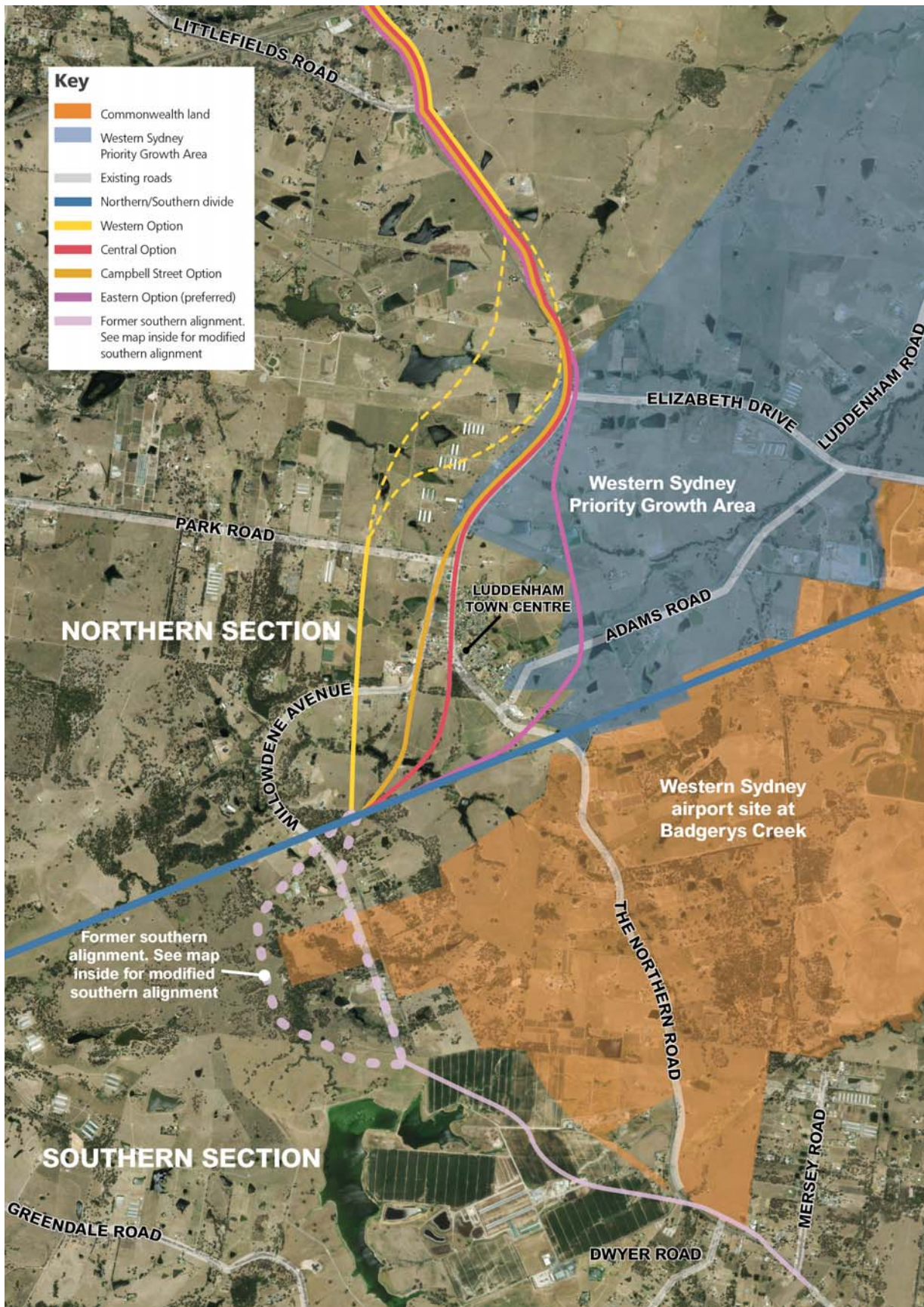
<http://www.rms.nsw.gov.au/projects/sydney-west/bringelly-the-northern-road-upgrade/stage-4.html>. The EIS (covering the entire project – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park) is expected to be placed on public exhibition in late 2016 where the community can provide feedback.





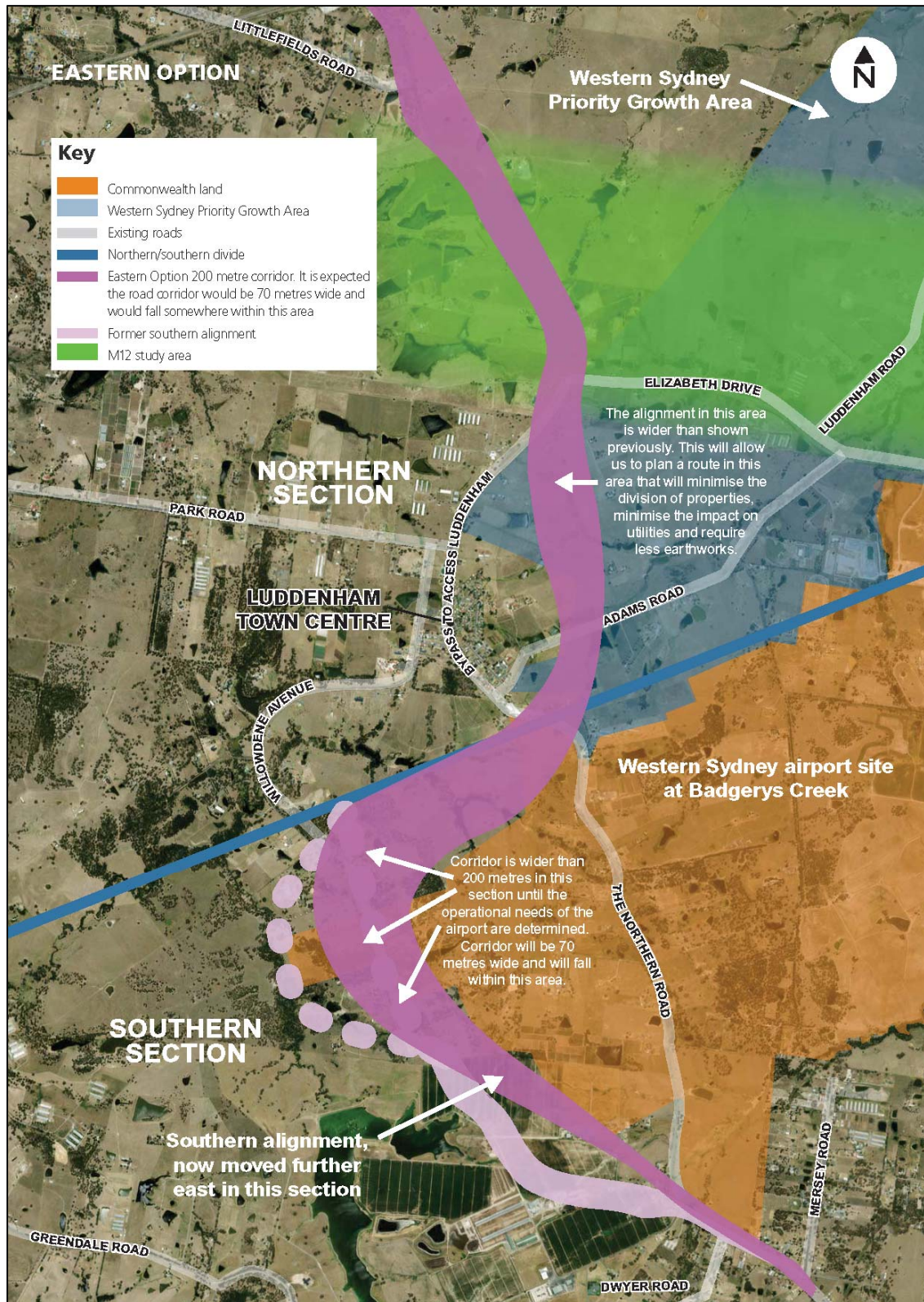
**Figure 2-1: The Northern Road from Mersey Road, Bringelly to Littlefields Road, Luddenham – Route Options (source: Parsons Brinckerhoff 2015)**





**Figure 2-2: The Northern Road from Mersey Road, Bringelly to Littlefields Road, Luddenham – Shortlisted Route Options (source: Roads and Maritime 2015)**





**Figure 2-3: The Northern Road from Mersey Road, Bringelly to Littlefields Road, Luddenham – Preferred Route Options (source: Roads and Maritime 2015)**

### **Project description**

The upgrade of The Northern Road (Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park) was announced as part of the Western Sydney Infrastructure Plan, following the Australian Government's decision to proceed with the Western Sydney Airport in April 2014. The Northern Road upgrade from Littlefields Road, Luddenham to Glenmore Parkway, Glenmore Park is 5 kilometres in length and will occur between Glenmore Parkway, Glenmore Park and Littlefields Road, Luddenham. The Northern Road upgrade from Mersey Road, Bringelly to Littlefields Road, Luddenham is approximately 11 kilometres.

The upgrade will provide for up to eight lanes between Glenmore Parkway, Glenmore Park and Mersey Road, Bringelly, including two bus lanes. The upgrade would be designed for 90km/h, but likely operate at 80km/h. The upgrade would also include shared paths for pedestrians and cyclists.

From Littlefields Road, Luddenham to Glenmore Parkway, Glenmore Park the upgrade would include new signalised intersections at some intersections, widening of existing intersections and changed accesses to improve safety and corridor capacity. The upgrade is expected to include a range of renewed and formalised infrastructure such as bridges, retaining walls, drainage, safety barriers and lighting. The existing heavy vehicle enforcement bays are proposed to be relocated along the corridor.

From Mersey Road, Bringelly to Littlefields Road, Luddenham the upgrade will involve realignment of the existing road corridor around the proposed Western Sydney Airport site to facilitate the construction and ongoing operation of the airport.

The capital investment value of the project is about \$500 million.

## **2.5 Key project components**

### **2.5.1 Alignment**

The Northern Road will generally follow the existing alignment between Glenmore Parkway, Glenmore Park and Littlefields Road, Luddenham.

South of Littlefields Road, The Northern Road will be realigned. This is necessary as the current alignment crosses the proposed Western Sydney Airport site at Badgerys Creek.

### **2.5.2 Intersections and Interchanges**

Intersections likely to change are included in this section, as follows. These will be further investigated and refined during preparation of the EIS and may include additional intersection upgrades.

#### ***Bradley Street Intersection***

The existing intersection of Bradley Street and The Northern Road would be upgraded to a signalised intersection, with a U-turn area located on the eastern side of the Bradley Street traffic lights. All movements would be permitted in addition to the southbound U-turn bay.

#### ***Defence Establishment Entrance***

The existing intersection of the Defence Establishment at Orchard Hills Street and The Northern Road would be upgraded to a signalised intersection, with a U-turn area located on the western side of the Defence Establishment traffic lights. All movements would be permitted in addition to the U-turn bay.

#### ***Chain-O-Ponds Road***

The existing intersection of Chain-O-Ponds Road and The Northern Road would be upgraded to a signalised intersection, with all movements permitted.

#### *Grover Crescent (north) Intersection*

The current northern connection between Grover Crescent and The Northern Road would be reconfigured, providing for left in and left out access between the two roads as well as providing for a combined southbound entry to Grover Crescent incorporating a U-turn bay. A northbound heavy vehicle bay is proposed just south of this connection, located between The Northern Road and Grover Crescent (north and south).

#### *Grover Crescent (south) and King Hill Road Intersection*

The existing intersection of Kings Hills Road and The Northern Road would be upgraded to a signalised intersection, with all movements permitted. While the current connection between Grover Crescent (south) and The Northern Road would be removed.

#### *Longview Road Intersection*

The existing connection between Longview Road and The Northern Road would provide left in and left out access only between the two roads. A new road link would be provided connecting Longview Road and Kings Hills Road, with the intersection between Kings Hills Road and The Northern Road providing for all movements.

#### *Gates Road Intersection*

The existing intersection of Gates Road and The Northern Road had been proposed to be upgraded to a signalised intersection, with all movements permitted. However, the geometry on approach to the site from the north would not allow for a traffic signal site to be safely provided for. A left in and left out only arrangement is currently being explored. This would require either a U-turn site to be located south of Gates Road for vehicles wishing to exit Gates Road and ultimately travel north. Alternately a connection from a new eastern connection at Littlefields Road may be provided to provide this functionality.

#### *Littlefields Road*

The existing intersection of Littlefields Road and The Northern Road would be upgraded to a signalised intersection, with all movements permitted.

#### *Interchange at the M12 Motorway*

It is proposed to connect the M12 Motorway with The Northern Road. This connection would be located between Elizabeth Drive and Littlefields Road. Subject to further investigations, the connection could be grade separated and would be provided as part of the M12 Motorway project.

#### *Elizabeth Drive Intersection*

It is proposed that there will be a connection with traffic lights between the new The Northern Road, the existing The Northern Road and Elizabeth Drive, with all movements permitted. The exact location of this connection is yet to be confirmed. Changes to the alignment of either Elizabeth Drive or the existing The Northern Road may be needed.

#### *Adams Road Intersection*

The realigned The Northern Road would pass over the top of the existing Adams Road to the east of Luddenham. There would be no connection between Adams road and the realigned The Northern Road.

#### *Eaton Road Intersection*

The realigned The Northern Road will bisect Eaton Road. To the east of the realigned The Northern Road, Eaton Road will be accessed via a left in, left out access at the existing The Northern Road and have a cul-de-sac at its western extent. To the east of the realigned The Northern Road, Eaton Road will connect at an upgraded intersection and have a cul-de-sac at its western extent.

