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# **The Northern Road Upgrade Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park**

NSW Environmental Impact Statement /  
Commonwealth Draft Environmental Impact Statement

## **Volume 1: Main Report**

June 2017



# **The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park**

**NSW Environmental Impact  
Statement / Commonwealth Draft  
Environmental Impact Statement  
June 2017**

## **Volume 1: Main Report**

Prepared for  
Roads and Maritime Services  
By Jacobs Australia  
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## 5 Project description

This chapter describes the proposed scope of work, including the route alignment, corridor width, main project elements, ancillary facilities, design standards and construction activities.

Table 5-1 outlines the environmental assessment requirements (SEARs) of the Secretary of the Department of Planning and Environment and the Commonwealth EIS Guidelines as they relate to describing the project.

Table 5-1 EIS assessment requirements – project description

Requirements	Where addressed in EIS
<b>Secretary's Environmental Assessment Requirements (NSW EP&amp;A Act)</b>	
a detailed description of the proposal, including:	Chapter 5
the proposed route,	Section 5.1 Section 5.2
design of the alignment (vertical and horizontal), associated structures (such as bridges, arches and culverts), interchanges, and road user, pedestrian and cyclist facilities (including street furniture, lighting and intersection crossing treatments),	Section 5.1 Section 5.2 Section 5.3
land use changes, including resumption of residential, commercial, industrial and recreational lands, and impacts to Crown land,	Section 5.2.15 Section 7.4
interactions with key utilities and services,	Section 5.2.14 Section 5.4.14
location and operational requirements of construction ancillary facilities and access tracks,	Section 5.4.13
relationship and/or interaction with existing public and freight transport services (including air, rail, and bus services);	Chapter 7-1 and Appendix G
an analysis of the proposal, including an identification of how relevant planning, land use and development matters (including relevant strategic and statutory matters) have been considered in the impact assessment (direct, indirect and cumulative impacts) and/or in developing management / mitigation measures;	Chapter 2
details of how the proposal integrates with approved and proposed infrastructure projects, including consideration of the Western Sydney Airport at Badgerys Creek and future (M9) Outer Sydney Orbital; and...	Section 5.2
Details of how the principles of ecologically sustainable development will be incorporated in the design, construction and ongoing operation phases of the proposal.	Section 4.4 Chapter 10



Requirements	Where addressed in EIS
<b>Commonwealth EIS Guidelines (Commonwealth EPBC Act)</b>	
All construction, operational and (if relevant) decommissioning components of the action should be described in detail. This should include the precise location (including coordinates) of all works to be undertaken, structures to be built or elements of the action that may have impacts on matters of National Environmental Significance.	Chapter 5
The description of the action must also include details on how the works are to be undertaken (including stages of development and their timing) and design parameters for those aspects of the structures or elements of the action that may have relevant impacts.	Section 5.3 Section 5.4 Section 5.5.1

## 5.1 Project scope

### 5.1.1 The project

The project involves upgrading the 16 km section of The Northern Road between Mersey Road, Bringelly and Glenmore Parkway, Glenmore Park.

The project generally comprises the following key features:

- A six-lane divided road between Mersey Road, Bringelly and Bradley Street, Glenmore Park (two general traffic lanes and a kerbside bus lane in each direction). The wide central median would allow for an additional travel lane in each direction in the future, if required
- An eight-lane divided road between Bradley Street, Glenmore Park and about 100 m south of Glenmore Parkway, Glenmore Park (three general traffic lanes and a kerbside bus lane in each direction separated by a median)
- About eight kilometres of new road between Mersey Road, Bringelly and just south of the existing Elizabeth Drive, Luddenham, to realign the section of The Northern Road that currently bisects the Western Sydney Airport site and to bypasses Luddenham
- About eight kilometres of upgraded and widened road between the existing Elizabeth Drive, Luddenham and about 100 m south of Glenmore Parkway, Glenmore Park
- Closure of the existing The Northern Road through the Western Sydney Airport site
- Tie-in works with the following projects:
  - The Northern Road Upgrade, between Peter Brock Drive, Oran Park and Mersey Road, Bringelly (to the south)
  - The Northern Road Upgrade, between Glenmore Parkway, Glenmore Park and Jamison Road, South Penrith (to the north)
- New intersections including:
  - A traffic light intersection connecting the existing The Northern Road at the southern boundary of the Western Sydney Airport, incorporating a dedicated u-turn facility on the western side
  - A traffic light intersection for service vehicles accessing the Western Sydney Airport, incorporating 160 m of new road connecting to the planned airport boundary
  - A traffic light intersection connecting the realigned The Northern Road with the existing The Northern Road (west of the new alignment) south of Luddenham

- A ‘give way’ controlled intersection (that is, no traffic lights) connecting the realigned The Northern Road with Eaton Road (east of the new alignment, left in, left out only)
- A four-way traffic light intersection formed from the realigned Elizabeth Drive, the realigned The Northern Road and the existing The Northern Road, north of Luddenham
- A traffic light intersection at the Defence Establishment Orchard Hills entrance, incorporating a u-turn facility
- New traffic lights at four existing intersections:
  - Littlefields Road, Luddenham
  - Kings Hill Road, Mulgoa
  - Chain-O-Ponds Road, Mulgoa
  - Bradley Street, Glenmore Park incorporating a u-turn facility
- Modified intersection arrangements at:
  - Dwyer Road, Bringelly (left in, left out only)
  - Existing Elizabeth Drive, Luddenham (left out only)
  - Gates Road, Luddenham (left in only)
  - Longview Road, Luddenham (left in, left out only)
  - Grover Crescent south, Mulgoa (left in only)
  - Grover Crescent north, Mulgoa (left out only)
- Dedicated u-turn facilities at:
  - The existing The Northern Road at Luddenham, south-west of Elizabeth Drive
  - The existing Elizabeth Drive, Luddenham around 800 m east of The Northern Road
  - Chain-O-Ponds Road, Mulgoa
- Twin bridges over Adams Road, Luddenham
- Local road changes and upgrades, including:
  - Closure of Vicar Park Lane, east of the realigned The Northern Road, Luddenham
  - Eaton Road cul-de-sac, west of the realigned The Northern Road, Luddenham
  - Eaton Road cul-de-sac, east of the realigned The Northern Road, Luddenham
  - Elizabeth Drive cul-de-sac, about 300 m east of The Northern Road with a connection to the realigned Elizabeth Drive, Luddenham
  - Extension of Littlefields Road, east of The Northern Road, Mulgoa
  - A new roundabout on the Littlefields Road extension, Mulgoa
  - A new service road between the Littlefields Road roundabout and Gates Road, including a ‘give way’ controlled intersection (that is, no traffic lights) at Gates Road, Luddenham
  - Extension of Vineyard Road, Mulgoa between Longview Road and Kings Hill Road
  - A new roundabout on the Vineyard Road extension at Kings Hill Road, Mulgoa
- A new shared path on the western side of The Northern Road and footpaths on the eastern side of The Northern Road
- A new shared path on the western side of The Northern Road and footpaths on the eastern side of The Northern Road where required
- The upgrading of drainage infrastructure
- Operational ancillary facilities including:
  - Heavy vehicle inspection bays for both northbound and southbound traffic, adjacent to Grover Crescent, Mulgoa and Longview Road, Mulgoa respectively
  - An incident response facility on the south-western corner of the proposed four-way traffic light intersection at Elizabeth Drive, Luddenham
- New traffic management facilities including variable message signs (VMS)
- Roadside furniture and street lighting
- The relocation of utilities and services

- Changes to property access along The Northern Road (generally left in, left out only)
- Establishment and use of temporary ancillary facilities and access tracks during construction
- Property adjustments as required
- Clearance of undetonated explosive ordinance (UXO) within the Defence Establishment Orchard Hills as required.

This EIS seeks approval for the project elements above. The EIS has been prepared based on a concept design. If approved, a further detailed design process would follow which may include variations to the concept design. Flexibility is provided in the concept design to allow for refinement of the project during detailed design or in response to any submissions received following the exhibition of the EIS.

The project assessed in this EIS does not include surveys, test drilling, test excavations, geotechnical investigations or other tests, surveys, sampling or investigation for the purposes of the design or assessment of the project.

The location and key components of the project are shown in Figure 5-1. Diagrams of the proposed intersection arrangements and local road changes are provided in Table 5-2, Table 5-3 and Table 5-7.

## 5.2 The completed project

### 5.2.1 Alignment

The project can be divided into two sections and described generally from south to north as follows:

- Mersey Road, Bringelly to Elizabeth Drive, Luddenham (about eight kilometres between chainage 0 and chainage 7500 – refer Figure 5-1)
- Elizabeth Drive, Luddenham to about 100 m south of Glenmore Parkway, Glenmore Park (about eight kilometres between chainage 7,500 and chainage 16,100 – refer Figure 5-1).

The following sections describe the alignment of the project.

#### **Mersey Road, Bringelly to Elizabeth Drive, Luddenham (Luddenham and Western Sydney Airport bypass)**

Between Mersey Road, Bringelly and Elizabeth Drive, Luddenham, the project would comprise a six-lane divided road (two general traffic lanes and a kerbside bus lane in each direction separated by a wide central median). The median would allow for an additional lane in each direction in the future, if required.

The project would tie into The Northern Road Upgrade, Peter Brock Drive, Oran Park to Mersey Road, Bringelly (Stage 2) at a point just north of Mersey Road. The existing road would be upgraded until diverting from the existing alignment around 300 m north of Mersey Road. At this location, a traffic light intersection would be provided, connecting the existing The Northern Road at the southern boundary of the Western Sydney Airport, incorporating a dedicated u-turn facility on the western side near the Leppington pastoral company entrance.

The new road alignment would primarily be located on agricultural land, with a small section (about 400 m), on land purchased for the Western Sydney Airport (Commonwealth land). The main service entry to the airport would be provided by a traffic light intersection at the western edge of the planned airport, about one kilometre north of Mersey Road. Roads and Maritime is currently in discussion with the Australian Department of Infrastructure and Regional Development (DIRD) to acquire portions of Commonwealth land, purchased for the airport, for the purpose of the project. In accordance with the *Western Sydney Airport revised draft Airport Plan 2016*, and as confirmed during consultation with DIRD, these portions of land do not form part of the operational requirements of the airport.

The new alignment would continue north and run generally parallel with the eastern side of Willowdene Avenue, along the western edge of the Western Sydney Airport site, before turning to the north-east where a new connection to the existing The Northern Road would be provided south of Luddenham. Eaton Road would be separated by the new alignment and would require a minor realignment to the west of the new intersection. Access to Eaton Road (west) would not be possible from the new alignment as the local road would terminate in a cul-de-sac. Access would instead be provided via the existing The Northern Road. Access to the eastern side of Eaton Road would be provided via a left in/left out arrangement with the eastern extent of Eaton Road terminating in a cul-de-sac. Refer to Table 5-7 for further details of local road changes.

The new alignment would continue across pastoral land, with the alignment bridging over Adams Road. A new four-way intersection with the realigned Elizabeth Drive and the existing The Northern Road would provide a northern connection to Luddenham. Elizabeth Drive would be realigned to enable the creation of the new intersection. Elizabeth Drive would be restricted to left out access onto The Northern Road in order to reduce conflicts with the new intersection. A new shared path would be provided on the western side of The Northern Road and footpaths on the eastern side of The Northern Road, as required.

The alignment and key features of this section of the project are presented in Figure 5-1. A typical cross section of the six-lane divided road configuration is presented in Figure 5-2.

### **Elizabeth Drive, Luddenham to Glenmore Parkway, Glenmore Park**

North of the realigned Elizabeth Drive intersection, the project has been aligned to consider tie-ins with future motorway infrastructure such as the proposed M12 Motorway and the planned M9 Motorway (Outer Sydney Orbital, or OSO). The alignment largely follows the existing road corridor, and the project would involve upgrading and widening the existing road on both sides. New traffic lights would be installed at Littlefields Road to provide access to the proposed extension of Littlefield Road. A north-south service road would also be provided connecting Gates Road to the Littlefields Road extension to provide northbound access to The Northern Road for residents living on Gates Road east of the project.

North of Littlefields Road, the project would generally follow the existing road alignment, crossing the WaterNSW Supply Pipelines between Gates Road and Longview Road.

Heavy vehicle inspection bays would be provided southbound along this section of the alignment and northbound adjacent to Grover Crescent. New intersection arrangements would be provided for Gates Road, Longview Road and Grover Crescent. New traffic lights would be installed at Kings Hill Road, Chain-O-Ponds Road, Defence Establishment Orchard Hills (DEOH) main gate and Bradley Street. Vineyard Road would also be extended between Longview Road and Kings Hill Road with a new roundabout located on the Vineyard Road extension at Kings Hill Road. This extension would provide southbound access to The Northern Road (via Kings Hill Road) as Longview Road would be altered to left in, left out only.

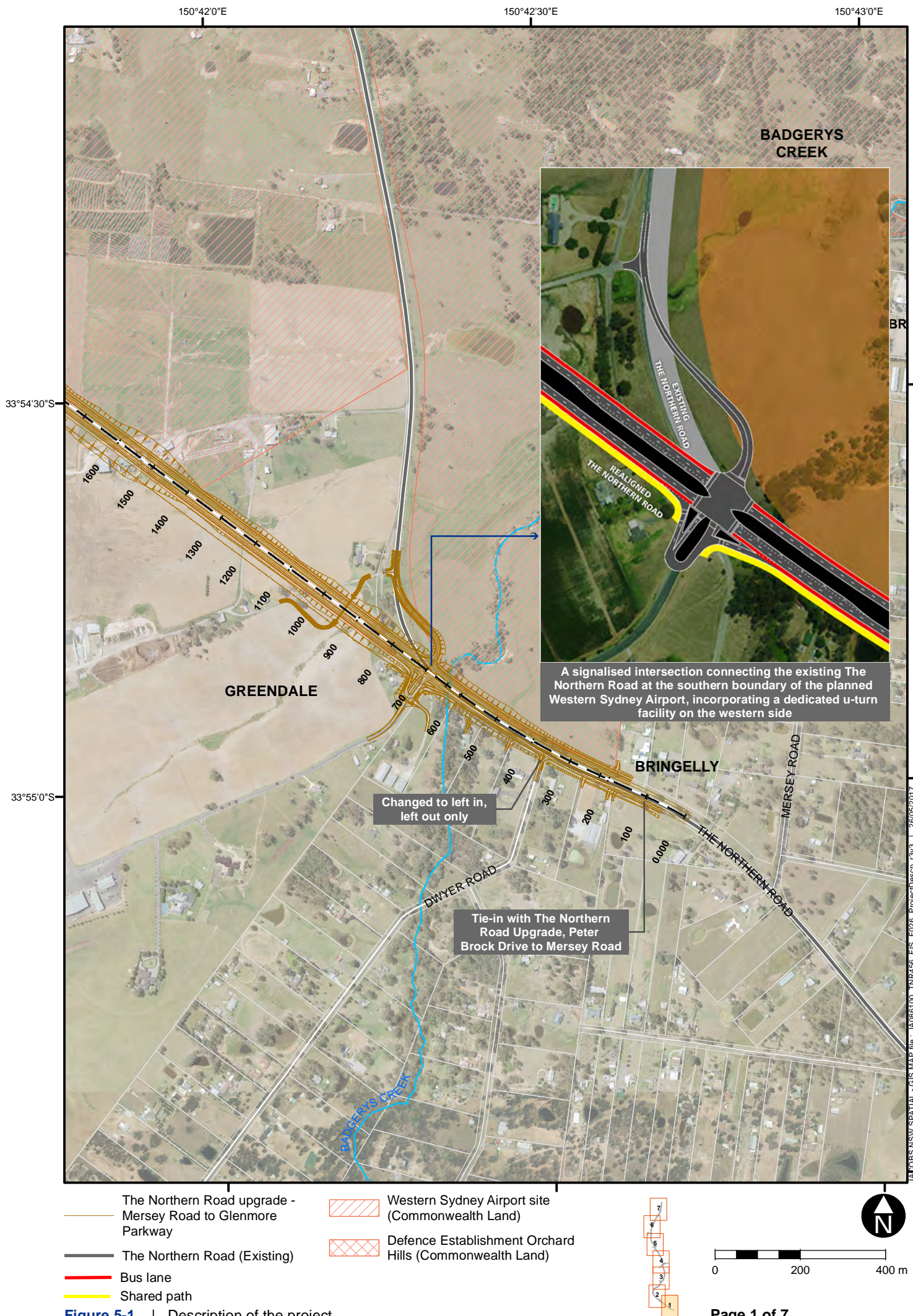
From the southern boundary of the DEOH, the upgrade would generally occur on the eastern side of The Northern Road within Commonwealth land. The wide central median would allow for additional lanes in each direction in the future, when required. However, there would be some acquisition of land on the western side of the existing corridor.

Between Elizabeth Drive and Bradley Street, the project would comprise a six-lane divided road (two general traffic lanes and a kerbside bus lane in each direction separated by a wide central median). North of Bradley Street, The Northern Road would be upgraded to an eight-lane divided road (three general traffic lanes and a kerbside bus lane in each direction separated by a median) until the tie-in with the proposed The Northern Road Stage 3 project about 100 m south of Glenmore Parkway.

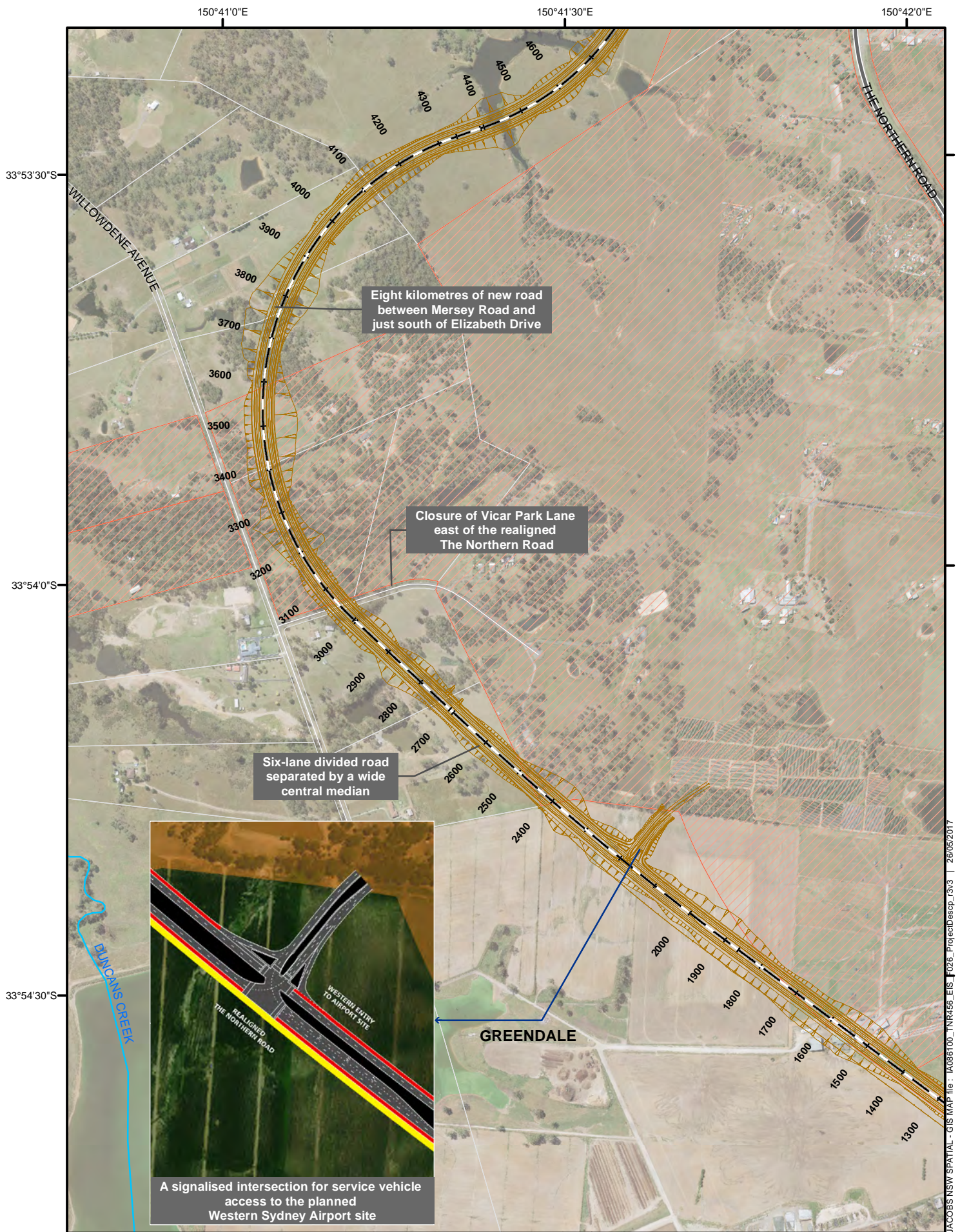
A new shared path would be provided on the western side of The Northern Road and footpaths on the eastern side of The Northern Road, as required.



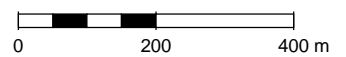
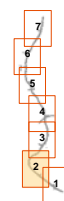
The alignment and key features of this section of the project are presented in Figure 1-2 (sheet 2) and Figure 5-1 in further detail. A typical cross section of the eight-lane divided road configuration is presented in Figure 5-3.







- The Northern Road upgrade - Mersey Road to Glenmore Parkway
- The Northern Road (Existing)
- Bus lane
- Shared path
- Western Sydney Airport site (Commonwealth Land)
- Defence Establishment Orchard Hills (Commonwealth Land)



**Figure 5-1** | Description of the project



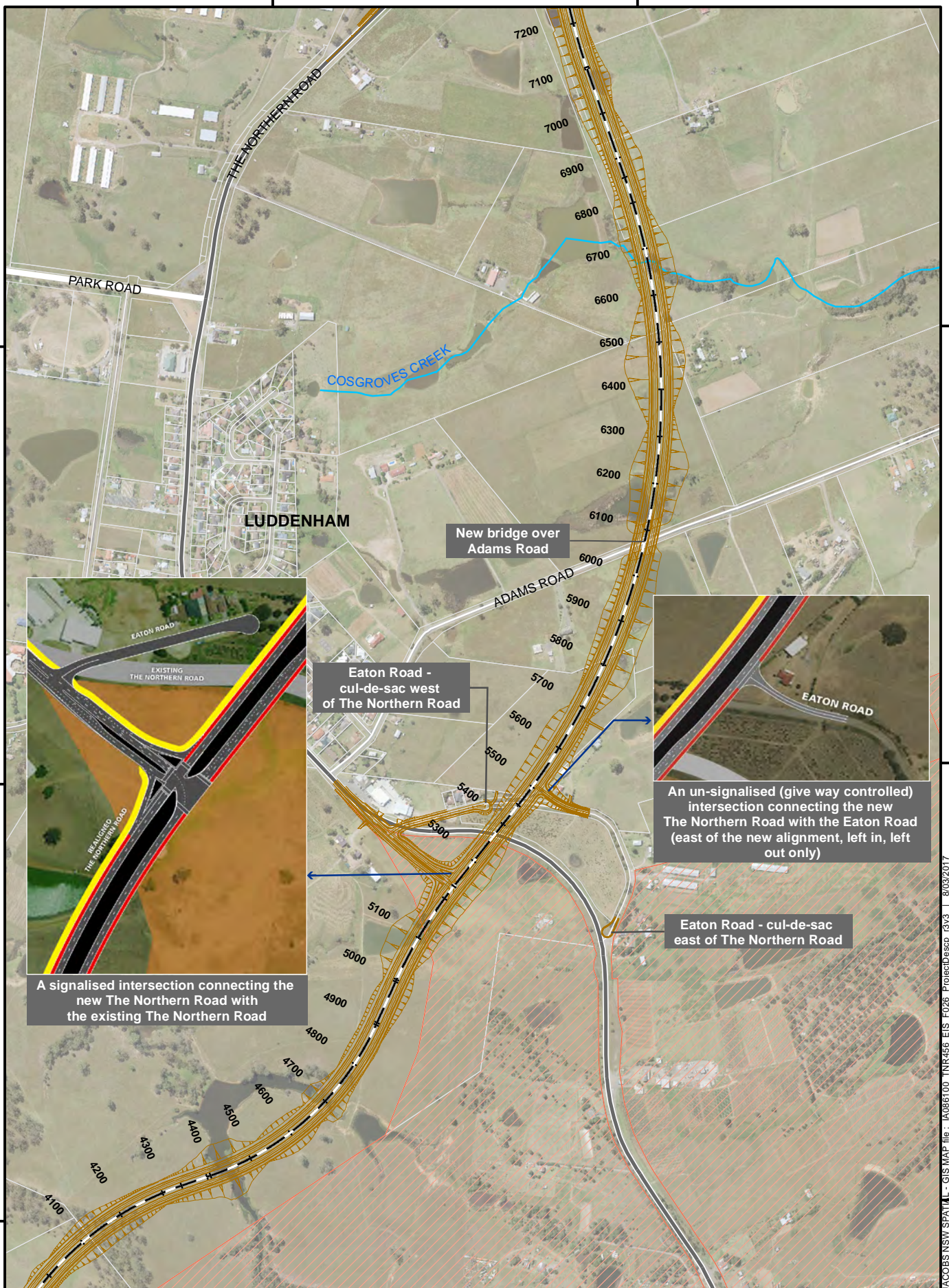
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— The Northern Road upgrade - Mersey Road to Glenmore Parkway

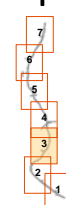
— The Northern Road (Existing)

— Bus lane

— Shared path

Western Sydney Airport site (Commonwealth Land)

Defence Establishment Orchard Hills (Commonwealth Land)

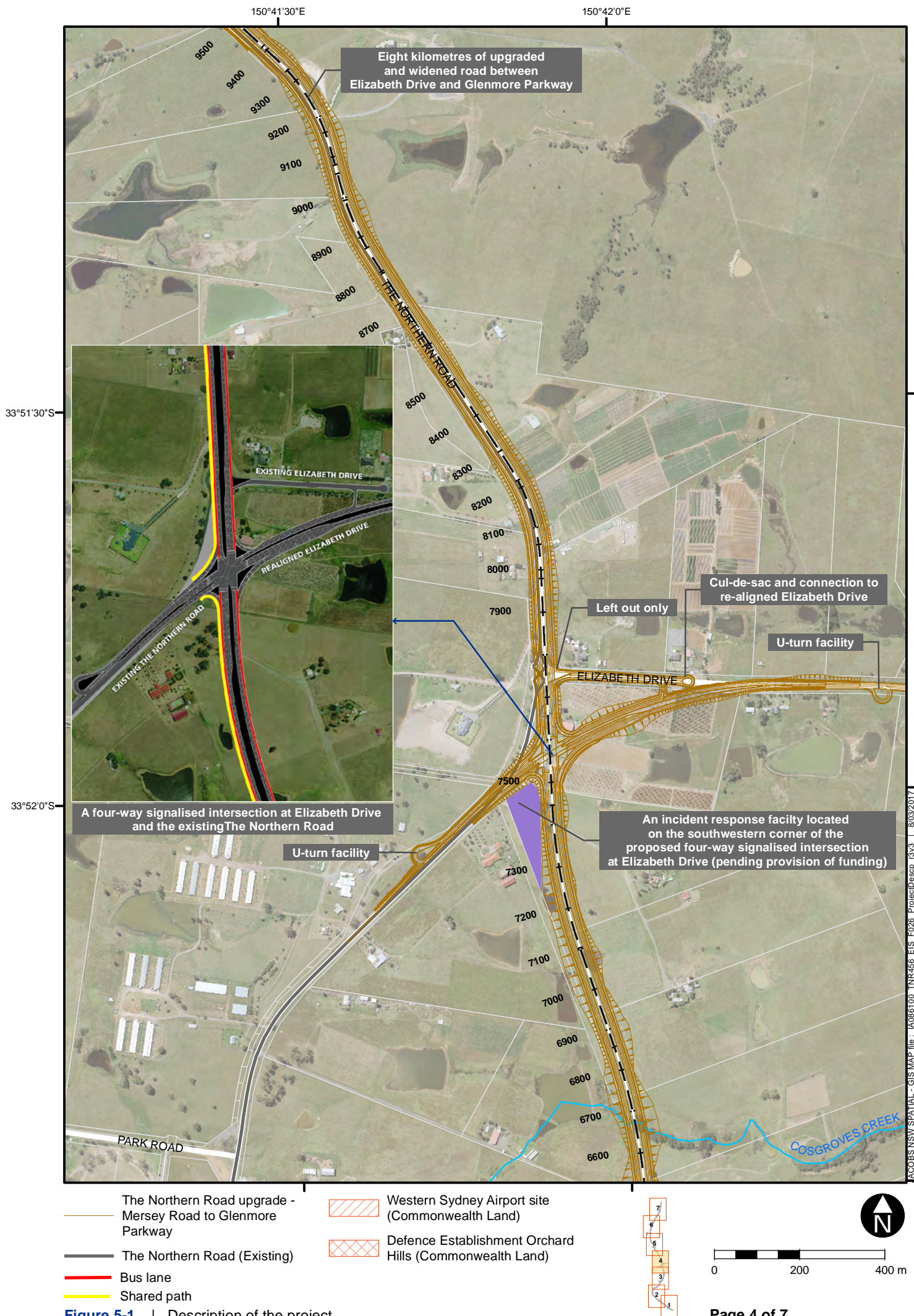


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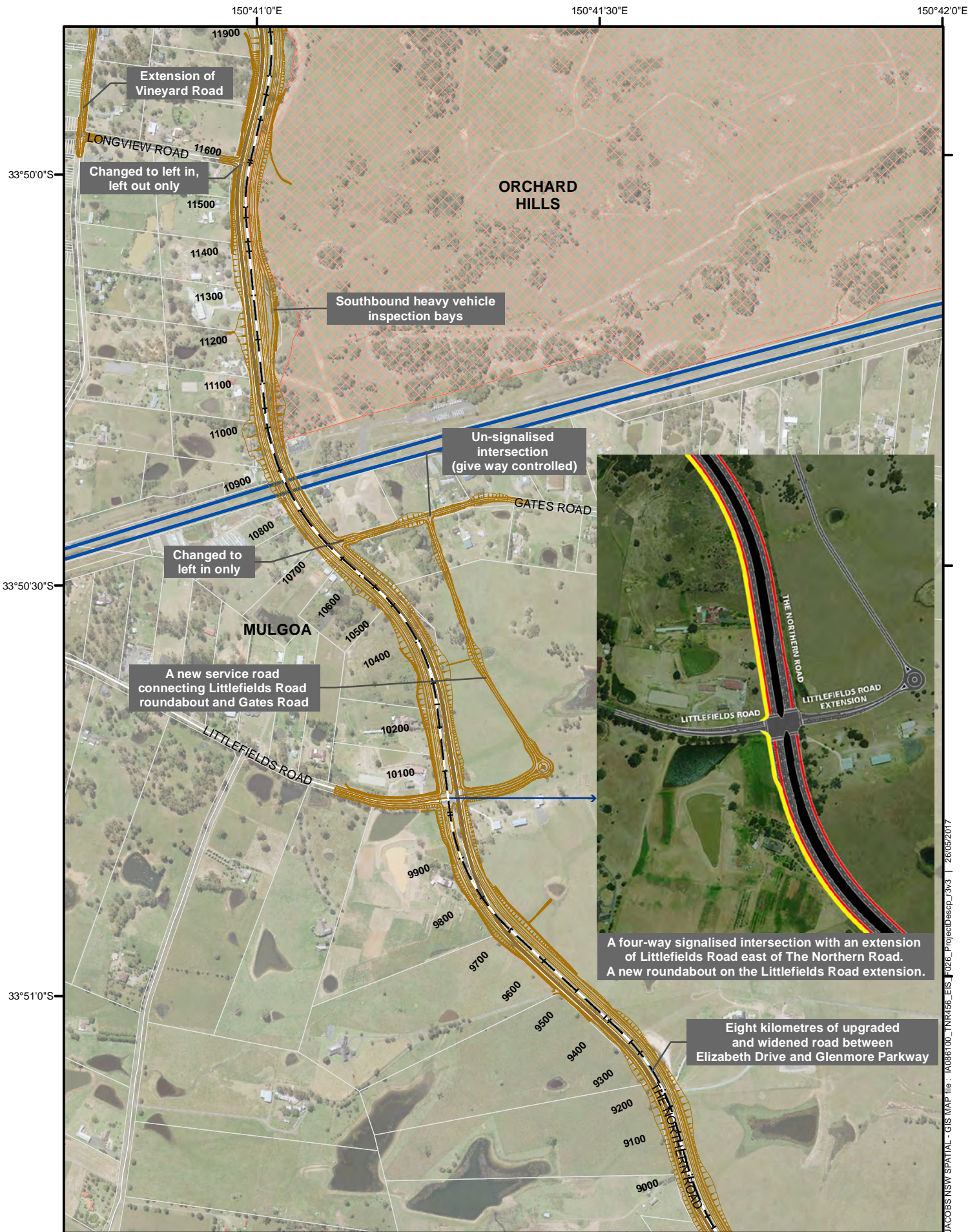


**Figure 5-1** | Description of the project



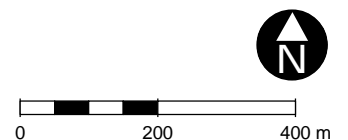
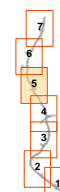