*The existing The Northern Road Luddenham*

A new intersection controlled by traffic signals providing for all movements would be provided between the existing The Northern Road and the realigned The Northern Road south of Luddenham.

*Western service entry to proposed western Sydney airport*

A new traffic signal controlled intersection would be located on the realigned The Northern Road at the western service entry to airport site. The intersection would include a U-turn area on the western side of the realignment.

*Dwyer Road Intersection*

The existing connection between Dwyer Road and the upgraded The Northern Road would provide left in and left out access only between the two roads.

### **2.5.3 Bridges**

A number of bridges would be required to cross physical constraints, may include and not be limited to:

- Water courses (including Badgerys Creek, Duncans Creek, Mulgoa Creek and Cosgrove Creek)
- Floodways.

### **2.5.4 Ancillary facilities**

Ancillary facilities would be required to enable the construction and operation of the project, including, but not limited to, the following:

- Construction site fences
- Temporary sediment and erosion control measures and other environmental controls
- Temporary signage
- Construction compounds
- Crane and hard stand area set up
- Stockpile sites (temporary and permanently incorporated into the finished work)
- Temporary site accesses
- Concrete batching plant(s)
- Temporary road diversions
- Potential operational Incident Response Facility.

### **2.5.5 Estimated project schedules & staging**

The following are estimated project schedules and staging, subject to change:

Early / preliminary work – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park	Mid 2017
Main work – Mersey Road, Bringelly to Littlefields Road, Luddenham	Late 2017

Operation – Mersey Road, Bringelly to Littlefields Road, Luddenham	End 2019
Main work – Littlefields Road, Luddenham to Glenmore Parkway, Glenmore Park	Mid 2018
Operation – Littlefields Road, Luddenham to Glenmore Parkway, Glenmore Park	End 2020

## 3 Key environmental issues

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### 3.1 Overview

Roads and Maritime engaged NGH Environmental to prepare a preliminary environmental investigation (PEI) for the project in March 2015, with the study area being from Mersey Road, Bringelly in the south to Bringelly Road/Caddens Road, Penrith about 19 kilometres to the north. The width of the study area varied as follows:

- **North of Elizabeth Drive** – about 250 metres either side of The Northern Road. This width was considered appropriate as the project follows the existing alignment in this area.
- **South of Elizabeth Drive** – about 1,500 metres wide. This broader area was considered as options for the new alignment were under consideration at that time (refer section 2.4).

The outcomes of the PEI indicate the following key environmental issues will require further detailed assessment, via the EIS, and may require project specific impact mitigation measures. Issues associated with these key environmental issues are elaborated further in this chapter, as follows:

- Traffic and transport
- Flooding and hydrology
- Ecology
- Aboriginal heritage
- Non-Aboriginal heritage
- Noise and vibration
- Socio-economic
- Landscape and visual amenity
- Land use.

A number of other environmental issues have also been identified. These issues are outlined in Chapter 5 and are considered to be of lesser consequence taking into consideration the project scope, the existing environment and the implementation of standard management and safeguard measures. The potential impact of these other environmental issues will be assessed further in the EIS for the project.

### 3.2 Traffic and Transport

#### 3.2.1 Overview

The Northern Road is a north-south arterial road in western Sydney connecting the South West Priority Growth Area to the M4 Motorway and to Penrith. The Northern Road in the study area is generally a two-lane road with a speed limit of 80 kilometres per hour. The Northern Road forms an overpass over the M4 Motorway and there are signalised junctions at the motorway entry and exit ramps for northbound and southbound traffic.



### *Intersections*

There are numerous intersections along The Northern Road in the study, including:

- Mersey Road
- Dwyer Road
- Eaton Road (south)
- Eaton Road (north)
- Adams Road
- Roots Avenue
- Blaxland Avenue
- Park Road
- Elizabeth Drive
- Littlefields Road
- Gates Road
- Longview Road
- Kings Hill Road
- Grover Crescent (south)
- Grover Crescent (north)
- Chain-O-Ponds Road
- Bradley Street.

### *Access*

These roads as well as a number of unnamed roads connected directly to The Northern Road provide access to a number of facilities including:

- Private residences
- Businesses
- Orchard Hills Golf Club
- Orchard Hills Defence Establishment
- Luddenham Showground
- Sales Park
- Freeburn Park
- Willmington Reserve.

None of the intersections south of Glenmore Parkway are signalised. The intersections at Elizabeth Drive as well as at Glenmore Parkway/Wentworth Road are roundabouts.

A section of the proposed Western Sydney Airport site is located in the study area to the south east, and includes is traversed by the existing alignment of The Northern Road, south of Luddenham town centre.

### *Heavy Vehicles & Public Transport*

The Northern Road is a designated heavy vehicle route and can carry the following:

- 4.6 metre high vehicles
- 19 metre B-double vehicles
- 23 metre B-double vehicles
- 25/26 metre B-double vehicles.

Three existing bus services pass through the study area:

- 789 – on The Northern Road for the length of the study area, operated by Busways
- 794 – on The Northern Road from the M7 Motorway to Wentworth Road, operated by Busways
- 781 – crosses The Northern Road at Glenmore Parkway, operated by Busways.

### *Traffic Volumes*

The average daily traffic on The Northern Road was recorded in 2011 to the south of the study area, about 50 metres north of Dwyer Road (Roads and Maritime 2012).

The recorded volumes are provided in Table 4-1.

**Table 4-1: Average daily traffic**

Location	Average daily traffic (vehicles/day)	Average weekday traffic (vehicles/day)
The Northern Road, 50 metres north of Dwyer Road	10,467	11,075

### *Other Planned Projects*

Construction work on other potential projects in the area could provide opportunities and constraints, including:

- Future construction of the M12 Motorway between the M7 and The Northern Road. It is expected the M12 Motorway would be generally parallel to and in the vicinity of Elizabeth Drive.
- Construction of The Northern Road Stage 3 between about 300 metres south of Glenmore Parkway, Glenmore Park and Jamison Road, Penrith. There is about a 200 metres tie-in with the northern extent of this project.
- Construction of the proposed Western Sydney Airport – The Northern Road would be a key transport route to the airport during both construction and operation.
- Development of the South West Priority Growth Area – Construction work is generally to the east of the southern section of The Northern Road. The Austral and Leppington North precincts, in the north of the growth area, were rezoned in 2013. The timing of construction in these precincts depends on the availability of services and the demand for housing.

The Outer Sydney Orbital (M9) is identified in a number of strategic plans (refer to section 2.2). Transport for NSW is currently undertaking the Outer Sydney Orbital Corridor Preservation Study.

The Broader Western Sydney Employment Area Draft Structure Plan – Preliminary Transport Analysis (DPI 2013c) structure plan identifies one possible rail line that would cross and/or run along The Northern Road, being a freight line connection to the western line to the north and possibly to the Southern Sydney Freight Line to the south.

### *3.2.2 Summary of issues*

Considering extensive developments being planned in the region, the upgrade of The Northern Road is likely to improve traffic flow in the region.

Property access would be a constraint during widening work on The Northern Road. Along with numerous residential and businesses, The Northern Road provide direct access to the following:

- Orchard Hills Defence Establishment – The Northern Road, Orchard Hills
- Orchard Hills Golf Club – The Northern Road, Orchard Hills.

#### *Construction*

Construction of the project would require the use of heavy vehicles to deliver construction plant, equipment and materials as well as remove waste from the project site. The construction period would also result in increased use of light vehicles on the surrounding road network associated with the construction workforce. The introduction of additional heavy and light vehicles may result in deterioration of intersection and traffic performance on the surrounding road network.

In addition, the construction of the project would be likely to have the following impacts:

- Road traffic, pedestrians and cyclists would be likely to be temporarily disrupted due to the increased traffic volumes from construction vehicles. There would be the potential for safety impacts due to temporary road arrangements or the proximity of construction activities to normal traffic
- Temporary disruptions and delays to traffic due to the narrowing of lanes, speed restrictions, additional truck movements and temporary road closures
- The potential for a temporary shift of traffic movements from roads within the project area to alternative routes during peak periods as motorists try to avoid congestion caused by road work
- Temporary impacts on pedestrian and cycle access
- Increased bus travel times with consequent delays for commuters
- Vehicle access to some properties close to construction sites would potentially be impacted.

#### *Operation*

Once the project is operating, it would have the following potential impacts:

- Permanent changes to existing traffic movements and permanent road modifications
- Alterations to pedestrian movements at existing intersections
- Alterations to existing property accesses.

The project would have the following benefits:

- The ability to separate longer distance/through traffic and local trips
- Reduction in overall travel times for longer distance business and freight trips

- Improvement in travel time reliability for public transport, freight, businesses and commuters
- Improved resilience to the traffic network capacity requirements during wet weather and flooding
- Improved resilience to the traffic network capacity requirements during peak periods
- An improved level of safety and a likely significantly reduced crash rate
- A possible Incident Response Facility.

### 3.2.3 Proposed further assessments

Roads and Maritime will carry out a more detailed assessment of the traffic, access and safety impacts of the project. The assessment will use traffic modelling to assess traffic impacts associated with the construction and operation of the project. The assessment will identify traffic impacts and undertake an assessment of existing local and regional traffic volumes and traffic patterns against forecast volumes and potential changes to traffic patterns associated with the project. The assessment will include:

- An assessment of interchange, intersection, road link and network capacity options to provide clear recommendations for input into the design
- Assessment of the traffic related impacts arising from construction vehicles as well as any changes in the road network as a result of construction activities
- Assessment of the traffic related impacts generally arising from completion of the project (the 'do something') as well as those that could be expected from the 'do nothing/do minimal' scenario, including assessment of impacts of the project on road users such as motorists, public transport, pedestrians and cyclists
- Analysis of historical crash data to ascertain the safety of the road network as well as outline the improvement in crash safety that would be likely to result from construction of the project
- The future development of the Outer Sydney Orbital (M9) and potential access to the route will be considered during the concept design, where possible
- The future development of freight and passenger rail lines will be considered during the concept designs, where possible.

## 3.3 Hydrology

### 3.3.1 Overview

Based on preliminary research, the waterways within the study area are deemed Class 2 or 3 waterways in accordance with Fairfull and Witheridge (2003) (see Table 4-2). Field surveys would be required to confirm these findings.

**Table 4-2: Assessment of waterways within the study area**

Feature					
Waterway	Mulgoa Creek	Cosgroves Creek	Badgerys Creek	Jerrys Creek	Duncans Creek
Class*1	Class 2-3	Class 2-3	Class 2-3	Class 2-3	Class 2-3
	Further investigation	Further investigation	Further investigation	Further investigation	Further investigation
Order*2	1st Order	1st Order	1st Order	1st Order	1 <sup>st</sup> Order
Key Fish Habitat*3	Yes	Yes	Yes	Yes	Yes

\*1 According to Fairfull and Witheridge (2003)

\*2 According to Strahler (1952)

\*3 According to DPI Fisheries mapping

### 3.3.2 *Summary of issues*

#### *Construction*

The construction of the project would need to consider the following issues:

- A large flood during construction may have the potential to impact construction work
- Temporary waterway crossings may likely be required, which would have potential impacts on flow regimes
- Watercourses may be required to be realigned/relocated during construction, potentially altering the point of discharge
- A major rainfall event would have the potential to impact on construction and may cause surface and groundwater contamination
- Construction stockpiles, structures and equipment may have an impact on flood characteristics, including height of flood water, flood water velocity, flow paths, timing and flood storage.

#### *Operation*

A preliminary review indicates that there are up to four creek crossings along the proposed project where watercourses would require passage through the project, including Mulgoa Creek, Cosgroves Creek, Badgerys Creek, Jerrys Creek and Duncans Creek.

Once the project is operating, this may have the following potential impacts:

- Bridges/culverts and batters may change the velocity, location and flooding characteristics, including the time of inundation, depths, rates of recession and could cause scour (scour is the removal of soil material by river flow)
- Potential impact on water passages may occur through the various watercourses, including changes to peak flows and floodplain storage
- Improved traffic network resilience during flooding.

### 3.3.3 *Proposed further assessments*

Roads and Maritime will carry out an assessment of the flooding impacts of the project. The assessment will:

- Describe the existing flood and drainage conditions in catchments relevant to the project
- Establish existing scenario flood levels and velocities for a range of design storm events
- Identify minimum road elevations and sizing of bridges and culverts to address flood risks
- Identify impacts to flooding for a range of design storm events, and the probable maximum flood
- Consider the potential impacts of climate change and future development on flooding and the concept design
- Identify potential impacts from changes in flooding characteristics on properties and structures
- Provide input into the concept design to ensure the design meets required flood management objectives the project objective of providing minimum 20 year

average recurrence interval flood immunity, and identify feasible and reasonable mitigation measures to minimise impacts to flooding.

### 3.4 Ecology

#### 3.4.1 Overview

A search of the OEH BioNet Wildlife Atlas revealed 62 threatened species listed under the *Threatened Species Conservation Act 1995* (NSW) (TSC Act) recorded within 10 kilometres of The Northern Road section of the original larger study area. They include 1 reptile, 3 amphibian, 24 bird, 2 invertebrate, 14 mammal, and 18 flora species. Also, 26 endangered ecological communities (EECs) have the potential to occur within the locality. Of these threatened species and communities 1 bird, 1 invertebrate and 2 flora species have been recorded within the study area, as well as 1 EEC (Attachment B).

A search of the EPBC Act Protected Matters Search tool revealed 48 nationally listed threatened species listed on the EPBC Act within 10 kilometres of the study area. They include 5 amphibian, 6 bird, 2 fish, 6 mammal, 1 reptile, and 28 flora species. Furthermore, 12 migratory birds were included. In addition, 6 EECs have the potential to occur within 10 kilometres of The Northern Road study area. Of these species and communities, 1 bird, 2 flora and 1 community have been recorded within the original larger study area (Attachment B).

A search on the DPI Records Viewer revealed 4 threatened species for the Hawkesbury – Nepean Catchment. Further research revealed these species are unlikely to be occurring within the waterways of the original larger study area.

A search of the Atlas of Living Australia revealed 38 threatened species previously recorded within a 10 kilometre radius of the original larger study area. These records include records from the OEH BioNet Wildlife Atlas.

A search on the BOM Atlas of Ground Water Dependent Ecosystems found no groundwater dependent ecosystems occurring within The Northern Road section of the original larger study area.

Furthermore, a review of published reports was undertaken, including:

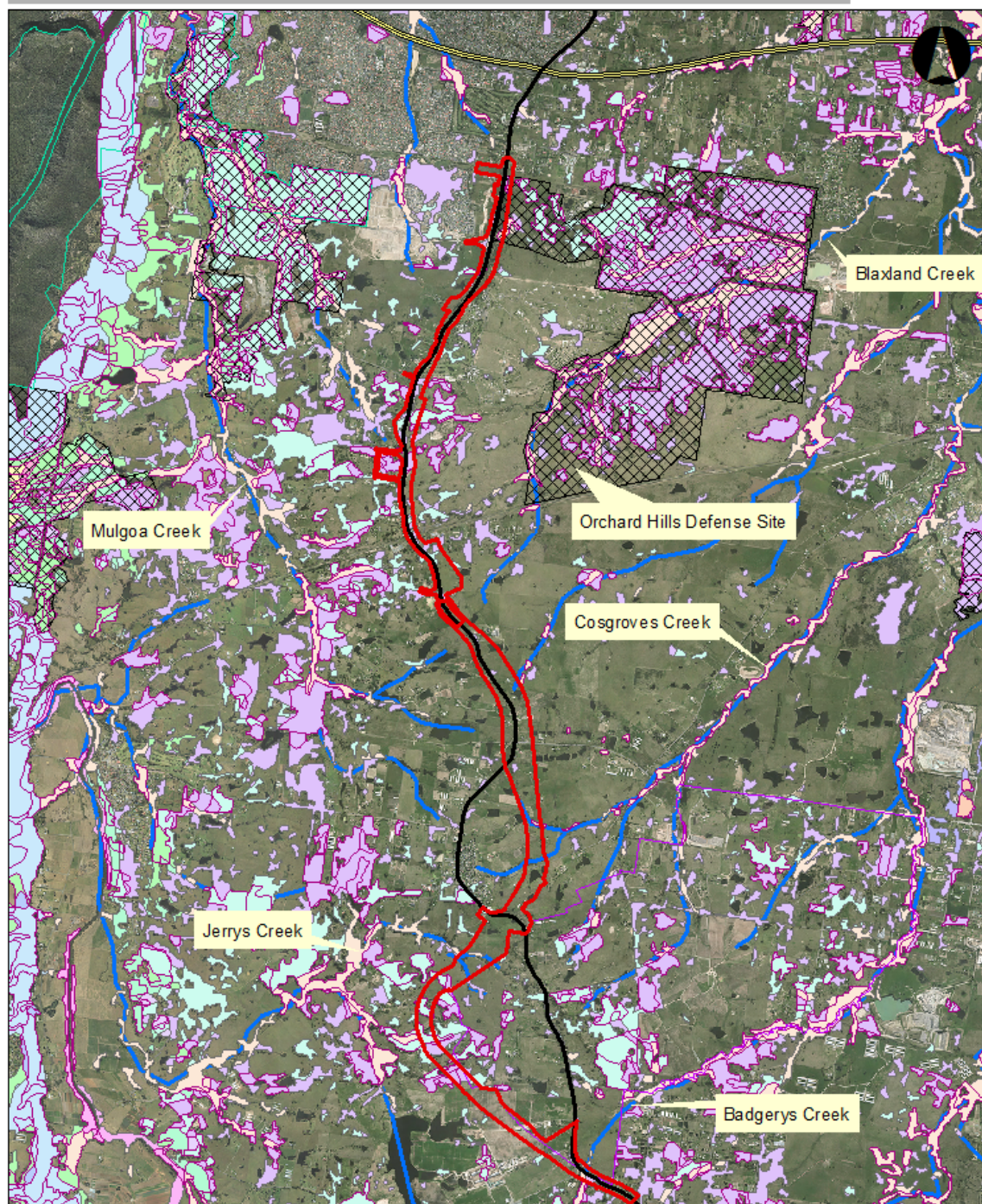
- The Broader Western Sydney Employment Area – Ecology Study (Eco Logical Australia 2013)
- Fairfield Biodiversity Strategy 2010 (Eco Logical Australia 2012a)
- Liverpool Biodiversity Management Plan 2012 (Eco Logical Australia 2012b)
- Biodiversity Strategy 2011-2020 Blacktown LGA (Eco Logical Australia 2011)
- The Cumberland Plain Recovery Plan (DECCW 2011b)
- Hawkesbury – Nepean Catchment Action Plan 2007- 2016 (Hawkesbury – Nepean CMA 2008)
- Penrith Biodiversity Strategy and Action Plan (Penrith City Council 2008b)
- Second Sydney Airport Draft Environmental Impact Statement (Dept. Transport and Regional Development 1997).

#### 3.4.2 Threatened species and ecological communities

A number of threatened plant and animal species and ecological communities listed under either NSW or Commonwealth legislation occur within the original larger study area (Figure 4-1 & Figure 4-2). The main endangered ecological community present is Cumberland Plain Woodland and its subtypes.



# The Northern Road - Endangered Ecological Communities (TSC Act)



<ul style="list-style-type: none"> <li>The Northern Road Project Boundary</li> <li>The Northern Road</li> <li>Waterways</li> <li>Assumed Airport Boundary</li> <li>NPWS Estate</li> <li>Endangered Ecological Communities</li> <li>Priority Conservation Lands</li> <li>1 - Shale Sandstone Transition Forest (Low Sandstone Influence)</li> </ul>	<ul style="list-style-type: none"> <li>10 - Shale Plains Woodland</li> <li>103 - Shale/Gravel Transition Forest</li> <li>11 - Alluvial Woodland</li> <li>12 - Riparian Forest</li> <li>14 - Moist Shale Woodland</li> <li>15 - Turpentine-Ironbark Forest</li> <li>2 - Shale Sandstone Transition Forest (High Sandstone Influence)</li> <li>3 - Cooks River-Castlereagh Ironbark Forest</li> </ul>	<ul style="list-style-type: none"> <li>31 - Sandstone Ridgeline Woodland</li> <li>32 - Upper Georges River Sandstone Woodland</li> <li>33 - Western Sandstone Gully Forest</li> <li>35 - Riparian Scrub</li> <li>36 - Freshwater Wetlands</li> <li>43 - Turpentine-Ironbark Margin Forest</li> <li>9 - Shale Hills Woodland</li> <li>9999 - Unclassified Vegetation</li> </ul>
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0 1 2 km

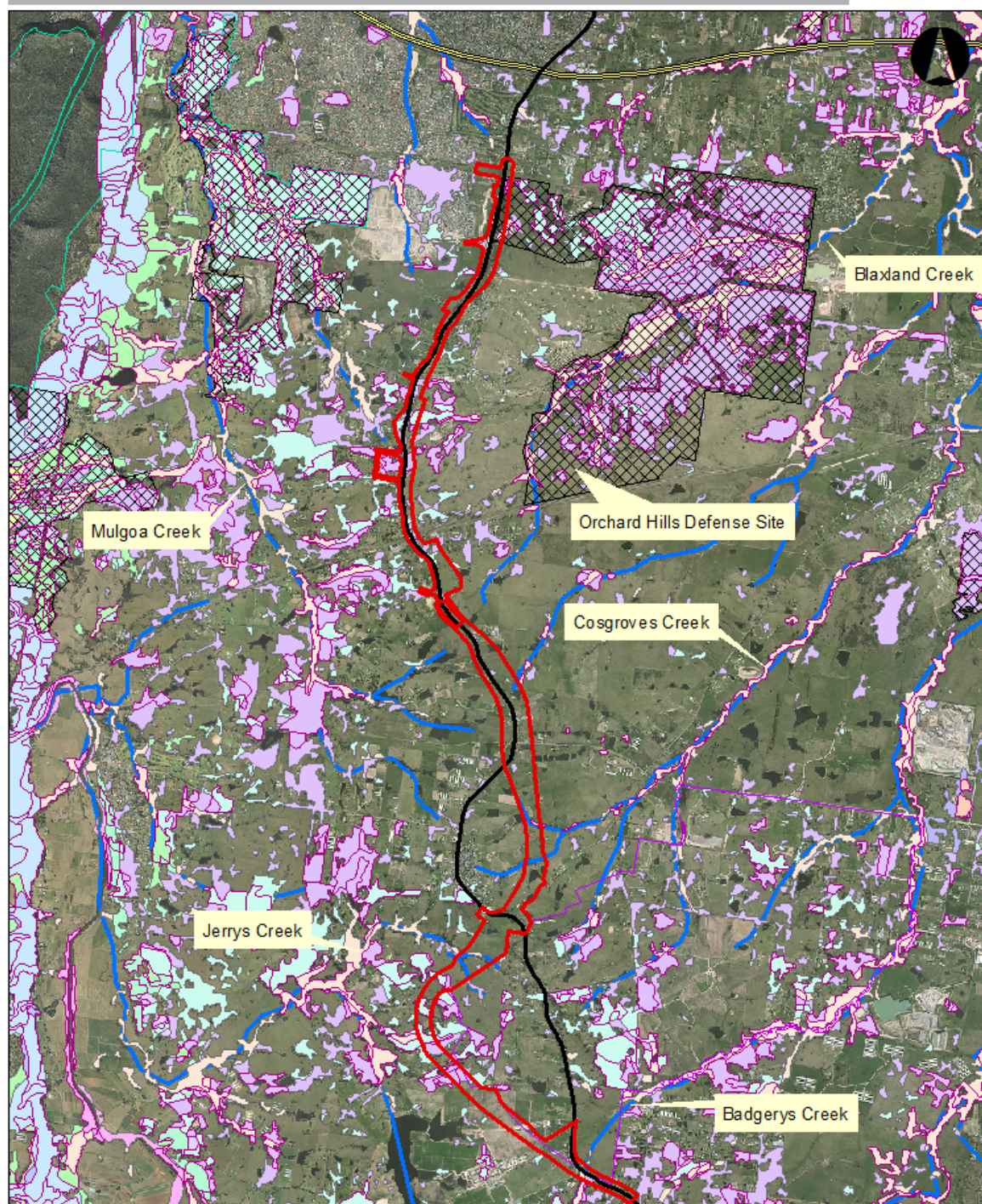
Original map sourced from The Northern Road PEI, June 2015 by Ngh Environmental

Amended by RMS January 2016

**Figure 4-1: Endangered Ecological Communities within and surrounding the study area under the TSC Act (source: Ngh Environmental 2015)**



# The Northern Road - Endangered Ecological Communities (TSC Act)



- The Northern Road Project Boundary
- The Northern Road
- Waterways
- Assumed Airport Boundary
- NPSW Estate
- Endangered Ecological Communities
- ⊠ Priority Conservation Lands
- 1 - Shale Sandstone Transition Forest (Low Sandstone Influence)
- 10 - Shale Plains Woodland
- 103 - Shale/Gravel Transition Forest
- 11 - Alluvial Woodland
- 12 - Riparian Forest
- 14 - Moist Shale Woodland
- 15 - Turpentine-Ironbark Forest
- 2 - Shale Sandstone Transition Forest (High Sandstone Influence)
- 3 - Cooks River Castlereagh Ironbark Forest
- 31 - Sandstone Ridgeline Woodland
- 32 - Upper Georges River Sandstone Woodland
- 33 - Western Sandstone Gully Forest
- 35 - Riparian Scrub
- 36 - Freshwater Wetlands
- 43 - Turpentine-Ironbark Margin Forest
- 9 - Shale Hills Woodland
- 9999 - Unclassified Vegetation

0 1 2 km

Original map sourced from The Northern Road PEI, June 2015 by Ngh Environmental

Amended by RMS January 2016

**Figure 4-2: Endangered Ecological Communities within and surrounding the study area under the EPBC Act (source: Ngh Environmental 2015)**



#### *Fauna habitat*

Previous reports have suggested the habitat within the original larger study area has been highly altered with introduced flora and fauna evident (Eco Logical Australia 2013). Similarly, the riparian habitats have been reported to be in fairly low condition, offering limited breeding and foraging opportunities for fauna (SKM 2012).

The remnant patches of woodland within the original larger study area would offer foraging and breeding opportunities for woodland birds, small and arboreal mammals, small reptiles and the Cumberland Plain Land Snail. The aquatic creek systems would also offer foraging and breeding opportunities for woodland and aquatic birds, arboreal and mammals, small reptiles and aquatic fauna. The cleared lands offer limited recourses for native fauna; however, grazers such as Eastern Grey Kangaroos may use this habitat.

#### *Aquatic Fauna*

No threatened aquatic fauna has been recorded within a 10 kilometre area of the original larger study area.

The study area occurs within the Hawkesbury/Nepean Catchment. A high number of farm dams are located within the study area may have the potential to provide habitat for aquatic species. In particular, large water bodies are located to the west of The Northern Road near Elizabeth Drive. Further, Duncan's Creek fills out into a large body of water in the south of the study area.