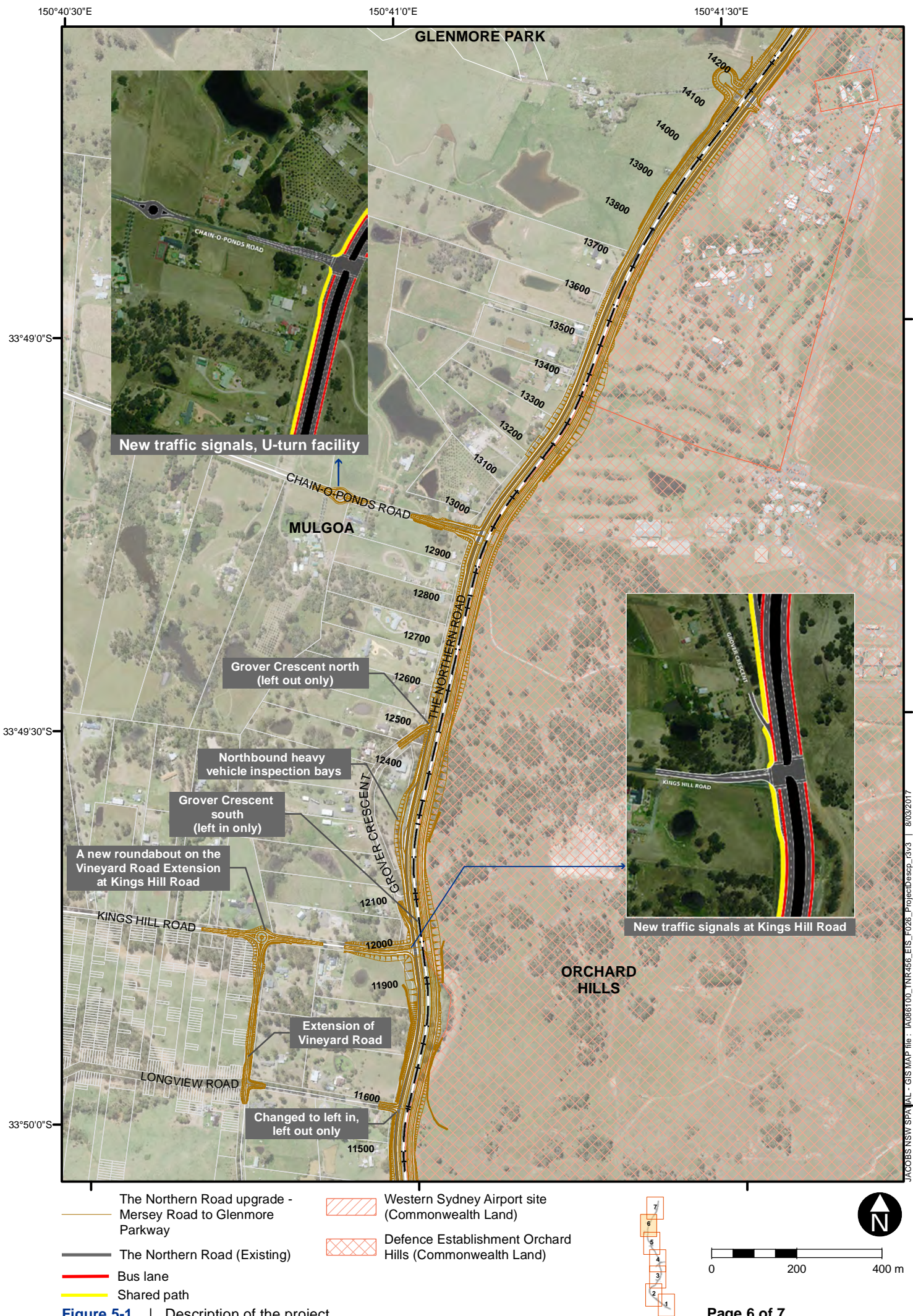
- The Northern Road upgrade - Mersey Road to Glenmore Parkway
- The Northern Road (Existing)
- Bus lane
- Shared path

- Western Sydney Airport site (Commonwealth Land)
- Defence Establishment Orchard Hills (Commonwealth Land)
- WaterNSW supply pipelines



**Figure 5-1** | Description of the project







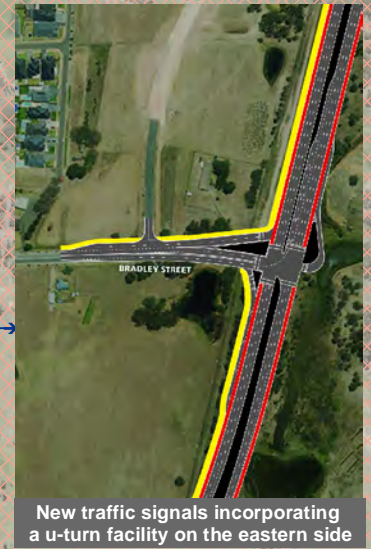
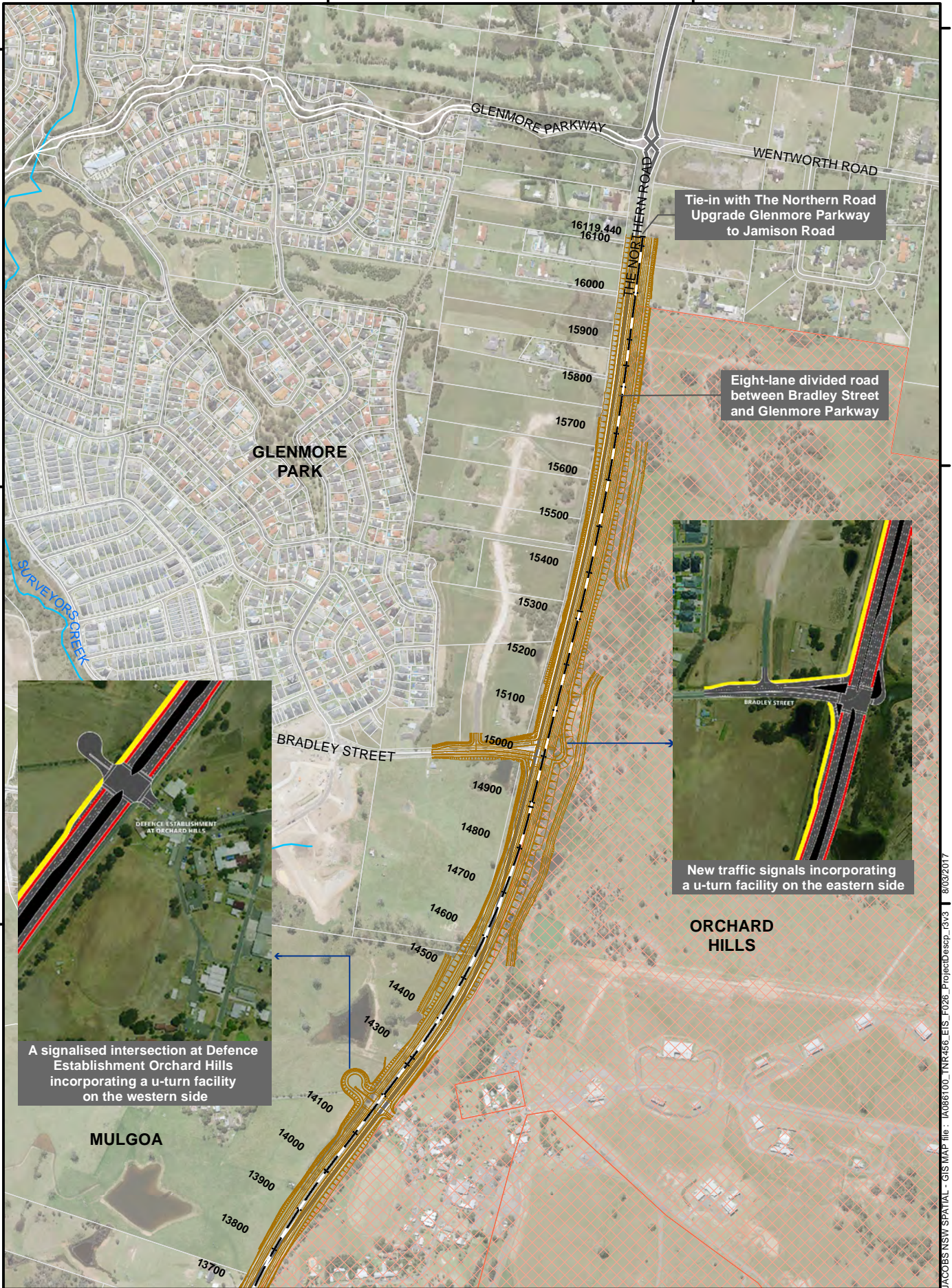
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150°42'0"E

33°47'30"S

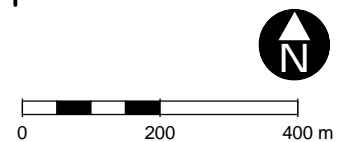
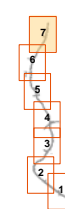
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33°48'30"S



- The Northern Road upgrade - Mersey Road to Glenmore Parkway
- The Northern Road (Existing)
- Bus lane
- Shared path

- Western Sydney Airport site (Commonwealth Land)
- Defence Establishment Orchard Hills (Commonwealth Land)



**Figure 5-1** | Description of the project



### 5.2.2 Road grade and lane widths

The gradient of the road would generally be about three per cent, but in places it could reach a maximum of six per cent.

The dual carriageways of the upgraded road south of Bradley Street would generally have:

- Two lanes per carriageway, each lane a minimum width of 3.5 m
- One dedicated bus lane, a minimum width of four metres
- A typical median width of about 16.5 m between edge lines (this would divide the carriageways and allow for future widening of the road within the median in the future if required).

The dual carriageways of the upgraded road north of Bradley Street would generally have:

- Three lanes per carriageway, each lane a minimum width of 3.5 m
- One dedicated bus lane, a minimum width of four metres
- A typical median width of about 9.5 m between edge lines (this would divide the carriageways and allow for future widening of the road within the median in the future if required).

Typical cross sections are presented in Figure 5-2 for the section of the project south of Bradley Street and Figure 5-3 for the section of road north of Bradley Street.

### 5.2.3 Corridor width and project footprint

The strategic and concept design process for the project has included refinements to the proposed alignment to ensure network enhancement objectives can be achieved while minimising environmental impacts, such as land acquisition and vegetation removal.

The total construction footprint (including compound and laydown sites) is estimated at about 278 ha. The construction footprint would include the land required for the construction of the main carriageway, intersection upgrades, new intersection, integration with existing surface roads, drainage infrastructure, surface support infrastructure, construction access tracks and temporary ancillary facilities (such as construction compounds).

Once operational, the total operational footprint is estimated at 202 ha. The operational footprint would consist of the land required to accommodate the operation of The Northern Road, the upgraded local roads and any drainage and ancillary infrastructure. It would incorporate about 45 ha of land currently owned by the Commonwealth consisting of:

- About 25 ha of land within the DEOH
- About 20 ha of land purchased for the Western Sydney Airport.

Figure 5-4 shows the proposed operational and construction footprints of the project.

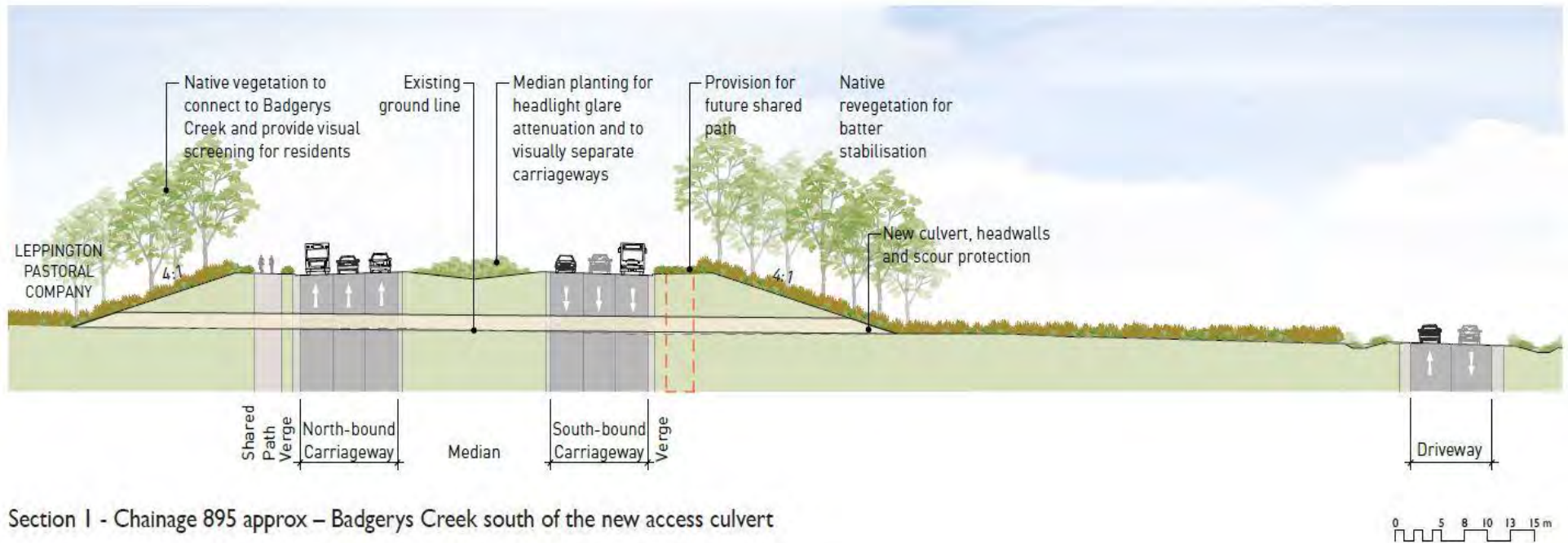
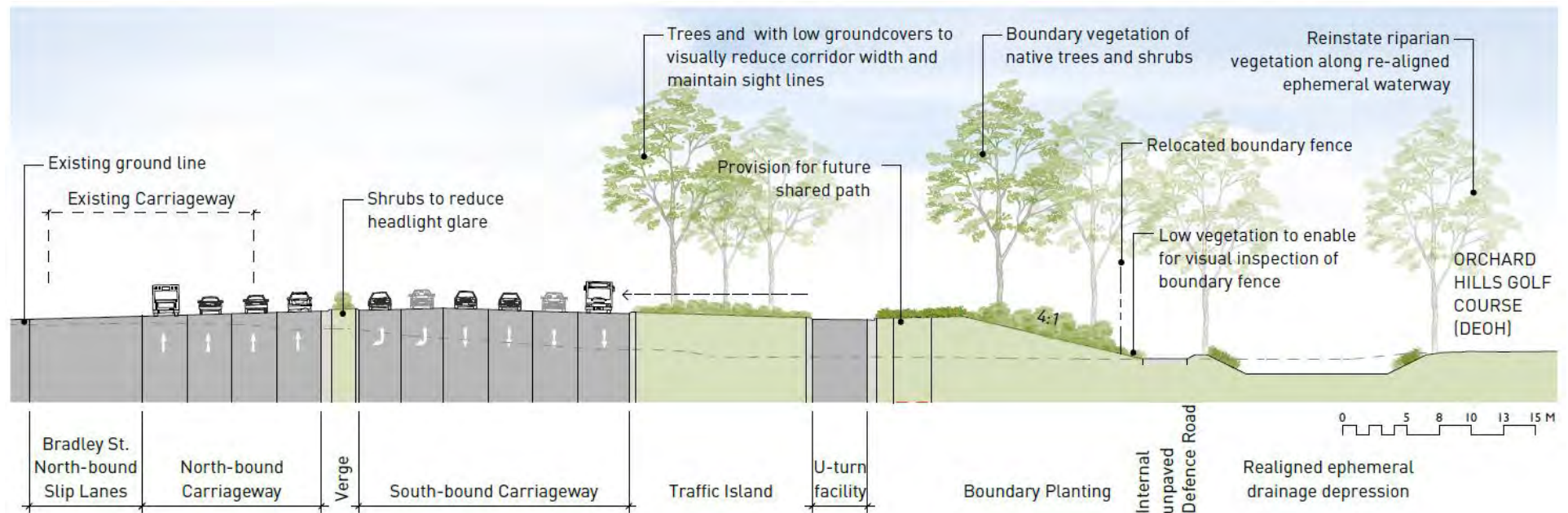


Figure 5-2 Typical cross section between Mersey Road and Bradley Street (six-lane divided road)

## Chapter 5 – Project description

The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park  
Environmental impact statement / draft Environmental Impact Statement



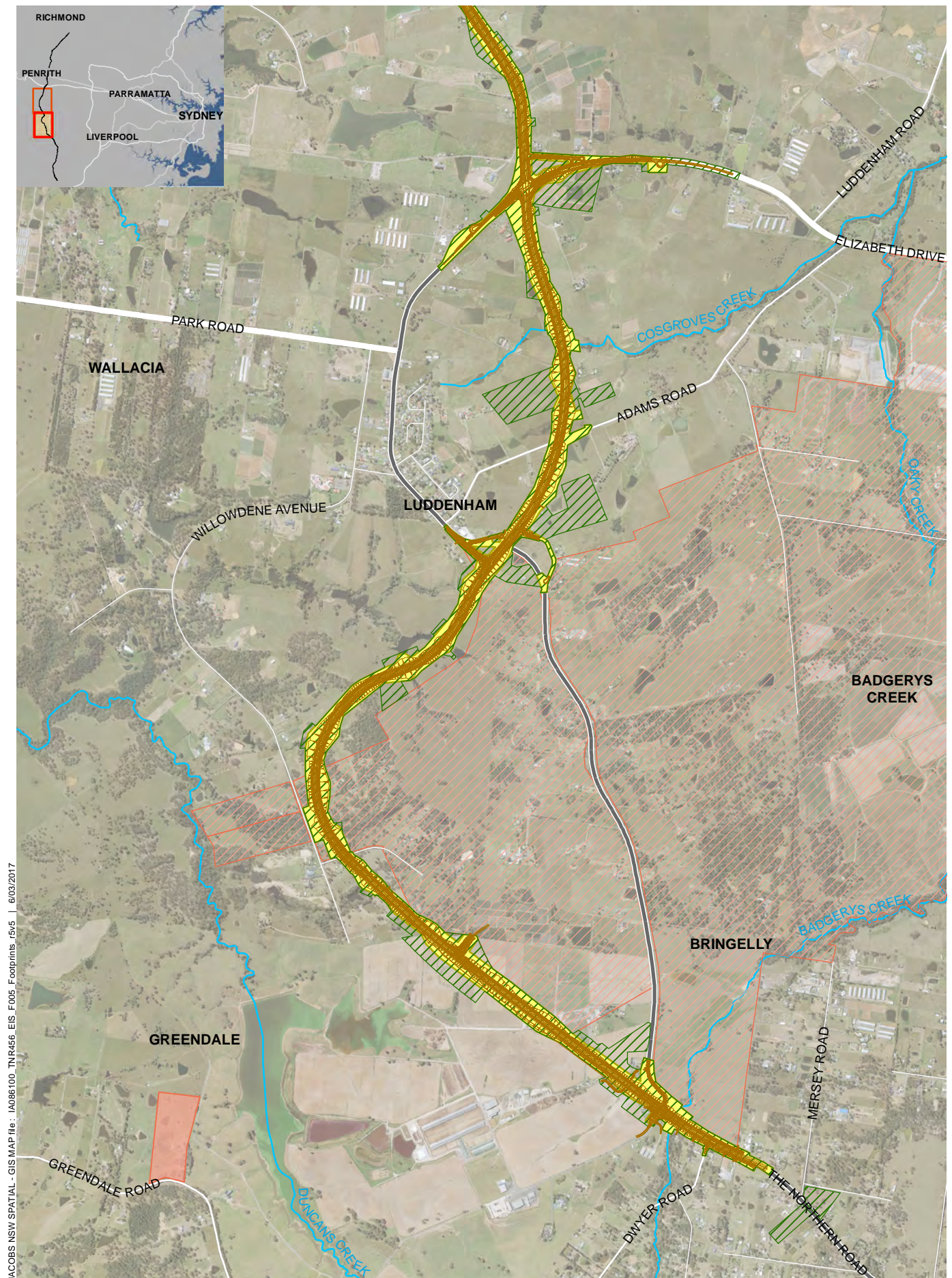
Section 11 - Chainage 15,035 approach – Bradley Street intersection