#### *Habitat connectivity*

There is limited contiguous habitat connectivity within the study area. The southern section of the study area is connected through riparian habitat along Badgerys Creek which extends north and south from the study area. Habitat connectivity also occurs through Duncan's Creek and its tributaries, eventually leading to an open water expanse.

Similarly, the mid and northern sections of the study area have riparian habitat connection through Mulgoa Creek and its tributaries, Surveyors Creek Nature Reserve and then through to the east into the Orchard Hills Defence Establishment site. This remnant patch of woodland is one of the largest intact remnant patches of Cumberland Plain Woodland and likely provides habitat for a suite of woodland flora and fauna species. This area is identified as a Priority Conservation Land (PCL) in the Cumberland Plain Recovery Plan (DECCW 2011b). It is also included on the Commonwealth Heritage list.

Some habitat connectivity also exists along The Northern Road where remnant trees and shrubs allow for fauna movements within the road corridor. This road habitat corridor is important for wildlife movements in an otherwise largely cleared landscape. Finally, much of the woodland habitat in the south-east of the study area is loosely connected.

Despite the limited contiguous habitat connectivity within the study area, the existing habitat is likely to provide stepping-stone connections. In this regard, there is a broad east-west connection in the northern part of the study area, which links from Prospect Reservoir, through Erskine Park, across Ropes Creek, Orchard Hills Defence Site, Mulgoa Nature Reserve (next to Glenmore Park) and then to the base of the Blue Mountains.

#### *Conservation areas*

A 'BioBank site' exists adjacent to Glenmore Park Stage 2, but it is not expected to be impacted by the project. Similarly, Mulgoa Nature Reserve occurs to the west of Glenmore Park and will not be impacted by the proposal.

As noted above, the Orchard Hills Defence Establishment site is identified as a Priority Conservation Land (PCL) in the Cumberland Plain Recovery Plan.

### *3.4.3 Summary of issues*

#### *Construction*

The construction impacts associated with the project will be determined during preparation of the EIS. The construction of the project may have the following impacts:

- Clearing and disturbance of habitat that is likely to contain threatened fauna, including the Cumberland Plain Land Snail and several species of threatened terrestrial bird
- Potential clearing and/or disturbance of EECs, including Cumberland Plain Woodland
- Potential loss of connectivity between habitat areas resulting in habitat fragmentation and edge effects
- Clearing of native vegetation
- Animal strike during the construction of the project
- Potential introduction and/or spread of weeds, including noxious weeds
- Potential impacts on aquatic environments (both within and outside the proposed motorway alignment), habitats and species as a result of potential mobilisation of sediments and pollutants
- Removal of habitat, including riparian vegetation.

#### *Operation*

Once the project is operating, it may have the following potential impact:

- Lighting may potentially impact bats and other animal species, for example some nocturnal species may avoid the area, while lighting may attract insects providing a food source for micro-bats
- Increased likelihood of animal strike and possible increase in mortality/injury to animals
- Increased noise would potentially adversely impact some animal species
- Permanently altered habitat and connectivity.

#### 3.4.4 Proposed further assessments

During the development of the design and the preparation of the EIS, opportunities to avoid and minimise impacts to areas of ecological value will be explored. Roads and Maritime will carry out an assessment of impact on the ecological values of the project site and adjoining areas including terrestrial, riparian and aquatic areas. The assessment will be undertaken by an accredited consultant in accordance with the *NSW Biodiversity Offsets Policy for Major Projects*, including the *Framework for Biodiversity Assessment*.

At this stage, Roads and Maritime does not expect the project to have a significant impact on biodiversity matters listed under the EPBCA. Preparation of the EIS will include consideration of potential impacts to nationally listed biodiversity. That will include use of relevant survey guidelines, application of the *Matters of Environmental Significance – Significant Impact Guidelines* (DoE, 2013), and consideration of applicable recovery plans, threat abatement plans and conservation guidance.

If a potential significant impact on nationally listed biodiversity is identified during assessment of the project, Roads and Maritime will first endeavour to avoid that impact. However, if it is unavoidable then Roads and Maritime will initiate a referral to the Australian Government, which may then trigger application of the NSW Bilateral Agreement with respect to environmental assessment.

### 3.5 Aboriginal Heritage

#### 3.5.1 Overview

An extensive search of the OEH Aboriginal Heritage Information Management System (AHIMS) on the 1 February 2016 disclosed nine Aboriginal heritage items within the PEI study area. A summary of the AHIMS search is included in Table 4-3.

**Table 4-3: Summary of AHIMS search within The Northern Road PEI boundary**

Site ID	Site name	Site context	Site feature
45-5-0408	Mulgoa 1	Open site	Artefact
45-5-2617	B 31	Open site	Artefact
45-5-2618	B 32	Open site	Artefact
45-5-2629	B 39	Open site	Artefact
45-5-2636	B 6	Open site	Artefact
45-5-2642	B 24	Open site	Artefact
45-5-2643	B 25	Open site	Artefact
45-5-2670	B 92	Open site	Artefact
45-5-2671	B 91	Open site	Artefact

Of the nine Aboriginal sites identified, eight are grouped within a radius of about 1.7 km, located at the southern extent of the study area. The last remaining site is located at the northern edge of the study area.

As of 1 February 2016, there were no Native Title claims in the study area, with no other current claims in the study area identified in the National Native Title Tribunal Register.

### 3.6 Summary of issues

#### *Construction*

Nine aboriginal sites have been identified. Depending on the detailed design and location of proposed surface infrastructure and construction activities, impacts on these sites may occur. The potential impact on these sites will be determined during the preparation of the EIS. The project will be designed and constructed to first avoid and then minimise the potential direct and indirect impacts on the known Aboriginal heritage sites. However, given the nature of the surface infrastructure required, it may be not be possible to avoid direct and / or significant impacts to the sites.

There would be also potential for direct impacts on unknown or unidentified archaeological items that may be uncovered, disturbed, damaged or destroyed. This will be taken into consideration during the preparation of the EIS and associated management plans.

#### *Operation*

The operational impacts associated with the project will be determined during preparation of the EIS and based on the alignment determined during the concept design phase. Once the project is operating, the presence of the project may impact on any intrinsic Aboriginal cultural values of the area and any existing or potential Aboriginal sites within close proximity to the project.

#### *3.6.1 Proposed further assessments*

Roads and Maritime will prepare an Aboriginal Cultural Heritage Assessment Report in line with Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI). The assessment will:

- Summarise the findings and recommendations of the PACHCI Archaeological Survey Reports
- Identify and investigate the Aboriginal archaeological and cultural heritage values that are known or are predicted to be present by carrying out field surveys, test excavations and consultation with the registered Aboriginal stakeholders and Aboriginal knowledge holders, as required
- Prepare an assessment of known and potential impacts to Aboriginal objects, places and cultural values resulting from the construction and implementation of the project
- Identify feasible and reasonable mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the measures)
- Prepare Aboriginal heritage constraints mapping
- Provide recommendation on any further archaeological work that may be required prior to construction.

### 3.7 Non-Aboriginal Heritage

#### *3.7.1 Overview*

The following non-Aboriginal heritage databases were searched on 1 February 2016 and the results are summarised in Table 4-4 (for items within study area or adjacent):

- World Heritage List (sourced from Australian Heritage Database)
- National Heritage List (sourced from Australian Heritage Database)
- Commonwealth Heritage List (sourced from Australian Heritage Database)
- NSW State Heritage Register (sourced from State Heritage Inventory)
- Liverpool LEP 2008 (sourced from State Heritage Inventory)

- Penrith LEP 2010 (sourced from State Heritage Inventory)
- Register of the National Trust of Australia NSW (non-statutory)
- Royal Australian Institute of Architects 20th Century Register of Significant Buildings (non-statutory).

**Table 4-4: Summary of heritage findings**

Register	Listings
World Heritage List	None
National Heritage List	None
Commonwealth Heritage List	None
NSW State Heritage Register	None
RMS Section 170 Heritage and Conservation Register	None
Liverpool LEP	8 local heritage items
Penrith LEP	8 local heritage items
Register of the National Trust of Australia NSW	None
Royal Australian Institute of Architects 20th Century Register of Significant Buildings	None

A total of 16 recorded heritage items (Table 4-5) were identified within, or adjacent to the proposal area. All of these were listed on statutory registers and none were listed on non-statutory registers.

**Table 4-5: Listed heritage items within The Northern Road study area.**

Item	Location	Property description	Significance	LGA	SHI number
Lawson's Inn Site	The Northern Road, opposite junction with Eaton Road, Luddenham	Inn/tavern Archaeological	Local	Liverpool	1970051
Luddenham Public School	The Northern Road, Luddenham	School	Local	Liverpool	1970085
Vicary's Winery Group*	The Northern Road, Luddenham	Winery/vineyard	Local	Liverpool	1970098
Vicary's Winery Horse Shed (Former)	The Northern Road, Luddenham	Shed	Local	Liverpool	1970453
Vicary's Winery Main House and Garden	The Northern Road, Luddenham	Cottage	Local	Liverpool	1970454
Vicary's Winery Vineyard	The Northern Road, Luddenham	Vineyard / landscape	Local	Liverpool	1970159
Vicary's Winery Woolshed	The Northern Road, Luddenham	Woolshed / shearing shed	Local	Liverpool	1970162
Vicary's Winery, Wine Tasting and Cellar Door Sales Building	The Northern Road, Luddenham	Winery / commercial premises	Local	Liverpool	1970178
Brick Cottage	Park Road, Luddenham	Residential	Local	Penrith	2260116
Brick Cottage	Campbell St, Luddenham	Residential	Local	Penrith	2260117
Luddenham Progress Hall	The Northern Road, Luddenham	Community Hall	Local	Penrith	2260119
Luddenham Uniting Church	The Northern Road, Luddenham	Church	Local	Penrith	2260120
Luddenham Uniting Church Cemetery	The Northern Road, Luddenham	Cemetery/Graveyard	Local	Penrith	2260121
St. James Church of England Cemetery	The Northern Road, Luddenham	Cemetery/Graveyard	Local	Penrith	2260123
St. James Church of England	The Northern Road, Luddenham	Church	Local	Penrith	2260122
Timber Cottages	29 and 41 The Northern Road, Luddenham	Cottages	Local	Penrith	2260118

All of the 16 identified heritage items above are located in Luddenham within the study

area. It was noted that the Vicary's Winery Group listing included all individually listed buildings and structures within the same property. However, these items are still individually listed as the Vineyard, Woolshed, Horse Shed, Wine Tasting and Cellar Door Sales building and the Main Homestead.

### *3.7.2 Summary of issues*

#### *Construction*

The construction of the project may have both direct and indirect impact on non-Aboriginal heritage items. Direct impact refers to situations where the project would result in a physical change to the item and/or the construction footprint and/or road reserve boundary would be likely to occur on part of the property on which the item is located. Indirect impact refers to impact on the value of a heritage item where direct impact does not occur (such as visual impacts).

#### *Operation*

The operational impacts associated with the project will be determined during preparation of the EIS. Permanent changes to the vistas to and from listed heritage items adjacent to the project may occur.

### *3.7.3 Proposed further assessments*

Roads and Maritime will carry out an assessment of impacts on non-Aboriginal heritage. The assessment will:

- Describe the existing non-Aboriginal heritage and archaeological heritage values relevant to the project, including historic chronological mapping
- Include Statements of Heritage Impacts for all identified heritage items which could be directly or indirectly impacted within the project impact zone
- Identify feasible and reasonable mitigation and management measures, including measures to avoid significant impacts where possible.

## **3.8 Noise and vibration**

### *3.8.1 Overview*

The sound profile of the project area is typical of a mixed use rural and urban area. The background noise levels are largely influenced by road traffic, and vary in level due to traffic volumes and the distance from the road.

In some places the project area is close to suburban and rural-residential areas, for which the project would be a new or changed source of noise.

Sensitive receivers within the study area include residential properties, businesses, rural properties and recreational areas as well as:

- Luddenham Public School – located at 24 Jamison Street but also has frontage to The Northern Road
- St James Church of England and associated cemetery – located along The Northern Road at Luddenham
- Luddenham Uniting Church and associated cemetery - located along The Northern Road at Luddenham
- Jehovah's Witnesses place of worship – located at 328 Homestead Road, Orchard Hills

- Christ Church at the College – located at 338 Wentworth Road, Orchard Hills.

The PEI study area corridor is narrow north of Elizabeth Drive and, as such, there are likely to be similar sensitive receivers outside of the PEI study area boundary that could be impacted through noise and vibration. These include a number of schools such as:

- Penrith Anglican College along Wentworth Road.

Residential sensitive receivers are scattered throughout the study area, particularly around the townships of Luddenham, about 1 kilometre south of The Northern Road and Elizabeth Drive intersection; Glenmore Park and Orchard Hills, at the northern end of the study area.

#### *Vibration*

Impacts from ground vibration during construction activities can be categorised as:

- Disturbance to building occupants
- Impact on building contents
- Impact on building structures.

The proposal would have potential vibration impacts on a range of buildings and structures.

### **3.8.2** *Summary of issues*

There are a number of sensitive receivers (primarily residential properties and businesses as well as schools and places of worship) located within and adjacent to the study area. These properties would provide both an operational and construction constraint for the proposal.

#### *Construction*

The construction of the project would be likely to have the following impacts:

- Some construction work may need to be carried out outside standard working hours to minimise impacts on business and areas of high traffic flow. This may have impacts on noise-sensitive receivers
- A number of noise-sensitive receivers would be impacted by construction traffic and the operation of plant and equipment. The extent of impact would vary according to the relationship of the construction work to the receiver location, intervening structures and the nature of construction work at various stages of the construction process
- There would be potential for construction vibration impacts on nearby buildings, heritage items and other structures. The level of impact would depend on the construction techniques used and the offset distances between the vibration source and the sensitive receiver.