Figure 5-3 Typical cross section between Bradley Street and Glenmore Parkway (eight-lane divided road)

## Chapter 5 – Project description

The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park  
Environmental impact statement / draft Environmental Impact Statement

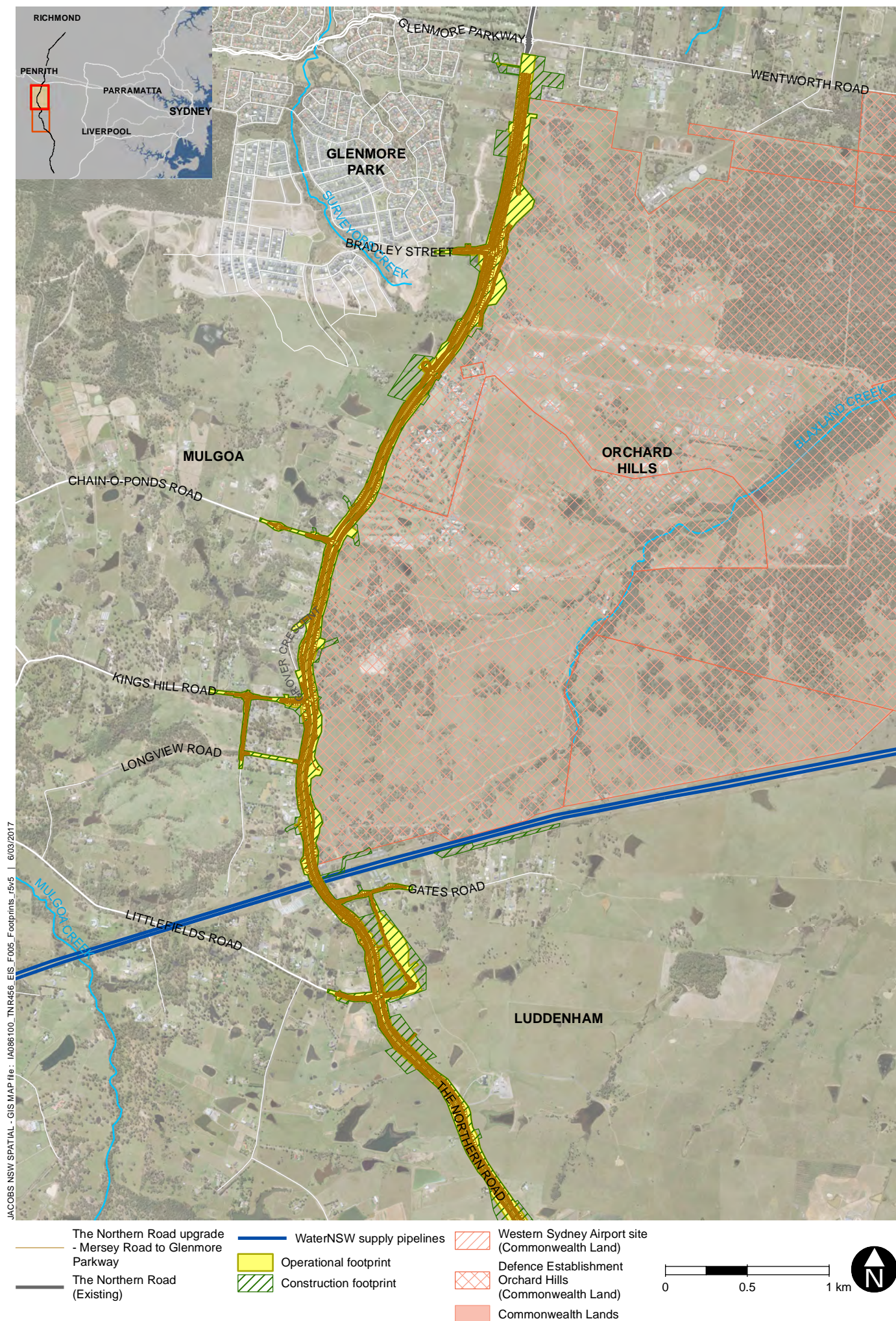




JACOBS NSW SPATIAL - GIS MAP file: IA086100\_TNR456\_EIS\_F005\_Footprints\_r5v5 | 8/03/2017

**Figure 5-4** | Operational and construction footprints for the project





**Figure 5-4** | Operational and construction footprints for the project



### 5.2.4 Intersections

The project would include new intersections with traffic lights, modified intersections, and new traffic lights at existing intersections as described in the following sections and shown in Figure 5-1.

#### New intersections

The project would include six new intersections:

- A traffic light intersection connecting the existing The Northern Road at the southern boundary of the Western Sydney Airport (Commonwealth land), incorporating a dedicated u-turn facility on the western side (chainage 700)
- A traffic light intersection for service vehicles accessing the Western Sydney Airport, incorporating 160 m of new road connecting to the planned airport boundary (chainage 2,200)
- A traffic light intersection connecting the new The Northern Road with the existing The Northern Road (west of the new alignment) south of Luddenham (chainage 5,200)
- An 'give way' controlled intersection (no traffic lights) connecting the new The Northern Road with Eaton Road (east of the new alignment, left in, left out only) (chainage 5,500)
- A four-way traffic light intersection formed by realigning Elizabeth Drive and the existing The Northern Road, north of Luddenham (chainage 7,600)
- A traffic light intersection at DEOH (Commonwealth land), incorporating a u-turn facility on the western side (chainage 14,200).



The project would include new traffic lights at four existing intersections:

- Littlefields Road, Luddenham (chainage 10,000)
- Kings Hill Road, Mulgoa (chainage 12,000)
- Chain-O-Ponds Road, Orchard Hills (chainage 12,900)
- Bradley Street, Orchard Hills incorporating a u-turn facility on the eastern side (chainage 15,000).

Plans and descriptions of the proposed intersection configurations are presented in Table 5-2.

Work at all intersections would generally include kerb realignments, drainage adjustments, installation of traffic lights, relocation of road furniture and other similar work to accommodate the project. Refer to Section 5.4 for further information on the construction of the project.

Table 5-2 Proposed layout of new intersections, and proposed traffic lights at existing intersections

New intersection location and configuration	
	<p>A signalised intersection connecting the existing The Northern Road at the southern boundary of the planned Western Sydney Airport, incorporating a dedicated u-turn facility on the western side.</p> <div><p><b>LEGEND</b></p><ul style="list-style-type: none"><li>bus lane</li><li>shared path</li><li>Commonwealth Land</li></ul></div>
	<p>A signalised intersection for service vehicle access to the planned Western Sydney Airport, incorporating 160 m of new road connection to planned western Sydney airport boundary. The intersection would allow all turning movements into and out of the airport site.</p> <div><p><b>LEGEND</b></p><ul style="list-style-type: none"><li>bus lane</li><li>shared path</li><li>Commonwealth Land</li></ul></div>



## New intersection location and configuration



A signalised intersection connecting the realigned The Northern Road with the existing The Northern Road (west of the new alignment) south of Luddenham. This would provide an upgraded entry to Luddenham from the south as well as a right turn entry for vehicles coming from the north.

### LEGEND

- bus lane
- shared path
- Commonwealth Land



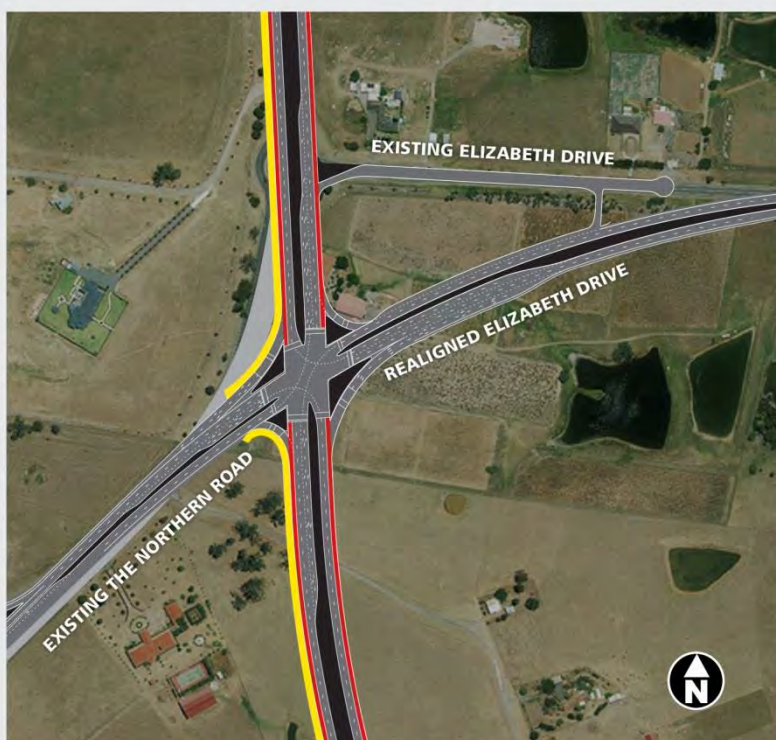
An un-signalised (give way controlled) intersection connecting the new. The Northern Road with Eaton Road south of Luddenham (east of the new alignment) This intersection would be left in, left out only for vehicles travelling south.

### LEGEND

- bus lane
- shared path
- Commonwealth Land



## New intersection location and configuration



A four-way signalised intersection formed from a realigned Elizabeth Drive and the existing The Northern Road, north of Luddenham.

This would provide an upgraded entry to Luddenham from the north and allow all turning movements onto the old The Northern road and the upgraded section of Elizabeth Drive.

### LEGEND

- bus lane
- shared path

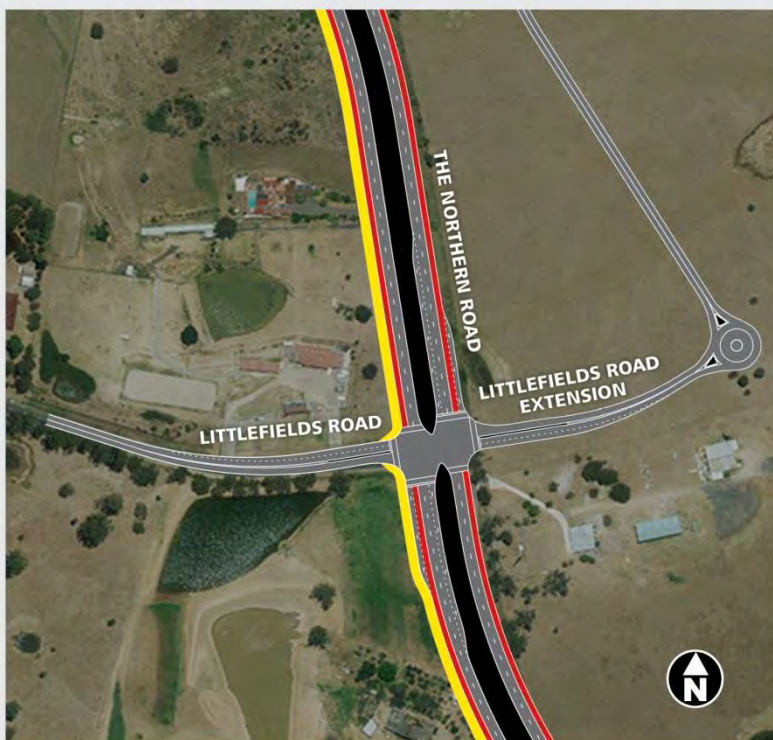


A signalised intersection at Defence Establishment Orchard Hills, incorporating a u-turn facility.

### LEGEND

- bus lane
- shared path

## New intersection location and configuration



New traffic signals at Littlefields Road, allowing all turning movements to and from Littlefields Road.

### LEGEND

- bus lane
- shared path



New traffic signals at Kings Hill Road allowing all turning movements to and from Chain-O-Ponds Road.

### LEGEND

- bus lane
- shared path



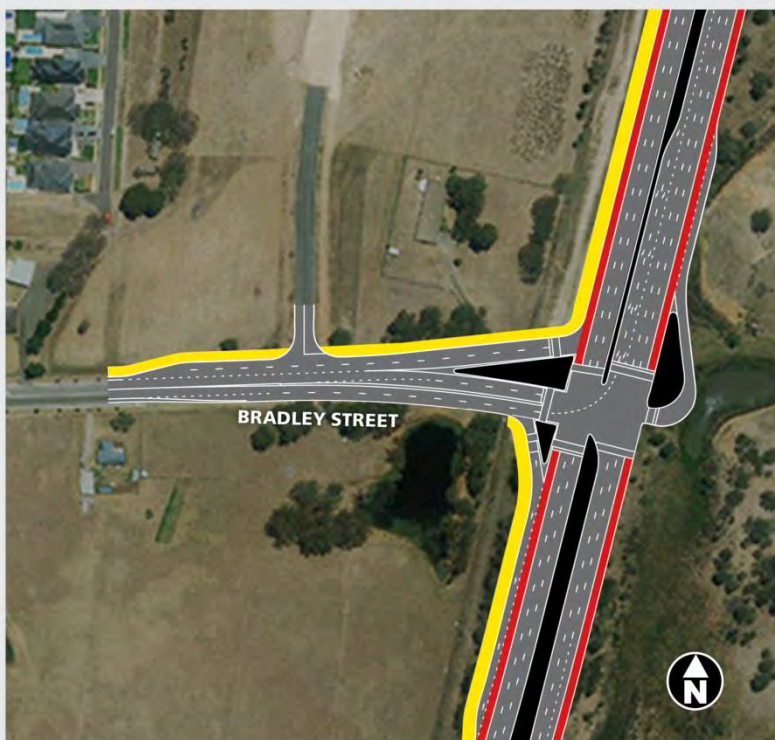
## New intersection location and configuration



New traffic signals Chain-O-Ponds Road, allowing all turning movements to and from Chain-O-Ponds Road.

### LEGEND

- bus lane
- shared path



New traffic signals at Bradley Street, Orchard Hills incorporating a u-turn facility allowing all turning movements to and from Bradley Street.

### LEGEND

- bus lane
- shared path

## Modified intersection arrangements

The project would include changes to the following existing intersections:

- Dwyer Road – left in, left out only (chainage 300)
- Existing Elizabeth Drive – left out only (chainage 7,800)
- Gates Road – left in only (chainage 10,700)
- Longview Road, Mulgoa – left in, left out only (chainage 11,600)
- Grover Crescent south – left in only (chainage 12,000)
- Grover Crescent north – left out only (chainage 12,500).

Plans showing proposed changes to existing intersection configurations and a description of the change are presented in Table 5-3.

### 5.2.5 Dedicated u-turn facilities



Dedicated u-turn facilities would be provided at the following locations, and would be generally designed to accommodate up to 26 m B-double vehicles:

- Existing The Northern Road at Luddenham, south-west of Elizabeth Drive - designed for up to 26 m B-double vehicles
- Chain-O-Ponds Road
- Existing Elizabeth Drive around 800 m east of The Northern Road.

The proposed locations of dedicated u-turn facilities are shown in Figure 1-2 and Figure 5-1.