The potential for vibration impact as a result of major work would depend on the selection of the preferred option, selection of construction plant, type of work and how close major work would be to receivers. Depending on the concept design, sensitive receivers may need to be considered via a vibration assessment as part of the EIS.

#### *Operation*

The introduction of new and redistribution of existing traffic would alter noise levels in the area. Once the project is operating, new traffic noise may be introduced to areas where there is a currently low background noise level. There may be potential for traffic noise levels to exceed current standards in some areas.



Opportunities to minimise noise impacts during construction and operation by using less developed land and avoiding built up areas (e.g. Luddenham town centre) would be investigated during the development of options.

### 3.8.3 Proposed further assessments

Roads and Maritime will carry out an assessment of the construction and operational noise and vibration impacts of the project. The assessment will:

- Describe the existing noise environment within the study area and surrounds, including baseline road traffic and background noise levels
- Assess noise and vibration impacts during construction and operation, on the identified sensitive receivers. The assessment of operational noise impacts will be carried out in accordance with the NSW Roads and Maritime *Environmental Noise Management Manual* (ENMM) or an updated iteration, *NSW Road Noise Policy 2011*, and Australian Standard AS2702-1984: “*Acoustics – Methods for the Measurement of Road Traffic Noise*”. The construction noise and vibration assessment will be carried out in accordance with the NSW *Interim Construction Noise Guideline (ICNG)*, and *Assessing Vibration: A Technical Guideline*
- Identify feasible and reasonable noise mitigation measures to address noise exceedances at sensitive receivers. Requirements for noise walls and other design features to minimise noise would need to be considered at the concept design stage in accordance with the Roads and Maritime *Noise Mitigation Guideline* (RMS 2015a).

## 3.9 Socio-economic

### 3.9.1 Overview

The census area of Mulgoa - Luddenham - Orchard Hills was used to characterise the area and is considered representative of the study area (see Table 4-6). The area is generally rural in character and has a population density of 40.7 people per square kilometre, compared with 378 for greater Sydney. The main employment sectors in the area are construction, manufacturing and retail trade.

The number of registered vehicles per 1,000 people is 723 in the area, higher than the number for greater Sydney (601) and commuting by car is by far the most used method at 87 per cent of workers, compared to 58 per cent of workers in Greater Sydney. The use of public transport as a method of commuting to work is low, due to limited availability.

**Table 4-6: Area Statistics from Australian Bureau of Statistics (2011)**

	Mulgoa – Luddeham – Orchard Hills	Greater Sydney
Population	6,727	4,672,619
Population density (persons/km <sup>2</sup> )	40.7	378
No of businesses	1,385	478,797
No of businesses with 5 or more employees	144 (14%)	63,012 (13%)
Top industry employment sectors	Construction (14.8%) Manufacturing (11.1%) Retail trade (10.7%) Health Care and Social Assistance (8.2%) Transport postal and warehousing (7.3%) Education and training (6.9%)	Health care and social assistance (10.9%) Retail trade (9.8%) Professional scientific and technical services (9.6%) Manufacturing (8.5%) Education and training (7.6%)
Registered vehicles per 1,000 population	723	601
Method of travel to work	Car (87%) Walk (6%) Other, incl. taxis (3%) Train or tram (2%)	Car (58%) Train or tram (9%) Bus (5%) Walk (4%) Other, incl. taxis (2%)

### *Land use*

The land use in the study area is a mixture of semi-rural properties with some small areas of more concentrated urban use, such as Luddenham. The main land uses identified include:

- Private properties, including residential and businesses, such as Vicary's Winery. The winery is also used as a venue for functions.
- Farm land (primary production) – located east and west of The Northern Road south of Elizabeth Drive. There are numerous farm dams in the study area. Leppington Pastoral Organic Fertilisers occupies a large area (about five square kilometres) partially in the south of the study area, west of The Northern Road.
- The Orchard Hills Defence establishment –located along The Northern Road. The site occupies an area of about 1740 hectares, the majority of which is used as a buffer zone to ensure the safe storage of munitions.
- Commonwealth Land (proposed site of the Western Sydney Airport) - located in the south of the study area, south of Elizabeth Drive. Luddenham public school – located at 24 Jamison Street but also has frontage to The Northern Road.
- St James Church of England and associated cemetery – located along The Northern Road at Luddenham.
- Luddenham Uniting Church and associated cemetery - located along The

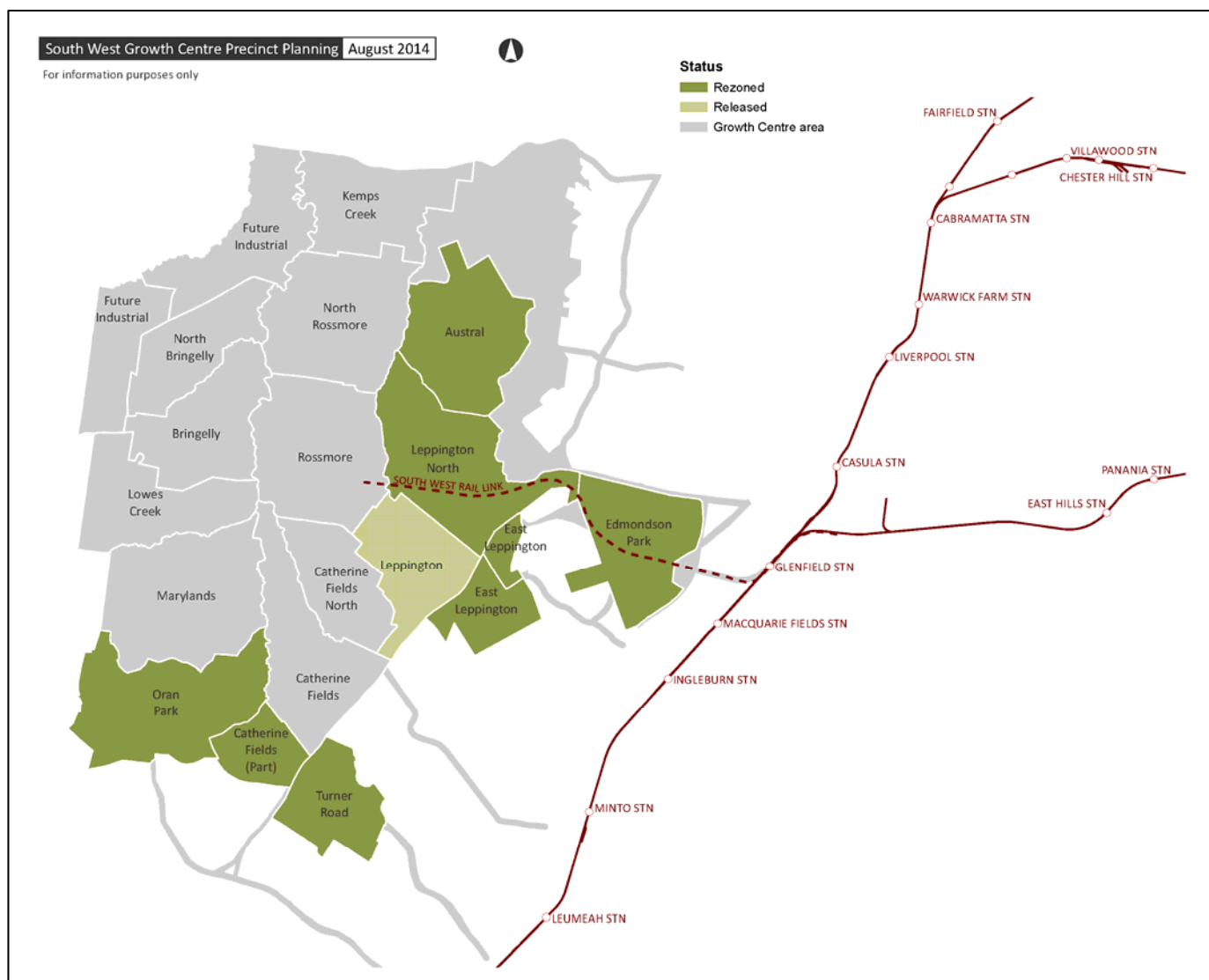
Northern Road at Luddenham.

- Christ Church at the College – located at 338 Wentworth Road, Orchard Hills.
- Sydney Water Supply Pipeline – this pipeline crosses the study area just north of Gates Road.
- Recreation areas/reserves:
  - Orchard Hills Golf Club - located along The Northern Road east of Chain-O-Ponds Road
  - Luddenham Showground – located along Park Road in Luddenham
  - Sales Park – the park includes a cricket pitch and is located along The Northern Road in Luddenham
  - Wilmington Reserve - the park includes a basketball court and is located along Jamison Street in Luddenham
  - Freeburn Park - located along Blaxland Avenue in Luddenham.

#### *Current and future development*

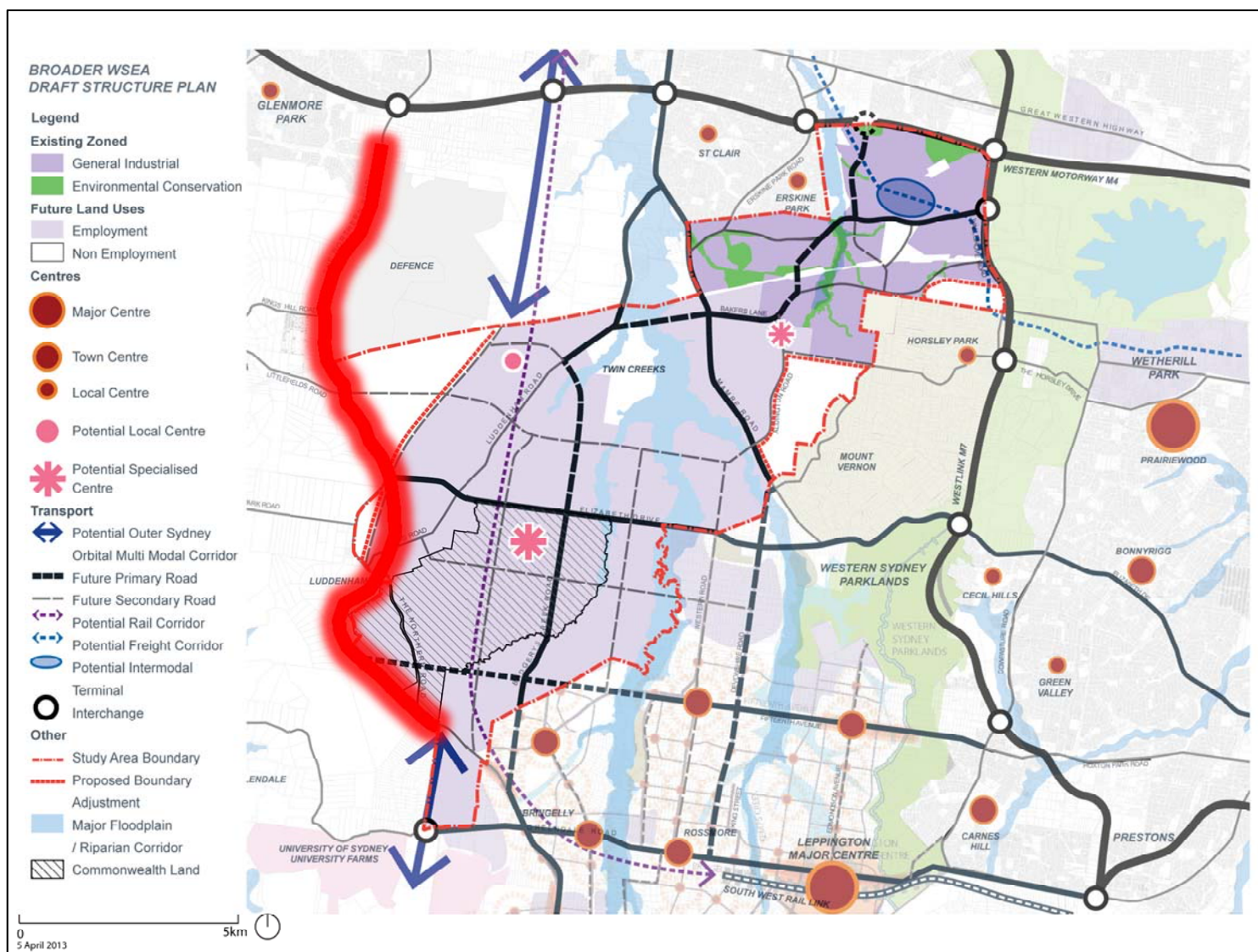
The South West Priority Growth Area is approximately 17,000 hectares, with a total of 18 precincts (refer to Figure 4-3). The precincts are being progressively released for development. This will continue for the next 30 years. The growth centre will house about 300,000 people in about 110,000 new residences. This area is within three local government areas:

- Liverpool Council
- Camden Council
- Campbelltown Council.



**Figure 4-3: South West Priority Growth Area (source: Dept. of Planning and Environment 2014)**

The BWSEA is an area of about 6,300 hectares and is expected to be a large new employment area (refer to Figure 4-4). The main employment sectors are expected to be freight and logistics.



**Figure 4-4: Western Sydney Employment Area with indicative project boundary (in red) (source: Dept. of Planning and Infrastructure 2013)**

### 3.9.2 Summary of issues

The upgrade of The Northern Road would cater for the planned population growth in the region and would form a key connection to the proposed Western Sydney Airport. This section of The Northern Road is the last to be upgraded, with the remainder of the road either already upgraded or under assessment.

Large areas of undeveloped 'greenfield' land to the east and west, within the study area, offer some opportunities to minimise potential socio-economic impacts.