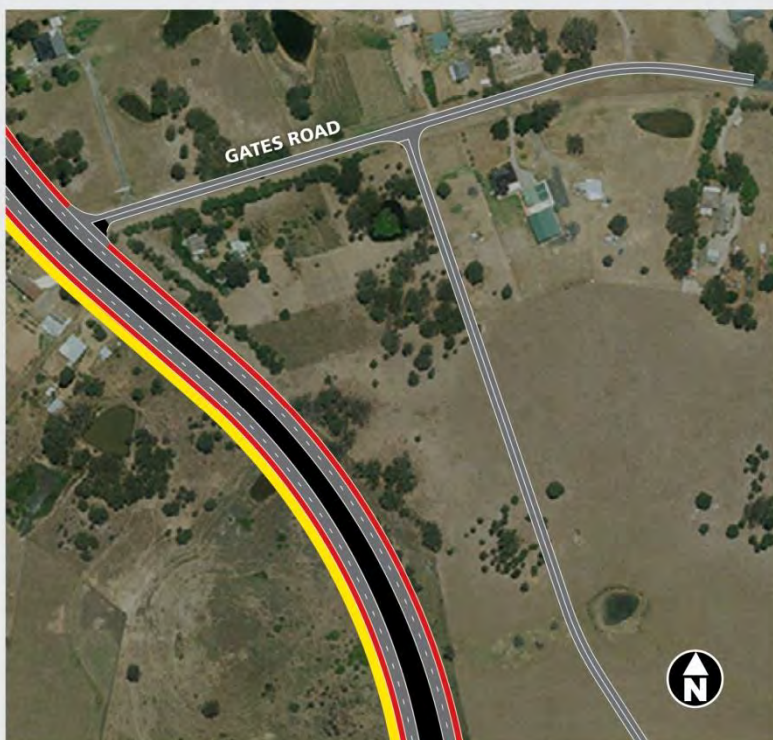


Table 5-3 Proposed modifications to intersection arrangements

Modified intersection arrangement location and configuration	
	<p>An unsignalised T-junction intersection, allowing left in, left out access, at the intersection between Dwyer Road and The Northern Road.</p> <div><b>LEGEND</b><ul style="list-style-type: none"><li>bus lane</li><li>shared path</li><li>Commonwealth Land</li></ul></div>
	<p>New left in, left out access to the realigned Elizabeth Drive and left out access to The Northern Road for private properties located on the existing Elizabeth Drive.</p> <div><b>LEGEND</b><ul style="list-style-type: none"><li>bus lane</li><li>shared path</li></ul></div>



## Modified intersection arrangement location and configuration



An unsignalled T-junction intersection, allowing left in only access at the intersection between Gates Road and the proposed alignment.

### LEGEND

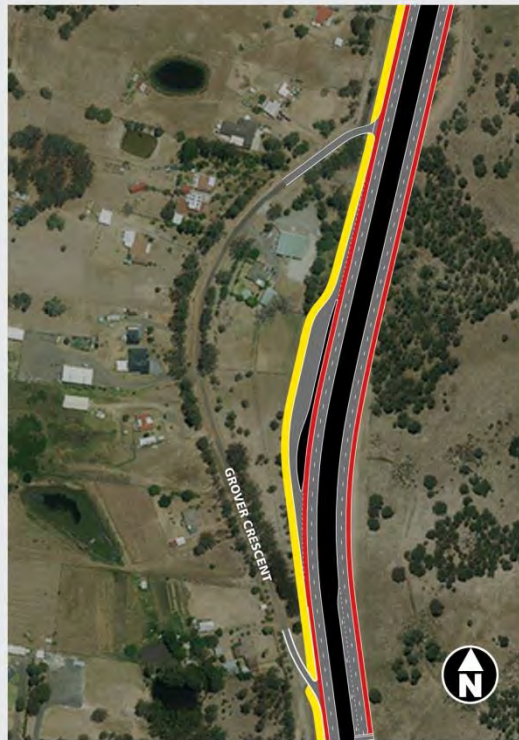
- bus lane
- shared path



Modified intersection at Longview Road allowing left in, left out only.

### LEGEND

- bus lane
- shared path



A modified intersections at Grover Crescent south (left in only) and Grover Crescent north (left out only).

**LEGEND**

- bus lane
- shared path

### 5.2.6 Bridges

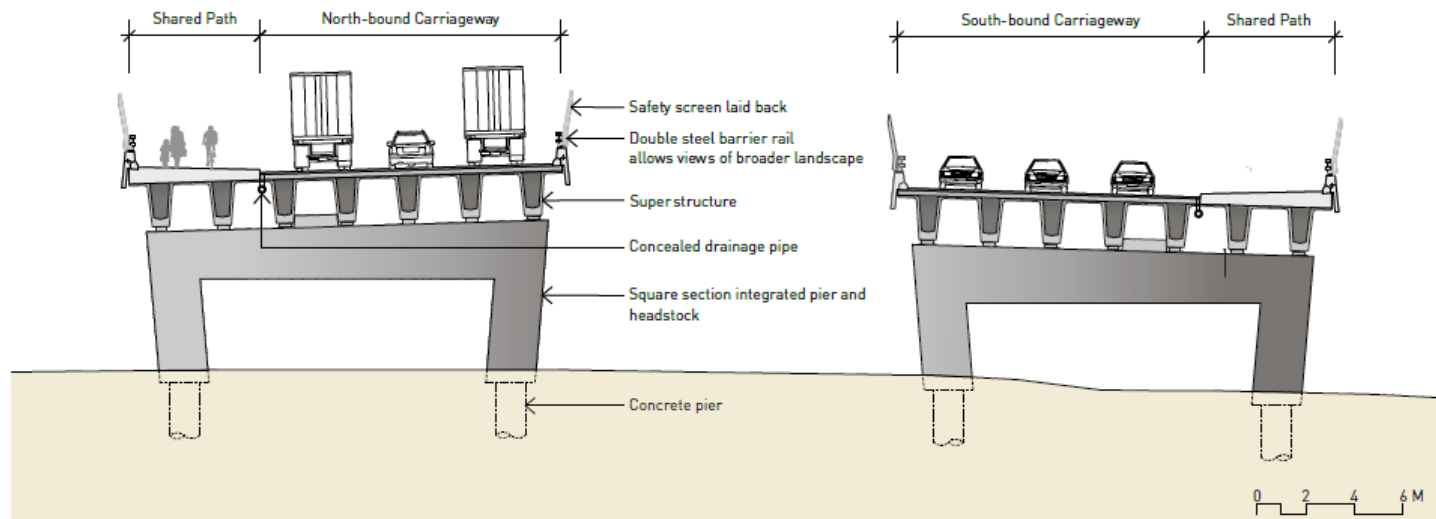
The project would include one new bridge crossing over Adams Road, Luddenham (refer to Table 5-4). The final bridge type would be confirmed during detailed design. The urban design of the proposed bridges is detailed further in Section 8.5 with the indicative cross section provided in Figure 5-5 and a photomontage of the bridge provided in Figure 5-6.

Table 5-4 Adams Road bridge details

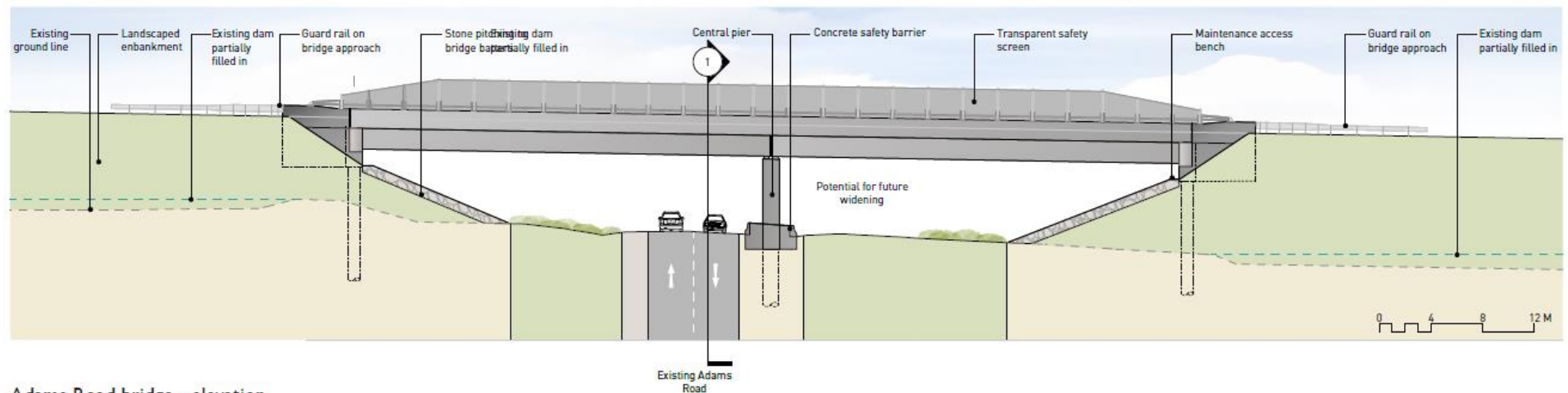
Bridge location / description	Structure type	Length and width
Northbound and southbound bridges are proposed over Adams Road, Luddenham (chainage 6100) The bridge structure would be of sufficient length to accommodate future widening of Adams Road (by others). The bridge would maintain a clearance of at least 5.4 m over Adams Road. The bridge would incorporate a safety screen and steel barrier rails, and a shared path on the western side. A footpath may be provided on the eastern side (to be confirmed during detailed design).	Super 'T' or Plank bridge (to be confirmed during detailed design)	Span: about 65 m Width of each bridge to accommodate the ultimate design of: 3 x 3.5 m lanes 1 x 4 m bus lane 1 x 3 m shared path (minimum width)

The potential impacts of the proposed bridge are assessed in Chapter 7 and Chapter 8. The potential visual impacts of the bridge are addressed in Section 8-5 Urban Design and Visual Impact.





Adams Road bridge - cross section



Adams Road bridge - elevation

Figure 5-5 Indicative cross section and elevation of the proposed Adams Road bridge

## Chapter 5 – Project description

The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park  
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Figure 5-6 Photomontage of the proposed Adams Road bridge

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**Chapter 5 – Project description**

The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park  
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### 5.2.7 Flooding and hydrology infrastructure

A drainage strategy has been developed to mitigate the impact of the project on flooding behaviour and scour potential, and provide a minimum 100 year average recurrent interval (ARI) level of flood immunity to The Northern Road. The final design and configuration of drainage infrastructure would be confirmed during detailed design. An assessment of the drainage design is presented in Section 8.1 and in Appendix K – Flood risk assessment. Key features of the drainage design for the project are outlined in Table 5-5.

Table 5-5 Summary of proposed drainage strategy

Catchment	Proposed drainage strategy
Badgerys Creek	<ul style="list-style-type: none"> <li>• Upgrade existing transverse drainage where the existing road would be widened</li> <li>• Provide new transverse drainage where the new section of road would be constructed</li> <li>• Provide four box culvert arrangements sized between 1,200 mm x 600 mm and 3,600 mm x 1,200 mm. The culverts would be reinforced concrete box culverts (RCBC)</li> <li>• Provide a flood relief channel, about 80 m long, on the eastern overbank of Badgerys Creek immediately upstream of the road embankment. The channel appears as an open trench and would be lined with concrete. Flood waters would spill into the channel during events up to the 100 ARI before discharging into Badgerys Creek. The channel in combination with upgraded culvert structures would prevent the project from increasing peak flood levels in existing development for events up to the 100 year ARI</li> <li>• Fill or partially infill several dams located beneath the road footprint.</li> </ul>
Duncans Creek	<ul style="list-style-type: none"> <li>• Upgrade existing transverse drainage where the existing road would be widened</li> <li>• Provide a box culvert arrangement sized at 1,800 mm x 1,200 mm</li> <li>• Provide new transverse drainage where the new section of road would be constructed</li> <li>• Fill or partially infill several dams located beneath the road footprint.</li> </ul>
Cosgrove Creek	<ul style="list-style-type: none"> <li>• Upgrade existing transverse drainage where the existing road would be widened</li> <li>• Provide two box culvert arrangements sized at 3,000 mm x 900 mm and 2,400 mm x 1,200 mm</li> <li>• Provide new transverse drainage where the new section of road would be constructed</li> <li>• Remove the earth embankments of the two large dams, located on either side of Adams Road, and reinstate drainage lines</li> <li>• Fill or partially infill several dams located beneath the road footprint.</li> </ul>

Catchment	Proposed drainage strategy
Unnamed tributary of South Creek	<ul style="list-style-type: none"> <li>Upgrade existing transverse drainage where the existing road would be widened</li> <li>Provide new transverse drainage where the new section of road would be constructed.</li> </ul>
Mulgoa Creek	<ul style="list-style-type: none"> <li>Upgrade existing transverse drainage where the existing road would be widened</li> <li>Provide new transverse drainage where the new section of road would be constructed</li> <li>Divert runoff from the project in a westerly direction along Littlefields Road, where it would discharge to a drainage line near the limit of the proposed road work.</li> </ul>
Blaxland Creek	<ul style="list-style-type: none"> <li>Upgrade existing transverse drainage where the existing road would be widened</li> <li>Provide new transverse drainage where the new section of road would be constructed</li> <li>Convert two existing dams on Commonwealth land into two permanent detention ponds and provide a third detention pond on Commonwealth land. All three ponds would be on the eastern side of The Northern Road where runoff from the project would discharge directly to the DEOH site. The detention ponds would reduce the volume of runoff discharging to the DEOH site</li> <li>Provide energy dissipation measures and level spreaders on the spillway to reduce the potential for scour in the receiving drainage lines</li> <li>Provide a new piped trunk drainage line to convey runoff from the project in an easterly direction within the WaterNSW Supply Pipelines corridor, where it would discharge to the DEOH site. Provide energy dissipation measures and a flow spreader at the outlet of the new drainage line, where flow would be discharged</li> <li>Provide a concrete causeway and low-flow pipe arrangement in the design of the three metre wide access track to be constructed along the eastern side of the DEOH boundary fence.</li> </ul>
Surveyors Creek	<ul style="list-style-type: none"> <li>Upgrade existing transverse drainage where the existing road would be widened within in Commonwealth land</li> <li>Provide four box culvert arrangements sized between 2,100 mm x 900 mm and 3,600 mm x 1,500 mm</li> <li>Convert an existing dam on the eastern side of The Northern Road (within DEOH site) to a permanent flood retardation basin to control project runoff (up to 100 year ARI events), discharging directly to the DEOH site. The flood retardation basin would attenuate flows generated by the upstream catchment (within DEOH) with the aim of offsetting the impact the increase in impervious area would have on peak flows downstream of its location. The basin would have the following key features: <ul style="list-style-type: none"> <li>A four metre high earth embankment constructed across the</li> </ul> </li> </ul>



Catchment	Proposed drainage strategy
	<p>valley between the embankment of the new road and high ground to the east</p> <ul style="list-style-type: none"> <li>- A 1,200 mm diameter outlet pipe</li> <li>- A spillway constructed in natural ground at the eastern end of the basin embankment</li> </ul> <ul style="list-style-type: none"> <li>• Construct a flood bypass channel on the eastern side of The Northern Road (within the DEOH site) for a length of about 100 m. The channel would convey flood waters for events greater than the 10 year ARI between the inlets of two transverse (cross) drainage structures. An earthen bund would be constructed at the northern end of the bypass channel to prevent flood waters flowing towards The Northern Road</li> <li>• Provide drainage channels extending from the project boundary to the first farm dam on a number of drainage lines where peak flows would be increased in privately owned land. Easements for drainage are to be provided along each channel to facilitate future maintenance</li> <li>• Provide drainage measures in the design of the 3 m wide access track, to be constructed on the eastern side of the OHDE boundary fence</li> <li>• Provide energy dissipation measures and level spreaders on the spillway of the ponds to reduce the impact of scour in the receiving drainage lines.</li> </ul>

Drainage pits, pipes and open drains have been designed to collect and convey stormwater runoff from the road pavement and to manage overland flow from surrounding catchments. The proposed drainage pit and pipe networks would either connect to the existing council drainage network or discharge into the inlet or outlet headwall of the proposed or existing cross culverts. Where table drains are proposed, the drainage network would discharge runoff into the table drain before it is discharged into a receiving waterbody.

Drainage scuppers would be provided at four-metre intervals to drain the decks of the new bridges.

Drainage culverts would be provided at low points in the road and at waterway crossings. The culverts would generally be located where there are existing culverts. The existing culverts would be upgraded where the hydraulic modelling shows they need to be enlarged to cater for an increased flow of water. Existing culverts that do not need to be enlarged would be extended to suit the proposed road widening. The sizing and design of culverts would be reviewed during detailed design.

In addition, scour protection measures would be provided at the inlet and outlet of each transverse drainage structure. These measures would typically comprise dumped rock riprap and/or reno mattress.

The potential impacts of the proposed drainage infrastructure are assessed in Chapter 7 and Chapter 8 of this EIS. Catchment hydrology and flooding behaviour after the implementation of the proposed drainage infrastructure are assessed in Section 8.1 for design storms of two, 10 and 100 year ARI, together with the probable maximum flood (PMF).

### Design criteria

The major drainage and cross drainage structures proposed are presented in Table 5-6.

Table 5-6 Drainage structures

Drainage infrastructure	Design criteria ARI
Pavement drainage	10 years on grades 100 years in unrelieved sag sections
Culverts	Culverts would be designed for existing catchment conditions, assuming any future development of the external catchments would provide stormwater detention to maintain peak flows up to the 100 year ARI.
Open channels	5 years
Runoff from cut batters and grassed medians	100 years
Gutters and medians	10 years
Catch drains	100 years
Bridge drainage	20 years
Shared path and footpath	1 year

### 5.2.8 Waterway realignments

Sections of the un-named tributary of Surveyors Creek would be realigned (straightened) where it runs along the eastern side of The Northern Road near Bradley Street. This work would create a low-flow channel and a benched overbank area which would tie into the existing channel on the opposite side of the road. The realignment is required as the road widening would intercept the existing drainage depression.