The town of Luddenham contain the highest constraints to any proposed road upgrade in terms of property impacts as properties are located closer to The Northern Road compared to other areas within the study area.

Property acquisition and the impact on local businesses and farms would need to be considered during the environmental assessment stage. Social and economic costs, including land acquisition or compensation and impacts to existing communities, would be a constraint for any proposed new alignment for The Northern Road. Any plans to upgrade The Northern Road would need to consider future developments in the area to ensure it is adequately integrated.

### *Construction*

The potential socio-economic impacts that may result from construction of the project may include:

- Impacts associated with property acquisition, including uncertainty for residents and business owners about the property acquisition process and potential need to relocate
- Impacts on community facilities and on open public space areas and reserves
- Impact on local businesses and residents as a result of temporary changes to amenity (e.g. construction noise and vibration) and temporary road and footpath closures and detours
- Temporary influx of workers to the area.

### *Operation*

Once operational, the potential socio-economic impacts of the project may include:

- Potential direct and indirect socio-economic impacts including on population and demography, access and connectivity, local business, agriculture, local tourism, social and recreational infrastructure, and community values
- Potential direct and indirect impacts on agricultural activities
- The project may increase traffic through reduce highway traffic through Luddenham, with impact on amenity
- Increased severance due to road widening
- Potential impact to flooding regimes which may result in impacts to properties, access and infrastructure.

The project would have several major social benefits, including:

- Increased efficiency of travel, especially during peak periods
- Improved connection to the South West Priority Growth Area, M4 and the B WSEA, including the proposed Western Sydney Airport
- Provision of opportunities to improve aspects of the public domain and new development opportunities would likely arise
- Providing a strategic buffer between Luddenham and planned development of the Broader WSEA and Western Sydney Airport (depending on the preferred alignment of The Northern Road from Mersey road, Bringelly to Littlefields Road, Luddenham).

### **3.9.3** *Proposed further assessments*

Roads and Maritime will carry out a socio-economic impact assessment in accordance with the current '*RMS - Environmental Planning and Impact Assessment Practice Note for Socio-Economic Assessment*', which will consider the construction and operational stages of the project, including the positive and negative, direct and indirect impacts.

The assessment will include:

- A description of the social and economic profile for the communities and businesses surrounding the proposed motorway including, but not limited to:
  - Social characteristics: Including population and demography, families and housing, travel behaviour, socio-economic indicators for areas and need for assistance
  - Economic characteristics: Including labour force, income and employment and



- business and industry
- A business impact assessment to consider and assess the potential impacts (both positive and negative) on business in the area, with specific consideration of the likely change in travel patterns as a result of the project
- An assessment of the potential positive and negative impacts of the project on the social and economic values of the area during construction and operation of the project. This will include consideration of Luddenham and the potential positive and negative impact on the community and businesses along the existing and future road corridor
- Assessment of impacts to community facilities
- Identification of feasible and reasonable management and safeguard measures, including measures to enhance the project's benefits to avoid, manage or mitigate its potential impacts.

### 3.10 Landscape and visual amenity

#### 3.10.1 Overview

The land to the west of The Northern Road is steep in parts and has a number of creeks and tributaries of the Mulgoa Creek draining through the landscape. The southwest of the original larger study area in particular has undulating areas, including creeks in gullies. There are also a number of farm dams in this area.

East of The Northern Road (which runs along a ridge line) the land is gently undulating with two ridgelines forming the main topographical features. One is located to the west of Luddenham Road and the other is in the Aldington Road / Mt Vernon Road areas. Creeks in this part of the study area include Badgerys Creek, Cosgroves Creek, Oaky Creek and Blaxland Creek.

#### *Landscape character*

Landscape character varies from generally semi-rural in the majority of the study area to occasional pockets of suburban areas including at Luddenham and Glenmore Park. There are residences along the both sides of the road, usually set back from the road except at Luddenham where they front the road. The road reserves are vegetated with large trees. The topography of the area is undulating. Considering the generally sparse vegetation either side of The Northern Road as a result of current and past agricultural uses, extensive scenic views to the east and west are present within the study area. In general, the vista within the study area is of a picturesque semi-rural character.

#### *Visual sensitivity*

The Northern Road is a tourist drive (tourist drive 18) and offers some views to the west towards the Blue Mountains. Identification of viewpoints would generally be from:

- Road users on The Northern Road
- Residents and businesses along The Northern Road
- Recreational users of the Orchard Hills Golf Club and Penrith Golf and Recreation Club
- Users of the proposed Western Sydney Airport.

### 3.10.2 Summary of issues

#### Construction

The construction of the project would be likely to have the following impacts:

- Visual impacts associated with construction activities (sites/compounds, machinery, temporary structures etc.) on visual amenity looking towards the Blue Mountains, as well as the and semi-rural character of the area
- Physical impacts on existing public open space and use of land
- Impacts on the visual amenity of some sensitive receivers located near construction work, and on road users.

#### Operation

Once the project is operating, it may have the following impacts:

- Potential impacts on the area's semi-rural scenic values. In particular, the project may impact views of the Blue Mountains
- Additional road infrastructure associated with the proposed motorway would make the road visually dominant within the landscape, particularly at intersections and interchanges
- The landscape character would be altered
- Should the noise impact assessment identify the need for noise walls, this could create a visual impact to nearby sensitive receivers and potential noise mitigation treatments may alter the physical appearance of some buildings and sites.

### 3.10.3 Proposed further assessments

Further assessment of the potential for visual impacts and landscape character impacts along the proposed motorway alignment will be undertaken in accordance with the Roads and Maritime guideline '*Environmental Impact Assessment-Guidance Note, Guideline for Landscape Character and Visual Impact Assessment*', and will include:

- Identification of the visual qualities present, including the existing landscape character of the region, sensitive locations, catchments and key viewpoints
- An evaluation of how well the design fits into the built, natural and community landscape
- A landscape character impact assessment assessing a series of landscape character zones along the route character. Each zone will be defined through the development of an understanding of land use, topography, and vegetation in combination with other factors
- A visual impact assessment of the project in the whole and parts on the landscape and urban character of the area, views to and from the project, magnitude of change to existing views and the visual sensitivity of the viewers
- The identification of feasible and reasonable measures to mitigate impacts. Identified mitigation measures will be incorporated into the project design.

The design of the project will be in keeping with urban design principles for the project and the Roads and Maritime guideline '*Beyond the Pavement: Roads and Maritime Urban Design Policy, Procedures and Design Principles*' (RMS, 2014), which identifies the following urban design principles regarding road infrastructure:

- Contributing to urban structure and revitalisation
- Fitting with the built fabric

- Connecting modes and communities
- Fitting with the landform
- Responding to the natural pattern
- Incorporating heritage and cultural contexts
- Designing roads as an experience in movement
- Creating self-explaining road environments
- Achieving integrated and minimal maintenance design.

### 3.11 Utilities

Aurecon was engaged to undertake a Utility Impact Investigation for The Northern Road Upgrade – Stages 3 and 4 in May 2015. Roads and Maritime will undertake further strategic utilities investigations. The Aurecon investigation determined the following critical and major existing utilities:

#### *3.11.1 Littlefields road, Luddenham to Glenmore Parkway, Glenmore Park*

Sydney Water – SyW1.1 (DN750 DICT & DN900 SCL), SyW1.2 (DN450 DICT), SyW1.3 (DN600 CICT), SyW1.4 (DN750 SCL) and SyW1.5 (DN500 CICT and DN375 CICT) pipelines feeding to and from the Orchard Hills Water Treatment Plant.

Water NSW - StW1.1 (DN3000 SCL & DN2100 SCL Prospect supply pipelines) – which supply raw water to the Prospect Water Filtration Plant.

Telstra - mobile towers in the project area include off The Northern Road near the Defence Establishment Orchard Hills and off The Northern Road near Wentworth Road.

Transgrid - 330kV double circuit overhead conductors (TG1.1) crossing The Northern Road near Glenmore Parkway.

Endeavour Energy - substation located near the intersection of The Northern Road and Gates Road.

#### *3.11.2 Mersey Road, Bringelly to Littlefields road, Luddenham*

Sydney Water – SyW2.1 (DN200 DICT & DN150 CICT) pipelines are located along Park Road and The Northern Road up to the town of Luddenham, constituting the single source of supply to Luddenham.

Telstra - mobile towers in the project area include off The Northern Road opposite Park Road and near the intersection of The Northern Road with Mersey Road.

Transgrid - 330kV overhead power (TG2.1) crossing The Northern Road and Elizabeth Drive.

Endeavour Energy - substation located near the intersection of The Northern Road and Gates Road. Endeavour Energy has plans for new feeder connections from this substation, and also to upgrade the capacity of the substation by augmentation. Further, there is a 33kV feeder, parallel to The Northern Road and Park Road.

## 4 Other environmental issues

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### 4.1 Overview

Other environmental issues listed below are considered to be of relatively lesser consequence taking into account the scope of the project, the existing environment and the implementation of standard and best practice management and mitigation measures. It is considered unlikely that these will be key issues for the project; however, further assessment will be carried out as part of the EIS. Any environmental management and safeguard measures required to minimise and mitigate impacts will be documented as part of the EIS. These issues are:

- Soils, contamination and water quality
- Air quality
- Greenhouse gases and climate change
- Resource and waste management.

### 4.2 Soils and contamination

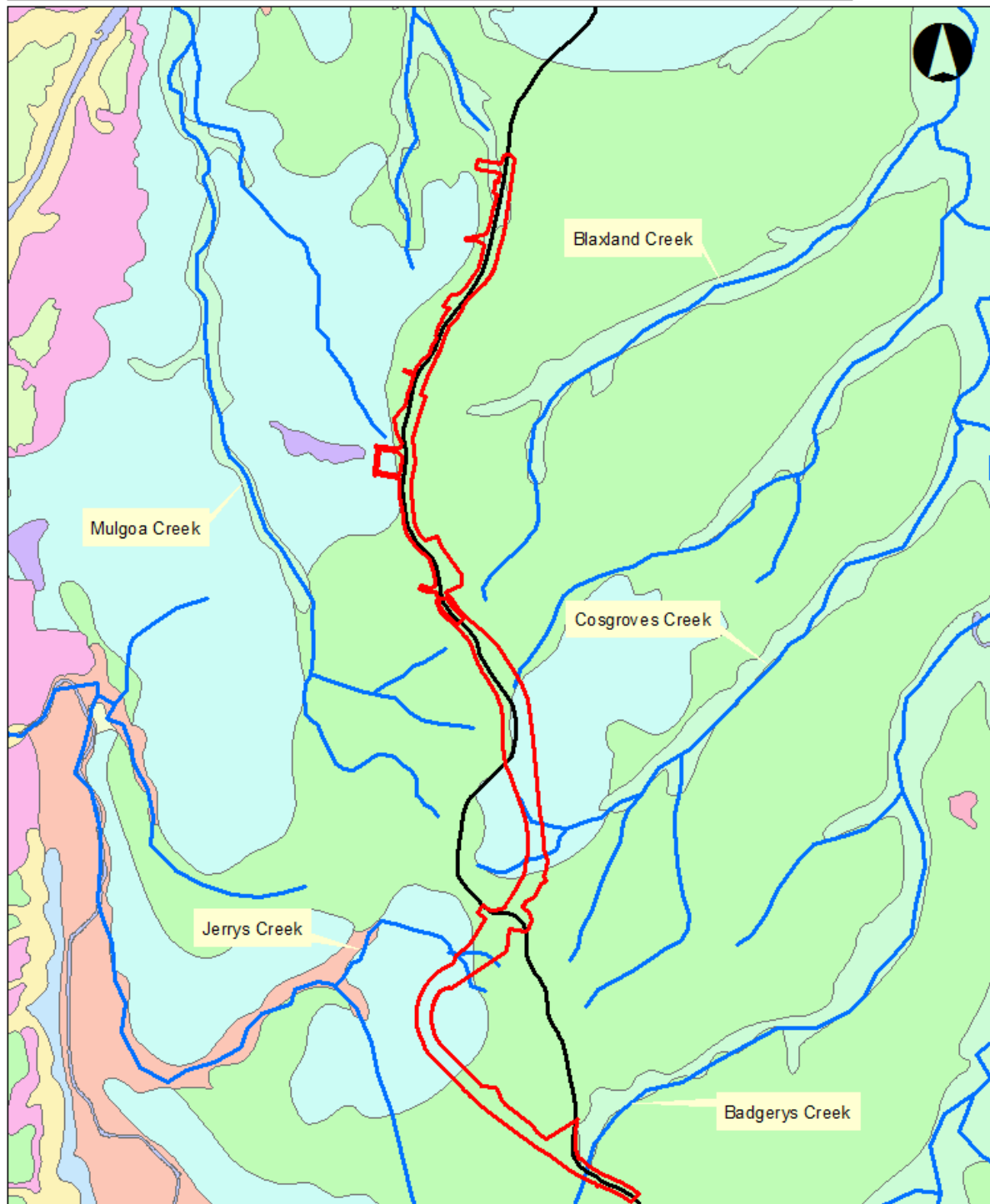
#### 4.2.1 Overview

##### *Soils*

The majority of the study area consists of Blacktown residual soils, with small patches of the erosion prone Luddenham soils in the southern half of the study area and two small patches of alluvial soils, one each at the northern and southern extents (Bannerman and Hazelton 1990). Richmond soils are found along parts of creek lines in the south west of the study area.

Blacktown soils are considered to offer poor soil drainage while Luddenham soils are considered to be highly susceptible to erosion (Bannerman and Hazelton 1990). An overlay of the study area on the Penrith 1:100 000 soil sheet map (Bannerman and Hazelton 1990) has been included in Figure 5-1 and Figure 5-2.