The potential impact of the proposed creek realignment is assessed in Chapter 7 and Chapter 8 of this EIS. Specifically, the potential for scour and erosion is assessed in Section 8.1 Flooding and Hydrology, and Section 8.2 Soils, Water and contamination.

### 5.2.9 Provisions for pedestrians and cyclists

Pedestrian and cyclist facilities would be provided to improve connectivity and safe crossing locations along the project. A shared pedestrian and cycle path would be provided the whole length of the project. The shared path would generally be three meters wide and would be located on the western side of the project.

A footpath would be provided on the eastern side of the project where warranted. The footpath would typically be 1.5 m wide and suitable for pedestrians only.

Signalised pedestrian and/or cyclist crossings would be provided at upgraded intersections where traffic lights are provided. The crossings would be designed to meet current safety standards.

### 5.2.10 Local road changes and upgrades

Some local roads would be upgraded as part of the project to cater for additional traffic demands, and to ensure safe and efficient connections with the realigned and upgraded The Northern Road. These upgrades would involve:


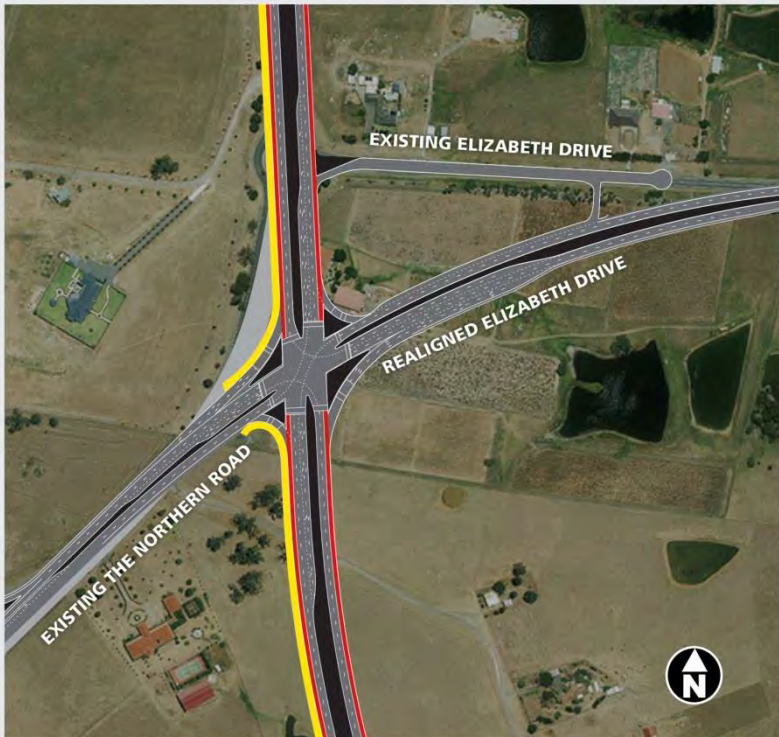
- Vicar Park Lane – closure of this road east of the realigned The Northern Road
- Eaton Road – new cul-de-sac 200 m east and west of The Northern Road
- Elizabeth Drive – new u-turn around 800 m east of The Northern Road



- Elizabeth Drive – new cul-de-sac about 300 m east of The Northern Road with a connection to the realigned Elizabeth Drive
- Littlefield Road – extension of the road east of the realigned The Northern Road, and provision of a new roundabout on the extension
- Littlefields Road – new north–south service road between the Littlefields Road roundabout and Gates Road
- Vineyard Road – extension of the road between Longview Road and Kings Hill Road, and provision of a new roundabout on the extension at Kings Hill Road
- Chain-O-Ponds Road – new u-turn bay.

The location and scope of the proposed local road upgrades are presented in Table 5-7.

Table 5-7 Proposed changes and upgrades to local roads

Location of local road upgrade
<div data-bbox="199 297 981 1032"></div> <div data-bbox="1035 329 1342 486"><p>Eaton Road would be cut where it crosses The Northern Road with a cul-de-sac east and west of The Northern Road.</p></div> <div data-bbox="1038 875 1364 996"><p><b>LEGEND</b></p><ul style="list-style-type: none"><li>bus lane</li><li>shared path</li><li>Commonwealth Land</li></ul></div>
<div data-bbox="199 1187 981 1921"></div> <div data-bbox="1035 1232 1353 1359"><p>A cul-de-sac about 300 m east of The Northern Road with a connection to the realigned Elizabeth Drive.</p></div> <div data-bbox="1038 1771 1364 1874"><p><b>LEGEND</b></p><ul style="list-style-type: none"><li>bus lane</li><li>shared path</li></ul></div>



## Location of local road upgrade



A new service road with one lane in each direction connecting between the Littlefields Road roundabout and Gates Road.

### LEGEND

- bus lane
- shared path



Extension of Vineyard Road, Mulgoa between Longview Road and Kings Hill Road.  
A new roundabout on the Vineyard Road extension at Kings Hill Road.

### LEGEND

- bus lane
- shared path

### 5.2.11 Cuttings and embankments

Cutting and batter slopes have generally been designed to be 1 in 4 slope. During detailed design, some batters may be locally steepened to 1 in 2 at pinch points (or be replaced by retaining walls) or as steep as 1 in 1.5 at the bridge spill-through abutments.

A retaining wall may be required near the intersection of Eaton Road (west) and The Northern Road (existing) where the road formation spills over the existing boundary at Luddenham. The wall is required to retain road fill. If required, it would be about 27 m long and less than one metre high.

Table 5-8 lists the approximate extents of deep cuttings and high fills proposed (five metres or more). The cuttings are subject to change following geotechnical investigations and analysis. The location and dimension of cuttings, retaining walls, and batters would be confirmed during detailed design. Deep cuttings and high fills are not proposed along local roads.

Table 5-8 Proposed indicative cuttings and fills for the project

Cutting / fill (from south to north)	Location	Approximate length (m)	Approximate depth / height (m)
Cutting	North of the signalised intersection connecting the existing The Northern Road at the southern boundary of the Western Sydney Airport (about chainage 1600)	255 m	5–10 m
Cutting	South of the proposed service entrance for the Western Sydney Airport (about chainage 1900)	125 m	5–10 m
Cutting	North of the proposed service entrance for the Western Sydney Airport (about chainage 2400)	110 m	5–10 m
Fill	South of Vicar Park Lane (about chainage 2800)	40 m	5–7 m
Fill	North of Vicar Park Lane (about chainage 3300)	95 m	5–12 m
Cutting	About 500 m north of Vicar Park Lane (about chainage 3500) – see Figure 5-8	220 m	5–10 m
Fill	About 800 m north of Vicar Park Lane (about chainage 3800) – see Figure 5-9	240 m	5–12 m
Cutting	About 1 km south of The Northern Road access to Luddenham (about chainage 4100)	75 m	5–7 m
Fill	About 750 m south of The Northern Road access to Luddenham (about chainage 4400)	120 m	5–10 m
Fill	About 500 m south of The Northern Road access to Luddenham (about chainage 4700)	85 m	5–10 m
Fill	South of The Northern Road access to Luddenham (about chainage 5000)	220 m	5–10 m
Cutting	North of Eaton Road (about chainage 5600)	200 m	5–7 m
Fill	Either side of Adams Road (about chainage 6000)	535 m	5–12 m
Cutting	About 350 m north of Adams Road (about chainage 6400)	154 m	5–12 m
Fill	About 550 m north of Adams Road (about chainage 6700)	160 m	5–10 m
Fill	South of Elizabeth Drive (about chainage 7100)	300 m	5–7 m



Cutting / fill (from south to north)	Location	Approximate length (m)	Approximate depth / height (m)
Cut	North of Littlefields Road on the western side of the alignment (about chainage 10,200)	70 m	5–7 m
Fill	North of Littlefields Road on the eastern side of the alignment (about chainage 10,300)	150 m	5–10 m
Cut	South of Gates Road (about chainage 10,400)	75 m	5–7 m
Cut	About 250 m south of Longview Road (about chainage 12,200)	25 m	5–7 m

### 5.2.12 Operational water quality controls

The potential impacts of the project on water quality would be minimised by implementing adequate permanent water quality measures for the operational phase. For this project, water quality treatment would be provided through 24 vegetated swales with rock check dams, which would be designed and vegetated in accordance with water sensitive urban design principles.

The swales would convey pavement runoff to the receiving waterways and creeks. The swales would also provide some water quality treatment. The amount of treatment would depend on the length and slope of the swale; wider swales would provide additional water quality treatment. The swales would incorporate rock check dams to provide additional treatment by slowing down the runoff and allowing it to temporarily pond during storm events. The swales have been modelled to assess their respective pollutant load reductions.

A water quality monitoring program is proposed to assess the water quality in receiving creeklines during construction and operation of the project, and to monitor the effectiveness of the swales.

Further information on the swales, including an assessment of their effectiveness, location and lengths, is provided in Section 8.2. Further information on the water quality monitoring program is provided in Section 8.2 and Appendix L – Soils, Water and Contamination.

The indicative location of the vegetated swales is shown in Figure 8-7. An indicative cross section illustration of a vegetated swale is shown in Figure 5-7.

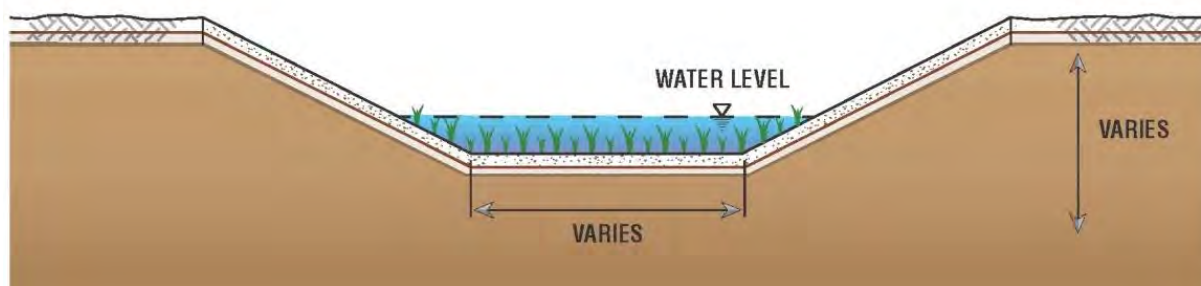


Figure 5-7 Indicative cross section of a vegetated swale

### 5.2.13 Roadside furniture, bus stops and lighting

Roadside furniture would be included along the length of the project for safety reasons, including delineation and directional guidance. All roadside furniture would be designed in accordance with the urban design objectives set out in Section 5.3.2. The location and design of these elements would be further refined during detailed design.

Bus shelter locations would be redesigned to suit planned bus route upgrades by Transport for NSW. Shelters would be designed to Transport for NSW and local government requirements.

The location of bus stops would be considered further during detailed design. These would then need to be modelled into the project. A number of existing bus stops would be relocated or removed (see Section 7.1), and two new bus stops may be provided for northbound and southbound routes near Bradley Street. Although the majority of relocated bus stops would only be moved from the entry side to the exit side of an intersection, bus stops between Kings Hill Road and Littlefields Road would be relocated a substantial distance from existing stops. The maximum additional distance passengers would need to travel as a result of relocated bus stops would be for the bus stop located at Gates Road, where passengers would need to travel up to an additional 650 m to reach the relocated bus stop at Littlefields Road.

New street lighting or adjustments to existing street lighting would be required at the signalised intersections. Street lighting would be provided along the full length of the project to light the carriageway and shared path. Street lighting would be designed to ensure relevant guidelines are adhered to, particularly in the vicinity of the Western Sydney Airport, to ensure lighting intensity; configuration and colour do not cause confusion, distraction or glare to pilots in the air. Lighting would meet the relevant guidelines, including requirements under the National Airports Safeguarding Framework *Guideline E: Managing the Risk of Distractions to Pilots from Lighting in the Vicinity of Airports* and Regulation 94 of the Civil Aviation Regulations 1988, as required, enabling lights to be designed and installed so that they.

The potential impacts of project lighting, including the effects on nocturnal fauna, are assessed in Chapter 7.3 Biodiversity.

There is provision in the design for wide footpaths and traversable batters with a 1 in 4 slope. As a result, there is no requirement for safety barriers for the length of the project with the exception of barriers provided for the Adams Road bridge and around isolated hazards such as VMS.

Indicative cross sections of typical cut and fill elevations are shown in Figure 5-8 and Figure 5-9.



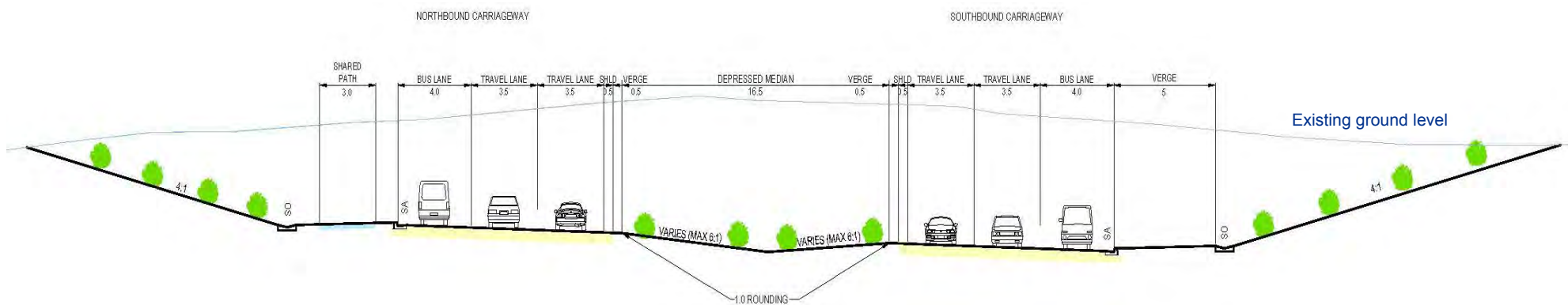


Figure 5-8: Indicative cross section and elevation of the proposed cut, about 500 m north of Vicar Park Lane (about chainage 3500)

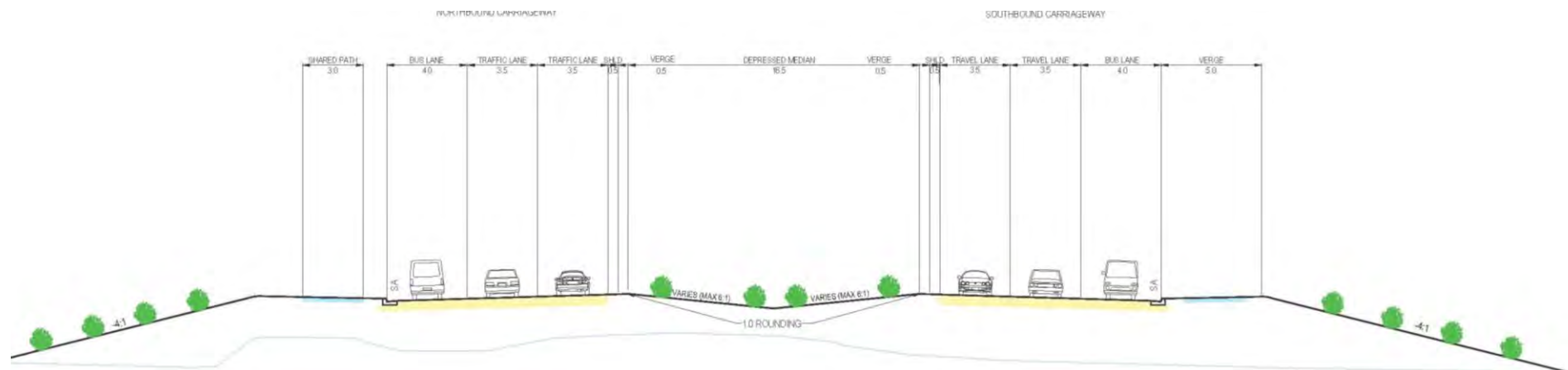


Figure 5-9: Indicative cross section and elevation of the proposed fill, about 500 m north of Vicar Park Lane (about chainage 3500)

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## 5.2.14 Property access changes and acquisition

### Property access

The dividing median within the proposed alignment would change the allowable movements from properties onto The Northern Road.

In addition, the project alignment would deviate from the existing road through existing properties, resulting in new segments of land that require access to the proposed alignment.

Access arrangements for the majority of properties that currently have access directly onto The Northern Road, and some properties that have access along roads that connect to The Northern Road, would change as a result of the project.

Proposed alternative access routes and arrangements are outlined in detail in Appendix G – Traffic and Transport and Section 7.1.

### Property acquisition

Sections of the project have been designed and aligned to minimise impacts on private property. Where reasonably practicable, houses and other property infrastructure have been avoided and consideration has been given to ensuring that land holdings are viable where partial acquisitions are required.

Nevertheless, private, Commonwealth (Department of Defence and DIRD) and Crown land would be required for the project. All private land would be acquired in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*. The acquisition of Commonwealth and Crown land would be negotiated with the Commonwealth Government and the NSW Department of Finance, Services and Innovation respectively.

Properties impacted by acquisition or adjustments are listed in Table 5-9 and are shown in Appendix J – Socio-economic Assessment.

The extent of property impacts would be refined and confirmed during detailed design in consultation with the property owners. For partial acquisitions, property adjustment plans would be developed in consultation with the property owner.

Table 5-9 Properties impacted by the project

Property ID	Property (lot number)	Existing land use*	Acquisition type	Dwellings affected	Buildings (sheds) affected
1	Lot 1 DP235845	Residential	Partial	-	-
2	Lot 97 DP27550	Residential	Partial	-	-
3	Lot 1 DP250684	Residential	Partial	-	-
4	Lot 96 DP27550	Residential / business	Partial	-	-
5	Lot 95 DP27550	Residential / business	Partial	-	-
6	Lot 94 DP27550	Residential	Partial	-	-
7	Lot 93 DP654182	Residential	Partial	-	-
8	Lot 92 DP27550	Business	Partial	-	-



Property ID	Property (lot number)	Existing land use*	Acquisition type	Dwellings affected	Buildings (sheds) affected
9	Lot 102 DP812653	Rural / residential	Partial	-	-
10	Lot 1 DP838361	Rural / Western Sydney Airport / Commonwealth land	Partial	-	Yes (2)
11	Lot 11 DP1092165	Rural residential	Partial	-	Yes (2)
12	Lot 27 DP259698	Residential	Partial	-	-
13	Lot 28 DP259698	Residential	Partial	-	-
14	Lot 33 DP259698	Rural residential	Partial	-	-
15	Lot 22 DP258581	Rural residential	Partial	-	-
16	Lot 21 DP258581	Residential	Dual offer/ partial	Yes (1)	-
17	Lot 20 DP258581	Residential	Partial	-	-
18	Lot 2 DP851626	Business	Partial	-	-
19	Lot 1 DP851626	Rural	Partial	-	-
20	Lot 2 DP623457	Business	Partial	-	-
21	Lot 21 DP614481	Residential	Partial	-	-
22	Lot 1 DP250030	Residential	Dual offer/ partial	Yes (1)	Yes (1)
23	Lot 1 DP90157	Residential	Partial	-	-
24	Lot 2 DP250030	Residential	Partial	-	-
25	Lot 3 DP250030	Residential	Partial	-	-
26	Lot 2 DP519034	Residential	Partial	-	-
27	Lot 104 DP846962	Residential	Partial	-	-
28	Lot 3 DP827223	Residential	Partial	-	-
29	Lot 103 DP846962	Residential	Partial	-	-
30	Lot 102 DP846962	Residential	Partial	-	-
31	Lot 1 DP232996	Rural residential	Partial	-	-
32	Lot 101 DP846962	Residential	Partial	-	-

Property ID	Property (lot number)	Existing land use*	Acquisition type	Dwellings affected	Buildings (sheds) affected
33	Lot 100 DP846962	Residential	Partial	-	-
34	Lot 5 DP232324	Crown land (road reserve)	Full	-	-
35	Lot 4 DP232324	Crown land (road reserve)	Full	-	-
36	Lot 3 DP911607	Crown land (road reserve)	Full	-	-
37	Lot 1 DP517853	Residential	Partial	Yes (2)	Yes (4)
38	Lot 2 DP517853	Rural residential	Partial	-	-
39	Lot 6 DP32026	Rural	Partial	-	-
40	Lot 5 DP32026	Rural	Partial	-	-
41	Lot 4 DP32026	Rural	Partial	-	-
42	Lot 1 DP1169433	Residential/ business	Partial	-	-
43	Lot 3 DP32026	Residential/ business	Partial	Yes (1)	-
44	Lot 504 DP581138	Residential	Partial	-	-
45	Lot 2 DP32026	Residential/ business	Partial	Yes (1)	Yes (1)
46	Lot DP160890	Residential/ business	Partial	Yes (1)	-
47	Lot 5 DP599382	Residential	Partial	-	-
48	Lot 1 DP200435	Residential/ business	Partial	-	-
49	Lot 501 DP580982	Residential	Partial	-	-
50	Lot 12 DP249113	Residential	Partial	-	-
51	Lot 11 DP249113	Residential	Partial	-	-
52	Lot 10 DP249113	Residential	Partial	-	-
53	Lot 9 DP249113	Residential	Partial	-	-
54	Lot 1 DP109697	Residential	Partial	-	-



Property ID	Property (lot number)	Existing land use*	Acquisition type	Dwellings affected	Buildings (sheds) affected
55	Lot 8 DP249113	Residential	Partial	-	Yes (1)
56	Lot 7 DP249113	Residential	Partial	-	-
57	Lot 101 DP580082	Business	Partial	-	-
58	Lot 11 DP30775	Residential	Partial	-	-
59	Lot 12 DP30775	Sydney Water pumping station	Partial	-	-
60	Lot 9 DP232322	Rural**	Full	-	-
61	Lot 13 DP30775	Residential	Partial	-	Yes (1)
62	Lot 8 DP232322	Rural residential**	Full	-	-
63	Lot 14 DP30775	Residential	Partial	-	-
64	Lot 22 DP32053	Rural	Partial	-	-
65	Lot 15 DP30775	Residential	Partial	-	-
66	Lot 23 DP207317	Residential	Partial	-	-
67	Lot 2 DP32053	Residential/ rural	Partial	-	-
68	Lot 1 DP420840	Residential	Partial	-	-
69	Lot 16 DP30775	Residential	Partial	-	Yes (1)
70	Lot DP341893	Water NSW asset maintenance	Partial	-	-
71	Lot A DP341629	Crown land (road reserve)	Partial	-	-
72	Lot 22 DP843123	Residential	Partial	-	Yes (1)
73	Lot 68 DP651114	Residential	Partial	-	Yes (2)
74	Lot 71 DP668758	Residential	Partial	-	-
75	Lot 73 DP2120	Residential	Partial	-	-
76	Lot 1 DP1064093	Residential	Partial	-	-
77	Lot 1 DP232322	Crown land (road reserve)	Full	-	-
78	Lot 77 DP659462	Business	Partial	-	-

Property ID	Property (lot number)	Existing land use*	Acquisition type	Dwellings affected	Buildings (sheds) affected
79	Lot 79 DP1085461	Residential	Partial	-	-
80	Lot 1 DP1085051	Residential	Partial	-	-
81	Lot 211 DP2255	Vacant	Partial	-	-
82	Lot 210 DP2255	Vacant	Full	-	-
83	Lot 80 DP2120	Residential	Partial	-	-
84	Lot 10 Sec H DP2234	Vacant	Full	-	-
85	Lot 3 DP202647	Residential	Partial	-	-
86	Lot 36 DP959167	Vacant	Partial	-	-
87	Lot 101 Sec H DP2234	Vacant	Partial	-	-
88	Lot 100 Sec H DP2234	Vacant	Partial	-	-
89	Lot 99 Sec H DP2234	Vacant	Partial	-	-
90	Lot 2 DP202647	Residential	Partial	-	-
91	Lot 98 Sec H DP2234	Vacant	Partial	-	-
92	Lot 97 Sec H DP2234	Vacant	Partial	-	-
93	Lot 96 Sec H DP2234	Vacant	Partial	-	-
94	Lot 37 DP959167	Vacant	Partial	-	-
95	Lot 84 Sec H DP2234	Vacant	Partial	-	-
96	Lot 83 Sec H DP2234	Vacant	Partial	-	-
97	Lot 38 DP959167	Residential	Partial	-	-
98	Lot 75 Sec H DP2234	Residential	Partial	-	-
99	Lot 74 Sec H DP2234	Residential	Partial	-	-
100	Lot 73 Sec H DP2234	Residential	Partial	-	-
101	Lot 72 Sec H DP2234	Residential	Partial	-	-
102	Lot 71 Sec H DP2234	Residential	Partial	-	-
103	Lot 70 Sec H DP2234	Residential	Partial	-	-



Property ID	Property (lot number)	Existing land use*	Acquisition type	Dwellings affected	Buildings (sheds) affected
104	Lot 69 Sec H DP2234	Residential	Partial	-	-
105	Lot 1 DP202647	Business	Partial	-	-
106	Lot 68 Sec H DP2234	Residential	Partial	-	-
107	Lot 67 Sec H DP2234	Residential	Partial	-	-
108	Lot 66 Sec H DP2234	Residential	Partial	-	-
109	Lot 65 Sec H DP2234	Residential	Partial	-	-
110	Lot 64 Sec H DP2234	Residential	Partial	-	-
111	Lot 63 Sec H DP2234	Residential	Partial	-	-
112	Lot 42 DP878814	Residential	Partial	-	-
113	Lot 62 Sec H DP2234	Residential	Full	-	-
114	Lot 23 DP29081	Residential	Partial	-	-
115	Lot 61 Sec H DP2234	Residential	Full	-	-
116	Lot 60 Sec H DP2234	Residential	Partial	-	-
117	Lot 24 DP29081	Residential	Partial	-	-
118	Lot 28 DP29081	Rural residential	Partial	-	-
119	Lot 1 DP569729	Residential	Partial	-	-
120	Lot 11 DP29081	Rural residential	Partial	-	-
121	Lot 10 DP29081	Residential	Partial	-	-
122	Lot 3 DP238092	Commonwealth Department of Defence uses	Partial	-	-
123	Lot 31 DP244610	Residential	Partial	-	-
124	Lot 32 DP244610	Residential	Partial	-	-
125	Lot 30 DP244610	Rural residential	Partial	-	-
126	Lot 8 DP29081	Residential/ business	Partial	-	-
127	Lot 1 DP1088989	Rural residential	Partial	-	-
128	Lot 6 DP29081	Rural residential	Partial	-	-

Property ID	Property (lot number)	Existing land use*	Acquisition type	Dwellings affected	Buildings (sheds) affected
129	Lot 2 DP224861	Rural residential	Partial	-	-
130	Lot 1 DP224861	Residential	Partial	Yes (1)	-
131	Lot 7 DP4832	Residential	Partial	-	-
132	Lot 500 DP1133119	Residential	Partial	-	-
133	Lot 1 DP551558	Residential	Partial	-	-
134	Lot 1 DP238092	Commonwealth Department of Defence uses	Partial	-	-
135	Lot 5 DP26658	Rural residential	Partial	-	-
136	Lot 6 DP26658	Rural residential	Partial	-	-
137	Lot 7 DP26658	Rural residential	Partial	-	-
138	Lot 1 DP711076	Residential	Partial	-	-
139	Lot 2 DP711076	Vacant	Partial	-	-
140	Lot 132 DP1002668	Residential	Partial	-	-
141	Lot 113 DP1015911	Rural	Partial	-	-
142	Lot 3 DP711076	Rural residential	Partial	-	-

Notes:

\* Information on existing land use is based on a review of aerial photography and visual inspection

\*\* strip of land located along road reserve

Temporary leases for construction access would be negotiated in accordance with the requirements of the site access schedule. Details of properties to be temporarily leased are outlined in in Table 5-10. The number and location of leases would be confirmed during detailed design and in consultation with property owners.

Table 5-10 Properties subject to temporary leases during construction

Temporary ancillary facility	Lot / plan	Existing land use
C1	Lot 3 DP234403 Lot 3 DP334403	Rural residential
C2	Lot 6 DP249262	Rural residential
C3/ C5	Lot 11 DP1092165	Rural/ commercial
C4	Lot 102 DP812653	Rural/ commercial
C6	Lot 2 DP851626	Rural/ commercial



Temporary ancillary facility	Lot / plan	Existing land use
C7	Lot 1 DP851626	Rural/ Commonwealth land (airport)
C8	Lot 1 DP250030	Rural
C9	Lot 2 DP519034	Rural
C10	Lot 105 DP846962	Rural
C11		Crown land (road reserve)
C12	Lot 1 DP517853	Residential/ commercial
C13	Lot 5 DP599382	Rural
C14	Lot 9 DP249113	Rural residential
C15/ C16	Lot 1 DP109697	Rural
C17	Lot 1 DP232322	Crown land (road reserve)
C18	Lot 1 DP202647	Residential/ commercial
C19	Lot 1 DP224861	Rural/ residential
C20	Lot 5 DP26658 Lot 6 DP26658	Rural residential
C21	Lot 1 and 2 DP711076 Lot 1 DP1033226 Lot 3 DP250030	Rural residential

### 5.2.15 Utility services relocations

The following utilities have been identified along or near the proposed alignment:

- Electricity – including high and low voltage transmission and distribution lines
- Water – Water NSW and Sydney Water mains including the WaterNSW Supply Pipelines
- Gas – A Jemena gas main is located near Bradley Street, Orchard Hills
- Telecommunications – including optic fibre and coaxial cables and several mobile towers
- Sewer – No sewer mains have been identified on the Sydney Water Dial Before You Dig (DBYD) data base. However, it is known that there is limited sewer in the area and some properties use septic systems.

Potential utility modifications and protection measures (including potential relocations) are discussed in Section 5.4.12.

### 5.2.16 Heavy vehicle inspection bays

Heavy vehicle inspection bays would be located for both northbound and southbound traffic. The northbound site would be adjacent to Grover Crescent, while the southbound site would be located between Littlefields Road and Gates Road.

The inspection bays would typically include a paved inspection area (about 2,000 square metres), fencing, lockable gates and two retaining walls. Both bays would be about 150 m long and 12 m

wide. A specific deceleration lane is not proposed as vehicles using the bay can use the bus lane to decelerate. Heavy vehicle compliance would occur at the inspection bay periodically once operational, which may vary based on road traffic flow patterns.

The locations of the heavy vehicle inspection bays are shown in Figure 1-2 and Figure 5-1.

### 5.2.17 Traffic management facilities

The following traffic monitoring and management systems would be provided for the project:

- VMS – these electronic signs would communicate up-to-date information about traffic and road conditions
- CCTV – would be installed at key intersections and other locations
- Traffic sensors – would be installed at key locations to provide information about traffic speeds, queue lengths and traffic numbers
- Power and communications cabling – would be installed along the length of the project to connect all the ITS infrastructure.

Four VMS are likely to be provided, but the exact number would be refined during detailed design. The proposed VMS locations of VMS are:

- Northbound on approach to the intersection with Elizabeth Drive
- Southbound on approach to the intersection with Elizabeth Drive
- Northbound on approach to the heavy vehicle inspection area adjacent to Grover Crescent
- Southbound on approach to the heavy vehicle inspection area opposite Longview Road.

A typical cantilever style VMS is proposed at these four locations. Indicative infrastructure is Figure 5-10.

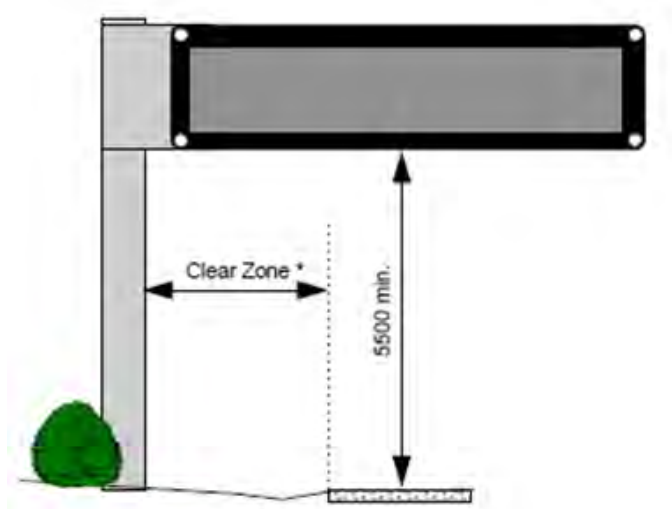


Figure 5-10 Indicative VMS infrastructure

The selection, placement and assessment of VMS are guided by the Roads and Maritime Guideline TDT 2005/ 02b – Guidelines for the Location and Placement of Variable Message Signs (Roads and Traffic Authority, 2008).

A visual assessment of the proposed VMS is presented in Appendix O – Urban Design and Visual Impact and Section 8.5 of this EIS. The final type and location of VMS would be determined during detailed design, which would aim to reduce the visual impact of VMS while maintaining their functionality.

### 5.2.18 Incident response facility

An incident response facility consisting of a paved area, office and garage would be constructed at the south-west corner of the realigned Elizabeth Drive and The Northern Road intersection. This facility would be staffed by Roads and Maritime, Transport for NSW or contractor personnel and would house incident response vehicles and equipment. The design of the incident response facility would be refined during detailed design but is likely to include:

- A car park for operational staff and a heavy vehicle tow truck (10 m long)
- An entry and exit roadway which would connect the front and rear of the double garage area and allow vehicles to attach trailers or drive through from either direction
- An operational building incorporating
- Kitchen, office and amenities
- A storage facility for trailers, portable VMS, portable lighting towers and other incident response equipment
- Communications and security equipment.

The location of the proposed incident response facility is shown in Figure 1-2 and Figure 5-1, and an indicative image of the proposed facility is shown in Figure 5-11.



Figure 5-11 Indicative image of the incident response facility

## 5.3 Design criteria

### 5.3.1 Design standards

Elements of the project have been designed using the following engineering standards, which are listed in order of precedence:

- Roads and Maritime QA Specification PS351 – Road Design
- Roads and Maritime QA Specification PS341 – Pavement Investigation and Design
- Roads and Maritime Specification R145 Pavement Marking
- Roads and Maritime Specification R142 and RMS Delineation Guidelines Section 15
- Published RMS supplements to Austroads Guide to Road Design
- Austroads Guide to Road Design



- RMS Guide Signposting Manual 2007
- Soils and Construction guidelines, 2004 Volume 1, and 2008 Volume 2
- Austroads Guide to Road Design (Part 5: Drainage Design)
- Soils and Construction Guidelines (2004) and (2008)
- Installation and Maintenance of Signs Manual 2010, Amended March 2014
- NSW Speed Zoning Guide 2011
- Australian Standard AS1742.