## The Northern Road - Soil Names



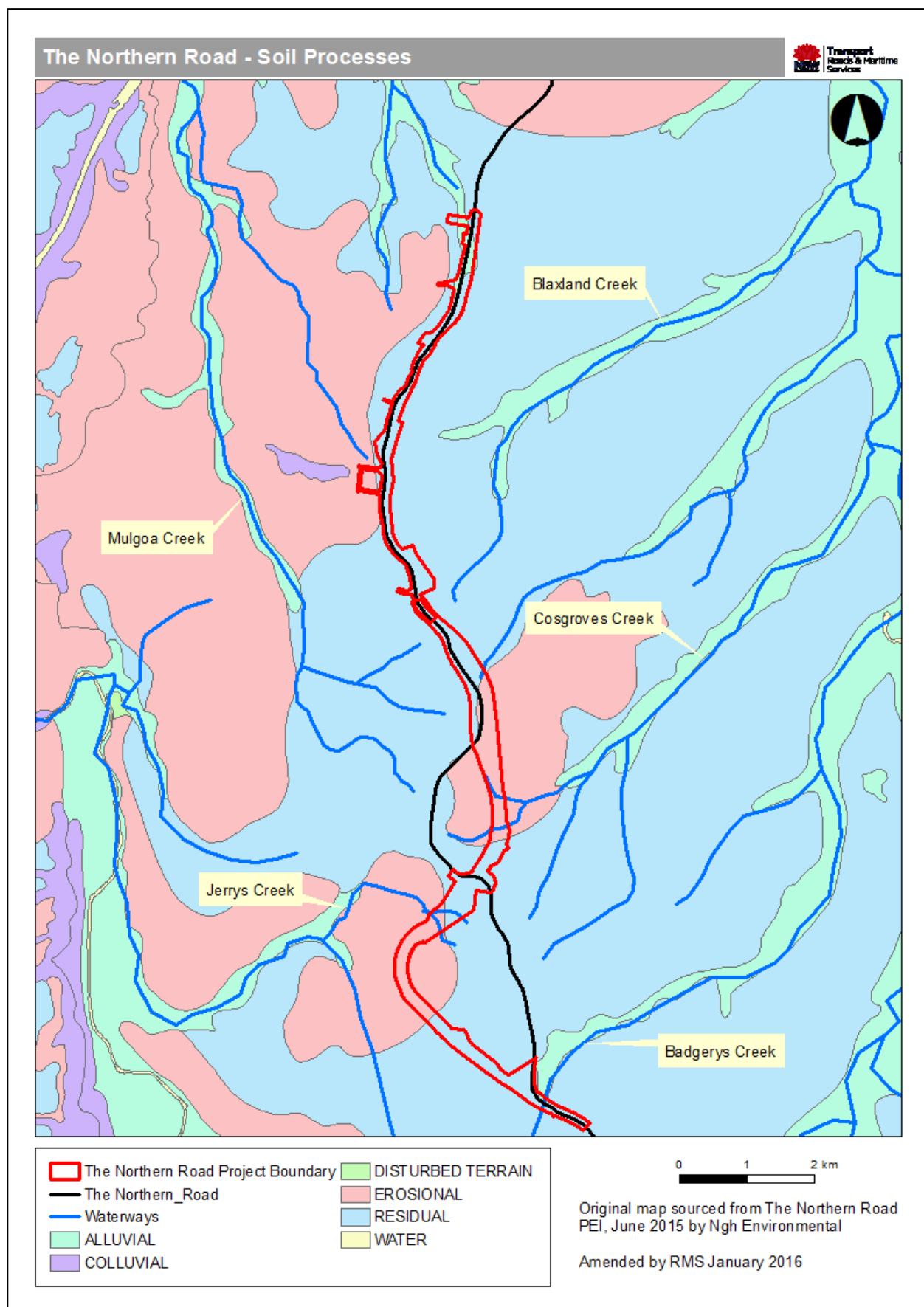
<span style="border: 2px solid red; padding: 2px;"> </span> The Northern Road Project Boundary	<span style="background-color: #90EE90; border: 1px solid black; padding: 2px;"> </span> FAULCONBRIDGE	<span style="background-color: #ADD8E6; border: 1px solid black; padding: 2px;"> </span> LUDDENHAM
<span style="border-bottom: 2px solid black; width: 20px; display: inline-block;"></span> The Northern Road	<span style="background-color: #FFB6C1; border: 1px solid black; padding: 2px;"> </span> FREEMANS REACH	<span style="background-color: #DDA0DD; border: 1px solid black; padding: 2px;"> </span> PICTON
<span style="color: blue;">—</span> Waterways	<span style="background-color: #FFDAB9; border: 1px solid black; padding: 2px;"> </span> GYMEA	<span style="background-color: #FFDAB9; border: 1px solid black; padding: 2px;"> </span> RICHMOND
<span style="background-color: #FFB6C1; border: 1px solid black; padding: 2px;"> </span> BERKSHIRE PARK	<span style="background-color: #FFDAB9; border: 1px solid black; padding: 2px;"> </span> HAWKESBURY	<span style="background-color: #90EE90; border: 1px solid black; padding: 2px;"> </span> SOUTH CREEK
<span style="background-color: #90EE90; border: 1px solid black; padding: 2px;"> </span> BLACKTOWN	<span style="background-color: #ADD8E6; border: 1px solid black; padding: 2px;"> </span> HAZELWOOD	<span style="background-color: #ADD8E6; border: 1px solid black; padding: 2px;"> </span> WATER
<span style="background-color: #90EE90; border: 1px solid black; padding: 2px;"> </span> DISTURBED TERRAIN	<span style="background-color: #FFDAB9; border: 1px solid black; padding: 2px;"> </span> LUCAS HEIGHTS	

0 1 2 km

Original map sourced from The Northern Road  
PEI, June 2015 by Ngh Environmental

Amended by RMS January 2016

**Figure 5-1: Soil names (source: Bannerman and Hazelton 1990)**



**Figure 5-2: Soil processes (source: Bannerman and Hazelton 1990)**

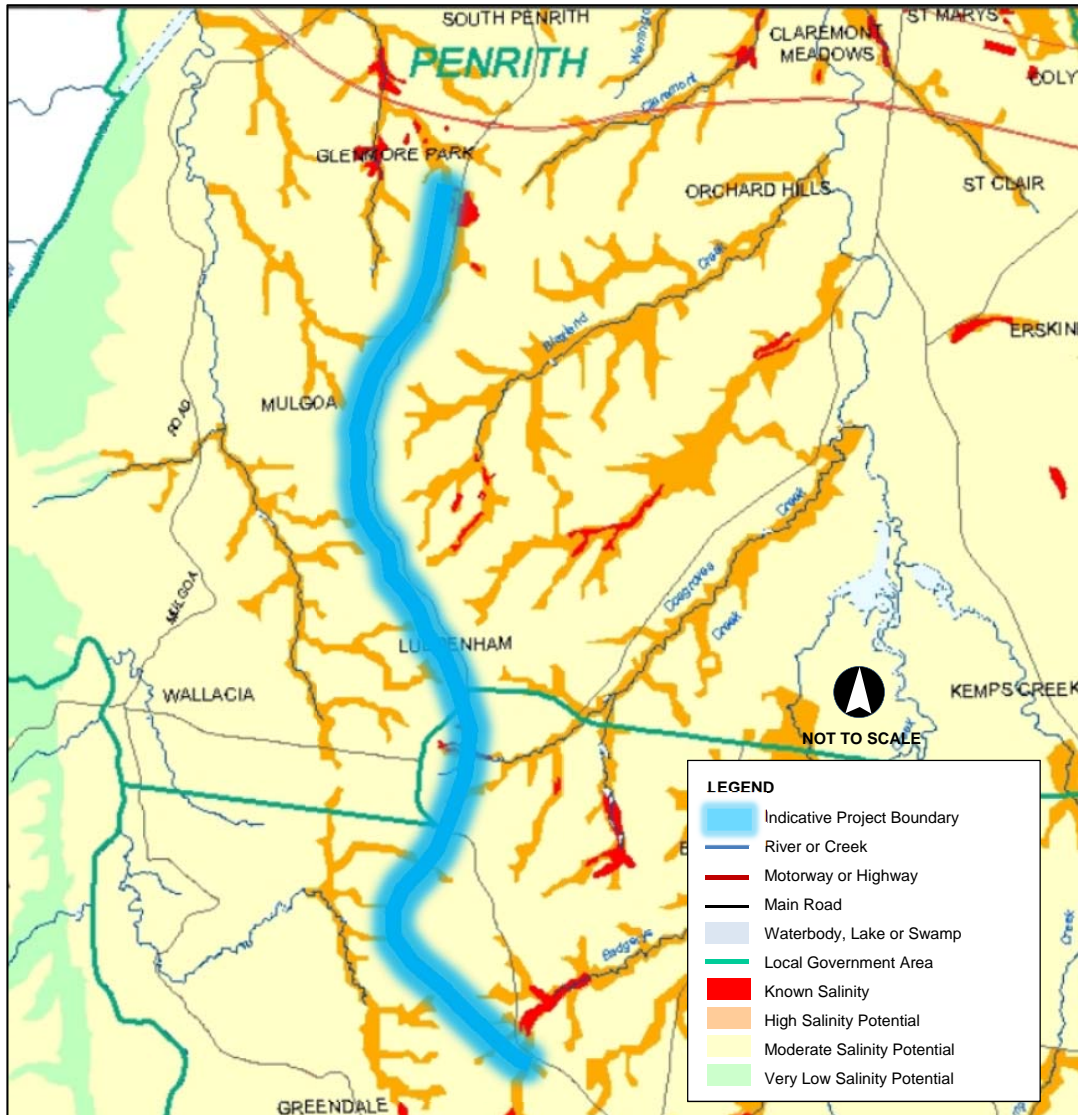


#### *Acid sulphate soils*

No acid sulphate soils or areas currently considered potential acid sulphate soils are present within the study area.

#### *Salinity*

Patches of known salinity and other areas of moderate salinity potential are present within the study area. The entire The Northern Road PEI study area is considered of low to moderate salinity potential (Figure 5-3).



**Figure 5-3: Salinity potential within the study area Green = LGA boundaries. Yellow = low potential for salinity. Orange = moderate potential for salinity. Red = known salinity (source: DIPNR 2002)**

#### *Contamination*

A search of the EPA Contaminated Land record was undertaken on 4 February 2015. A total of four current notices relating to two sites within the Liverpool LGA and six current notices relating to eight sites within the Penrith LGA were identified. The 'Elura Liquid Waste Disposal Site' is located within the study area at Lot 4 The Northern Road, Luddenham and is subject to a current notice.

The Orchard Hills Defence Establishment site is used for the storage of munitions and range of other defence related activities, such as of weapon ranges, fire training areas, and fuel storage and distribution from above ground and underground storage

tanks. Assessment of unexploded ordinances (UXO) in the EIS may be necessary depending on route options if traversing or in close proximity to the Orchard Hills Defence Establishment site. The site also contains a sewerage treatment plant, and two landfills for waste disposal.

Potential risks from known contamination have been identified at the Orchard Hills Defence Establishment. These risks are actively managed by Defence to ensure that impact to human health or the environment is minimised. There is no indication that contamination extends off-site. A Stage 1 Desktop assessment and limited Stage 2 intrusive investigations, including assessment of soil and groundwater quality have been completed for the site (Commonwealth of Australia 2013).

Considering the land uses in the locality, particularly agricultural uses, potential contaminants may occur in the soils.

#### *4.2.2 Potential impacts*

##### *Construction*

The construction of the project is likely to have the following impacts:

- There would be potential erosion and sedimentation due to the exposure of soils, particularly when the project traverses Mulgoa Creek, Cosgroves Creek, Badgerys Creek, Jerrys Creek and Duncans Creek.
- There would be potential for water quality impacts from the accidental spill of materials (including chemicals) during construction, and runoff from exposed or unclean surfaces
- There would be potential for groundwater contamination if construction activity intersects with groundwater
- There may be potential to find, expose and disturb contaminated land, particularly UXOs on the Commonwealth Defence Lands.

##### *Operation*

Once the project is operating, it could have the following impacts:

- Soil and water quality could be affected by any spills that may occur from bridge and road maintenance activities or vehicle accidents
- Soil and water quality could be affected by road runoff containing suspended solids, nutrients from atmospheric fallout, spills and other pollutants from vehicle, tyre and pavement wear.

#### *4.2.3 Proposed further assessment*

Roads and Maritime will carry out an assessment of impacts on soils and water quality. The assessment will:

- Review existing topography, soil (including acid sulphate and salinity risk maps), geological and contamination information pertaining to the project area and the findings of the soil testing program to inform potential impacts of the work
- Carry out geotechnical field investigations to further characterise the existing soil geotechnical conditions
- Identify sensitive surface and groundwater receiving environments
- Search databases (including the Environmental Protection Authority (EPA) Public Register of Licenses, the OEH Contaminated Land Record of Notices and National Pollutant Inventory Database) to ascertain potential contamination and pollution issues in the area
- Carry out a Phase 1 environmental site assessment including a review of site

history (including a review of historical aerial photographs, historical land title information, and the NSW groundwater database)

- Assess the potential for subsidence and other associated land movements in the area, and the potential to encounter acid sulphate soil and/or saline soils or soft soils
- Review the soil types present to understand the potential sources and magnitude of erosion, including both water-borne and air-borne material. Assess erosion and sediment impacts during construction and operation. This task will include an assessment of water quality
- Assess impact on groundwater and groundwater receiving environments
- Provide recommendations for erosion and sediment control measures during construction and operation of the project. Recommendations will be consistent with the *Managing Urban Stormwater: Soils and Construction volume 1 and volume 2* series published by the former NSW Department of Environment and Climate Change (DECC) in 2008.

#### 4.2.4 Management and safeguard measures

Soil, contamination and water quality issues are commonly encountered on Roads and Maritime road projects and can be managed and mitigated through the implementation of standard management and safeguard measures, which Roads and Maritime will detail in the EIS. They will include:

- A remedial action plan or appropriate construction environmental management plan prepared in accordance with the relevant EPA guidelines, if it is necessary to address contaminated areas
- Construction sediment and erosion control plans and construction spill emergency procedures as part of the Construction Environmental Management Plan (CEMP) for the project.

Roads and Maritime has successfully managed acid sulphate soils and potential acid sulphate soils on other road construction projects and, while specialist management techniques may be required, these are typically well developed. However, the extent of acid sulphate soils identified to date is not anticipated to present a substantial constraint to the project's development or construction.

### 4.3 Air Quality

#### 4.3.1 Overview

Separate searches of the National Pollution Inventory Database on 3 February 2015 were conducted for both the Liverpool and Penrith LGAs. Each LGA is discussed separately below:

##### *Liverpool*

A total of 17 facilities were found on the National Pollution Inventory Database that impact the air quality in the Liverpool LGA. None are located within The Northern Road PEI study area. The nearest are the Inghams Badgerys Creek farms which is about 2 kilometres east of the southern section of the study area.

##### *Penrith*

A total of 19 facilities were found on the National Pollution Inventory Database that impact the air quality in the Penrith LGA. Of these, three are located within The Northern Road study area; namely:

- Baiada Luddenham 1 Poultry Facility
- Baiada Luddenham 2 Broiler Facility
- Baiada Luddenham 3 Broiler Facility.

The following are the mostly commonly reported industry emissions (in order of output):

- Carbon monoxide
- Total Volatile Organic Compounds
- Oxides of Nitrogen
- Particulate Matter (PM) $10\mu m$
- Ethanol.

#### *Sensitive receivers*

Sensitive receivers within the study area (both the Liverpool and Penrith LGAs) include local residents, commercial businesses, rural and light industrial businesses and road users. It is expected that any upgrade to The Northern Road would not lead to increased traffic in itself. Rather, it would cater for increased traffic loads through population growth, the proposed Western Sydney Airport and other developments.

The proposal would impact any nearby sensitive receivers during construction, in particular from dust emissions.

#### **4.3.2** *Potential impacts*

##### *Construction*

During construction, air quality impacts are likely to be caused by dust generation and emissions from earthworks, spoil storage and transport, vehicles, and plant and equipment.

##### *Operation*

Once the project is operational, potential impacts on air quality would result from changes in patterns of vehicle emissions. The project is likely to see an increase in traffic volumes due to population increases and new developments, including the proposed Western Sydney Airport.

#### **4.3.3** *Proposed further assessment*

Roads and Maritime will carry out an air quality investigation to evaluate the impact of emissions of key pollutants to inform mitigation and management measures for the design and operation of the project. The assessment will:

- Review the available local meteorological data, local climate and existing local air quality in the area
- Identify relevant air quality goals and standards, sensitive receptors, activities and weather conditions potentially impacting air quality
- Prepare an emissions inventory for two modelling years (year one and ten of operation), including for carbon dioxide, nitrogen dioxide and particulate matter
- Prepare a qualitative assessment of the potential impacts during construction
- Prepare an impact assessment report based on the findings of the modelling, including all details of the methodology and comparisons with the relevant air quality assessment criteria for both the 'do minimum' and 'do something' scenarios
- Identify feasible and reasonable management measures (particularly dust suppression measures) to be implemented.

#### 4.3.4 Management and safeguard measures

The potential for air quality impacts on Roads and Maritime road projects is common and can be managed through the development of construction management plans and appropriate consideration of air quality issues during detailed design. Roads and Maritime will detail the management measures and safeguards to be implemented during construction and operation in the EIS. Safeguards will include the implementation of appropriate dust control measures during construction.

### 4.4 Greenhouse gases and climate change

#### 4.4.1 Overview

Transport is a substantial contributor to greenhouse gas emissions in Australia and as such, there is a need to consider how a road infrastructure project may directly or indirectly contribute to greenhouse gas emissions. Greenhouse gas emissions sources can be categorised into three different scopes; namely, scope one, scope two, and scope three.

The *NSW Climate Impact Profile* (DECCW, 2010) identifies the following projected climate change impacts for the Western Sydney region:

- By 2050, the climate is virtually certain to be hotter, with a likely increase in rainfall, especially in summer. Winter rainfall is unlikely to change. However, changes in weather patterns that cannot be resolved by the climate models mean that rainfall in coastal regions is difficult to simulate
- Run-off and stream flow are likely to increase in summer and autumn and decrease in spring and winter
- Altered fire regimes have the potential to cause major ecological change.

#### 4.4.2 Potential impacts

##### *Construction*

The construction of the project would contribute to greenhouse gas emissions, either directly (scope one) or indirectly (scope two), as a result of:

- Fuel consumption for transporting materials to site and the operation of construction equipment
- Vegetation clearing
- Indirect greenhouse gas emissions such as through embodied energy of products used for construction work, and their supply chains (such as concrete, and steel), or through the generation of electricity for consumption by the project.

##### *Operation*

Once the project is operating, greenhouse gas emissions would be generated from electricity use of road lighting, embodied energy in maintenance materials, and fuel in the use of equipment, machinery and materials to maintain the motorway. There would be likely to be some offset due to a reduction in fuel used because of the traffic efficiencies provided by the project across the local road network.

The project could be impacted by climate change due to changes in sea level rise, increased rainfall and rainfall intensity, increased potential for localised flooding, and extreme temperatures, which may potentially impact its operation and maintenance.

#### 4.4.3 *Proposed further assessment*

Road and Maritime will:

- Quantify operational greenhouse gas emissions, including the effects of land clearance and the change in predicted vehicular emissions, and compare against existing scenarios
- Quantify construction greenhouse gas emissions
- An identification of feasible and reasonable opportunities and mitigation measures that may be implemented to reduce greenhouse gas emissions associated with construction of the project.

#### 4.4.4 *Management and safeguard measures*

Greenhouse gas and climate change issues are commonly encountered on Roads and Maritime projects and can be managed and mitigated through the implementation of standard management and safeguard measures, which Roads and Maritime will detail in the EIS. These will be undertaken in accordance with the Transport Authorities Greenhouse Group *Greenhouse Gas Assessment Workbook for Road Project*, and will include:

- Incorporating climate change considerations into the project design, particularly with regard to providing flood immunity
- Minimising vegetation clearance wherever possible
- Minimising waste and re-using materials wherever possible
- Reducing construction transport requirements through use of local staff, resources, suppliers, and landfills, wherever possible
- Reducing operational impacts where practicable (e.g. through vegetation plantings as part of urban design, solar for lighting etc.).

### 4.5 Resource and waste management

#### 4.5.1 *Overview*

The project would require construction resources and manufactured items during the construction stage. These may include, but are not limited to:

- Fill material (e.g. rock, sand, gravel, sandstone, brick)
- Bitumen and asphalt
- Timber and steel
- Water and fuel
- Soil and plant species (e.g. for landscaped areas)
- Composite materials
- Manufactures items (e.g. poles, pipes, cables, signs).

Various waste streams would be generated during construction and operation of the project. The main waste streams that are likely to be produced during construction include:

- Excavated material: Including rock, gravel, clay and sand
- Demolition waste: Including building materials, bridge removal materials, vegetation, and kerbs and pavements
- Vegetation waste: From the removal of trees, shrubs and groundcovers



- Packaging materials: Including crates, pallets, cartons, plastics and wrapping materials
- Liquid wastes
- Construction materials
- General waste from construction sites: Including office wastes, scrap materials and biodegradable waste.

#### 4.5.2 *Potential impacts*

##### *Construction*

Construction of the project would generate liquid and solid waste. Also, resource use requirements for the project may affect the availability of resources for other uses.

##### *Operation*

Additional wastes would be generated during routine maintenance and repair activities over time. The type and volume of the wastes generated would be dependent on the nature of the activity, but would predominantly consist of green waste, oil, road materials, as well as contaminated waste resulting from potential fuel spills and leaks.

#### 4.5.3 *Proposed further assessment*

Roads and Maritime will assess the resource and waste management impacts of the project. The assessment will:

- Identify waste streams generated during the construction stage of the project
- Assess waste management impacts associated with construction activities
- Identify management and mitigation measures for resource use and waste across the project including disposal sites and transport impacts.

#### 4.5.4 *Management and safeguard measures*

Resource and waste management issues are commonly encountered on Roads and Maritime road projects and can be managed and mitigated through the implementation of standard management and safeguard measures, which will be detailed in the EIS. These will include the following measures:

- Construction waste management will follow the waste hierarchy principles of avoid, reduce, reuse, recycle, recover, treat and dispose
- A waste management strategy will be prepared for the project detailing the management and disposal methods of waste generated by the project. All generated wastes will be managed and disposed of in accordance with relevant State legislation and government policies including the *Waste Avoidance and Resource Recovery Act 2001*, the *Waste Avoidance and Resource Recovery Strategy 2007* (DECC, 2007) and the NSW Government's Waste Reduction and Purchasing Policy. The *Waste Classification Guidelines* (DECCW, 2008) will also be used to classify the different types of waste
- Waste materials will be transported to and from the site by covered trucks, where possible
- A waste register will be maintained for the site. It would detail the types of waste collected, amounts, date/time and details of disposal
- The construction contractor will be required to re-use materials where feasible, including material collected on site.

### 4.6 Cumulative Impacts

A range of other development and infrastructure projects are either operating, under construction or planned for western Sydney, including the proposed Western Sydney Airport and other road upgrade projects under WSIP. Cumulative impacts associated with the project and these schemes will be assessed as part of the EIS for the project.

## 5 Conclusion

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Roads and Maritime is seeking approval for the proposed upgrade of The Northern Road from Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park. This project would include widening the existing two lane corridor to a maximum of eight lanes. This includes two bus lanes. The upgrade is also expected to include a range of renewed and formalised infrastructure such as bridges, retaining walls, drainage, safety barriers and lighting.

Roads and Maritime has formed the opinion that the project is likely to significantly affect the environment and would, therefore, require an environmental impact statement. Accordingly, the project is SSI under Part 5.1 of the EP&A Act and approval is required from the Minister for Planning.

The key environmental issues identified for the project are the following matters:

- Traffic and transport
- Flooding and hydrology
- Ecology
- Aboriginal heritage
- Non-Aboriginal heritage
- Noise and vibration
- Socio-economic
- Landscape and visual amenity
- Land use.

The environmental impact statement will include the following:

- A detailed description of the project including its components, construction activities and potential staging
- A comprehensive assessment of the potential impacts on the key issues including a description of the existing environment, assessment of potential direct and indirect and construction, operation and staging impacts
- Description of measures to be implemented to avoid, minimise, manage, mitigate, offset and/or monitor the potential impacts
- Identify and address issues raised by stakeholders.

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## Attachment A

### Requirements of the Environmental Planning and Assessment Regulation 2000

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Clause 192 of the *Environmental Planning and Assessment Regulation 2000* requires that an application for approval of the Minister to carry out State Significant Infrastructure must include:

- (a) details of any approval that would, but for s 115ZG of the Act, be required for the carrying out of the State significant infrastructure, and
- (b) details of any authorisations that must be given under section 115ZH of the Act if the application is approved, and
- (c) a statement as to the basis on which the proposed infrastructure is State significant infrastructure, including, if relevant, the capital investment value of the proposed infrastructure.

#### **Approvals that would otherwise apply**

Approvals that may be required to carry out SSI, if not for s 115ZG of the EP&A Act, include:

- An Aboriginal heritage impact permit under s 90 of the *National Parks and Wildlife Act 1974*
- An approval under Part 4, or an excavation permit under s 139, of the *Heritage Act 1977*.

#### **Authorisations if the application is approved**

Authorisations that may be required for the project under s 115ZH of the EP&A Act include:

- A consent under s 138 of the *Roads Act 1993*
- An environment protection licence under Chapter 3 of the *Protection of the Environment Operations Act 1997* (for any of the purposes referred to in s 43 of that Act).

#### **State Significant Infrastructure statement**

Clause 14(1) of State Environmental Planning Policy (State and Regional Development) 2011 provides that development is declared to be State Significant Infrastructure pursuant to s 115U(2) of the Act if it is permissible without development consent under Part 4 of the Act under a SEPP; and is specified in the categories of development in Schedule 3.

State Environmental Planning Policy (Infrastructure) (ISEPP) permits development for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent. As The Northern Road upgrade is for a road and road infrastructure facilities, and is to be carried out by Roads and Maritime Services, the project is permissible without development consent under Part 4 of the EP&A Act.

Schedule 3 of State Environmental Planning Policy (State and Regional Development) 2011 provides that general public authority activities for infrastructure or other development that (but for Part 5.1 of the EP&A Act and within the meaning of Part 5 of the Act) would be an activity for which the proponent is also the determining authority, and would, in the opinion of the proponent, require an environmental impact statement to be obtained under the EP&A Act.

Roads and Maritime has formed the opinion that The Northern Road upgrade Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park is likely to significantly affect the environment and would require an environmental impact statement to be obtained under s 112 of the EP&A Act.

On this basis the project is State significant infrastructure. Approval from the Minister for Planning and Infrastructure is required under s 115W of the EP&A