The engineering design parameters for the project are summarised in Table 5-11 and Table 5-12.

Table 5-11 The Northern Road design criteria

Design parameter	Value adopted in design
Design speed	90 km/h
Minimum general traffic lane width	3.5 m
Minimum bus lane width	4.0 m
Minimum auxiliary lane width	3.3 m
Minimum grade	0.5%
Maximum grade	6%
Cut batter slope	Generally 1 in 4, but steepening 1 in 2 where required
Fill batter slope	Generally 1 in 4, but steepening 1 in 2 where required
Bench width	4 m cut 4.5 m fill
Design vehicle	B-double

Table 5-12 Local road design criteria

Design parameter	Value adopted in the design
Posted speed limit	Adams Road – not signposted Eaton Road – 60 km/h Vicar Park Lane – not signposted Dwyer Road – not signposted Airport Access – 60 km/h The Northern Road (Existing) – 60 km/h Elizabeth Drive – 80 km/h Littlefields Road – 80 km/h Gates Road – 60 km/h Longview Road – not signposted Vineyard Road – not signposted Kings Hill Road – 70 km/h Grover Crescent – 60 km/h

Design parameter	Value adopted in the design
	Chain-O-Ponds Road – 70 km/h Bradley Street – 80 km/h
Design speed	Design speed generally the same as the posted speed
Minimum grade	1%
Maximum grade	6%
Cut batter slope	Generally 1 in 4, but steepening to 1 in 2 where required
Fill batter slope	Generally 1 in 4, but steepening to 1 in 2 where required
Bench width	4 m cut 4.5 m fill
Design vehicle	Dwyer Road – 19 m semi-trailer Airport Access – B-double Eaton Road – 19 m semi-trailer The Northern Road (existing) – B-Double Adams Road – 19 m semi-trailer The Northern Road and Littlefields Road – 19m semi-trailer The Northern Road and Littlefields Road extension – 26 m B-double Littlefields Road Extension u-turn – 26 m B-double The Northern Road and Gates Road – 8.8 m service vehicle Gates Road and Gates Link Road – 8.8 m service vehicle The Northern Road and Longview Road – 8.8 m service vehicle Longview Road and Vineyard Road – 8.8 m service vehicle The Northern Road and Kings Hill road – 26 m B-double Kings Hill Road u-turn – 19 m semi-trailer The Northern Road and Grover Crescent South – 8.8 m service vehicle The Northern Road and Grover Crescent North – 8.8 m service vehicle The Northern Road and Chain-O-Ponds Road – 19 m semi-trailer Chain-O-Ponds u-turn – 19 m semi-trailer The Northern Road, Defence entry and u-turn – 26 m B-double The Northern Road, Bradley and u-turn – 19 m semi-trailer

### 5.3.2 Urban design objectives and principles

The urban and landscape design objectives and principles for the project are based on:

- The South Western Sydney Urban Design Strategy (SWSUDS) (Cox, 2015), which provides guidance on the desired outcomes for the road network of the area
- The Northern Road Corridor Plan of Management (RMS, 2015) Narellan to Bringelly - Consistent with the corridor approach to the design of the road network promoted by the SWSUDS, the design objectives and principles identified by the Corridor Plan of Management for The Northern Road sections south of the project (Stage 1 and 2) are of relevance to achieve a consistent corridor outcome
- The proposed upgrade of The Northern Road between Glenmore Parkway and Jamison Road. Consistent with the corridor approach to the design of the road network promoted by the SWSUDS, the design objectives and principles identified for the Upgrade of The Northern Road north of Glenmore Parkway are of relevance to achieve a consistent corridor outcome

- Beyond the Pavement (RMS, 2008). This is the overarching Roads and Maritime policy guiding urban design on all projects. It outlines nine design principles as key to achieving an integrated engineering and urban design outcome for all Roads and Maritime projects
- The analysis of the local setting and its landscape character.

The following four overarching urban design objectives have been developed for the project:

- Protect and enhance existing views, character and cultural values of the corridor
- Provide a flowing road alignment that is responsive to, and integrated with the natural and built landscape
- Facilitate the provision of good urban design outcomes for areas adjoining the road
- Develop a simple and unified palette of elements and details that are attractive and easily maintained.

Further detail regarding the project's urban design objectives and principles is provided in Section 8.5 and Appendix O – Urban Design and Visual Impact Assessment.

### 5.3.3 Landscape framework

An urban design and landscape framework has been developed, based on the project objectives and principles, to achieve an integrated design for the project. It describes the relationship between the proposed road work, structures, the Adams Road bridge and the adjoining areas based on the current project design.

The urban design concept for the project includes a landscape design framework that has been guided by the following principles:

- Complement the existing landscape, visual and spatial character through appropriate vegetation types and heights
  - Use vegetation to stabilise cut batters and to minimise their visual impact
  - Use vegetation to stabilise fill embankments, carefully balancing plant selection to ensure views of the surrounding landscape as identified on the strategy plans
  - Provide vegetation to screen the upgrade from sensitive nearby land uses where applicable
  - Provide tree cover in verges and medians where it is safe to do so, based on clear zone requirements
- Design soft works to direct views and vistas to emphasise the attractive rural setting, having regard to planned future land use changes, in particular the Western Sydney Airport and employment lands in the WSPGA
- Retain existing woodland where possible. Where removal cannot be avoided, reinstate native vegetation to compensate for the loss of vegetation and habitat
- Use vegetation to maximise potential for biodiversity links in areas of identified ecological value
- Enhance intersections through feature planting to enhance them as 'gateways'. Examples include the entrances to places such as Luddenham, rural residential clusters, residential subdivisions and the service entry to the Western Sydney Airport. This would provide variety and visual interest along the route as well as visually enhance the local identity
- Select species around the end of the airport runway (at Willowdene Avenue) that are not bird-attracting to avoid safety risk for planes
- Wherever possible, use surplus local natural materials such as rock and timber in creek restoration and water quality treatments to help recover biodiversity and create habitat
- Where required, carry out landscaping work in accordance with water sensitive urban design guidelines (Roads and Maritime, 2016).



The plant species for the project would generally build on the native Cumberland Plain Woodland vegetation communities of the area. They may be supplemented by commercially available species known to perform well under motorway conditions.

During detailed design, development of the planting concept and layouts for vegetation would be developed to ensure the selection and placement of species accord with all relevant requirements including the Roads and Maritime Landscape Guideline, clear zone and sight topping distance requirements and the Obstacle Surface Limitation requirements of the Western Sydney Airport.

The urban design and landscape strategy for the project is a large-scale diagram that translates the landscape framework and principles into an overall urban design approach. It provides the basis for the urban concept design plans and sections. The strategy is presented in Appendix O – Urban Design and Visual Impact Assessment.

## 5.4 Construction

The construction work described in this section is based on the construction methodologies required to construct the project (described in Section 5.1.1) and may be refined during detailed design of the project and/or in response to submissions received during the exhibition of the EIS.

Detailed construction planning would occur before construction starts and would consider methods and scheduling to manage community and environmental issues including noise, access, amenity and general disruption.

Equipment and plant requirements would be refined during detailed design and during the development of the construction methodology by the construction contractor. The details of construction would be detailed in the Construction Environmental Management Plan (CEMP).

The construction strategy for the project has been designed to ensure that construction occurs in a safe and efficient manner while managing identified constraints and minimising environmental impacts. The general principles of the construction strategy are to:

- Achieve safe and convenient access for construction vehicles and the public, plant and equipment along the length of the project and to and from public roads while at the same time minimising impacts
- Consider impacts on road users, the effect on urban amenity and the suitability of local road pavements
- Manage impacts on existing infrastructure including local roads, utilities and services
- Recognise that modifications to existing infrastructure come with increased safety risks to road users and construction personnel and can result in the need to undertake work at night or to implement traffic switches
- Manage community and environmental issues including noise, access, amenity and general disruption.

### 5.4.1 Construction footprint

The total area required to construct the project is referred to as the 'construction footprint'. The construction footprint generally includes the area required for road works, bridge works, access for construction vehicles and plant, drainage infrastructure, temporary sediment basins, utilities and services adjustments, and temporary stockpiles and temporary ancillary facilities.

The total construction footprint (including compound and laydown sites) is estimated at 278 ha and is shown in Figure 5-4. The construction footprint would be refined during detailed design.

### 5.4.2 Overview of construction activities

Construction of the project would generally include the following key activities:

- Early works and property adjustments

- Construction of ancillary facilities
- Earthworks
- Traffic management and access
- Road widening and new road work
- Intersection works
- Construction of bridges and viaducts
- Construction drainage
- Construction of pavements
- Installation of noise mitigation measures
- Relocation of utilities and services
- Finishing work.

Construction activities and stages may occur concurrently. More information about the main components of these construction activities are provided in the following sections.

### 5.4.3 Early works (pre-construction activities)

Early works (or pre-construction activities) are works that take place prior to the main construction, in preparation for the start of construction. Some of these activities would take place prior to the formal approval of construction management plans, in accordance with the standard NSW Conditions of Approval for Critical State Significant Infrastructure projects, and would be managed by a separate Early Works Environmental Management Plan.

Pre-construction activities for the project would generally include:

- Notification of residents of construction work
- Leasing or acquisition of land
- Relocation of fencing on DEOH lands
- Clearance of unexploded ordinance (UXO) within DEOH as required
- Installation of construction signage and advisory signs
- Installation of environmental controls
- Preparation of dilapidation and building condition surveys
- Adjustment, relocation and protection of public utilities and services
- Site establishment activities, such as:
  - Establishment of temporary ancillary facilities, including minor clearing, minor earthworks, installation of office accommodation, utilities and other facilities
  - Establishment of construction site fencing, signage and lighting
  - Establishment of construction site access points, traffic management measures, alternative public access routes and diversions. This could include any minor road modifications
  - Demolition of redundant structures on acquired/leased land
  - Relocation and/or removal of farm infrastructure (including farm dams) as required and in consultation with affected land owners
- The following activities prior to vegetation clearing:
  - Pre-clearing surveys
  - Marking out 'no go' zones
  - Identifying fauna habitat trees and fauna release areas through pre-clearing surveys
- Establishment of temporary drainage.

Pre-construction activities may be carried out at various times over the duration of the project corresponding to different construction stages and project components. For each construction stage or project component, the various types of preliminary activities may also be carried out collectively or in isolation, depending on the specific requirements of the stage or component.

Section 5.4.4 covers the establishment and operation of temporary ancillary facilities. Section 5.4.6 considers traffic management and construction access arrangements in more detail.

#### 5.4.4 Earthworks

Earthworks would be required along the entire length of the project. Earthworks would typically also be required for:

- Topsoil stripping
- Areas of new cut and fill along the alignment
- Construction of retaining walls
- Cut and fill or preparation of site for the new bridge over Adams Road
- Installation of road drainage infrastructure.

Vegetation would be cleared before the start of earthworks.

Material excavated from the corridor would be re-used in road widening or placed on site to stabilise batters. Potential for spoil re-use would be confirmed during detailed design. It is estimated that there is likely to be a net deficit of fill material.

Table 5-13 outlines the indicative types and volumes of materials that would be managed during construction and provides the recommended management approach for each material.

Table 5-13 Indicative material types and quantities required during construction

Type of material	Approximate quantity	Management approach
Clearing and grubbing	65,000 square meters	Determine the amount of material to be used on site or removed from site, including consideration of the <i>Raw Mulch Exemption 2008</i> (PoEO Act).
Excavated material (cut)	240,000 m <sup>3</sup>	Re-use or disposed of surplus material that cannot be used on site in the following order of priority: <ul style="list-style-type: none"> <li>• Transfer to other Roads and Maritime projects for reuse in accordance with the EPA's excavated public road resource recovery exemption</li> <li>• Transfer to an approved Roads and Maritime stockpile site for reuse on a future project only if a specific project has been identified prior to stockpiling and POEO Act waste regulatory requirements are met. If a project cannot be identified the material would not be stockpiled</li> <li>• Transport off site for reuse by a third party in accordance with relevant EPA resource recovery exemption or to an EPA licensed waste recovery facility</li> <li>• Dispose at an accredited materials recycling or waste disposal facility.</li> </ul>
Imported material (fill)	400,000 m <sup>3</sup>	Where practical, locally sourced.



### 5.4.5 New road work (including intersections)

The project would include the construction of about eight kilometres of new road between Mersey Road and just south of Elizabeth Drive.

The typical stages for constructing the new road pavement would include:

- Clearing of any vegetation
- Removal and stockpiling of topsoil
- Cut to fill operations including the removal of spoil to achieve the required levels at the underside of the new road surface
- Placement and compaction of selected material (usually crushed rock or natural gravels)
- Placing, compacting and finishing of either concrete or gravel road surface sub-base layers (to match existing adjacent road surface profile)
- Placing, compacting and finishing of asphalt road surface base layers
- Installation of new drainage infrastructure and any other services
- Installation of traffic lights
- Installation of kerbing and barriers
- Finishing work, such as line marking; kerb and gutter construction; installation of safety barriers, street lighting and sign posting; and landscaping
- Decommissioning and rehabilitation of temporary ancillary facilities and all temporary works.

### 5.4.6 Road widening

The project would involve widening the existing The Northern Road to provide additional lanes between Elizabeth Drive and 100 m south of Glenmore Parkway. Road widening would also include the provision of a central median. The stages for road widening typically include:

- Minor demolition of kerbs, other road elements and other structures
- Clearing of any vegetation
- Removal and stockpiling of topsoil
- Construction of temporary haul roads
- Excavation of any excess or geotechnically unsuitable subsoils
- Installation of new drainage infrastructure and any other services
- Modification of existing stormwater systems including water management ponds and culverts
- Importation, placement and compaction of engineered fill material
- Construction of the road sub-base and base (the road base would consist of deep lift asphalt)
- Asphaltting, which would involve either full pavement reconstruction or the milling and re-sheeting of asphalt overlay and full depth asphalt paving of the additional lanes
- Finishing work, such as line marking; kerb and gutter construction; installation of safety barriers, street lighting and sign posting; and landscaping
- Decommissioning and rehabilitation of temporary ancillary facilities and all temporary works.

### 5.4.7 Bridges

A new bridge would be constructed across Adams Road. It would have a clearance of at least 5.4 m over Adams Road.

The bridge would comprise piled foundations (bored piles) with wrap-around reinforced earth wall abutments and conventional pre-cast planks if there is sufficient width over Adams Road.

Construction of the bridge would generally involve:

- Piling
- Construction of bridge abutments
- Installation of pre-cast concrete planks/girders and barriers
- Excavation of existing embankment material to create a new bridge opening
- Installation of throw screens.

The work may require partial closure of Adams Road with one lane only open during this period. Traffic control would be implemented on Adams Road throughout the bridge construction period.

Piled foundations for bridge abutments and piers may require traffic lane closures, including some local road closures or traffic contra-flow arrangements to allow sufficient space for the piling rig to operate safely.

### 5.4.8 Drainage

The project would require the construction of new drainage infrastructure and alterations to existing drainage infrastructure. Drainage would comprise:

- Pavement drainage, which includes:
  - Pipes and pits used to drain runoff from the road pavement
  - Bridge deck drainage consisting of scuppers and carrier pipes for proposed bridges
  - Open channels to protect the road embankments and direct collected roadway runoff to a water quality device or receiving waterway
- Transverse drainage, which includes:
  - The provision of new culverts, or the extension and/or upgrade of existing culverts, to convey existing waterways across the road alignment.

Constructing drainage would involve localised excavation, compaction and installation of drainage pipes and pits, and construction of table drains and temporary construction sediment basins.

As the road formation is being constructed, drainage structures, such as culverts, would be installed to enable flows to be maintained. Where required, a temporary diversion channel would be constructed to enable the installation of culverts. The diversion channel would be lined with scour protection measures such as geofabric or clean fill to minimise the potential for scour. After the culvert is installed, the drainage line would be reinstated and the temporary channel removed.

In addition, a tributary of Surveyors Creek on the eastern side of The Northern Road (within Commonwealth land) would need to be permanently realigned to accommodate the widened road formation. This work would typically involve:

- Removing vegetation (mostly shrubs and grasses) and topsoil
- Constructing the new channel alignment, including establishing natural bed and bank profiles
- Installing scour protection measures
- Establishing vegetation early in the process
- Diverting the creek to the new channel.

Temporary watercourse crossings may also be required for some or all watercourses traversed by the project to facilitate construction activities. If required, these watercourse crossings would likely comprise a temporary causeway with culverts to maintain the low flows, and they would likely be maintained for the duration of construction.

A number of farm dams may also require dewatering to facilitate construction. Dewatering would be undertaken in accordance with the relevant procedures outlined in the CEMP.

Generally, the construction of new surface drainage on the outside of the carriageways would be undertaken in parallel with the earthworks for road widening or new road construction.

#### 5.4.9 Pavements (road surfaces)

New pavements would be required for road widening and new road sections as well as for upgrades to local roads and intersections. New pavement construction would typically involve:

- Placing select material (usually crushed rock, natural gravels or suitable soils)
- Placing, compacting and finishing concrete to form sub-base pavements
- Placing, compacting and finishing the open grade or dense grade asphalt wearing course.

In areas where the project would tie in or modify existing roads, pavements would potentially be subject to widening, changes in configuration, removal, milling and pavement build-up and resurfacing.

New pavement would be marked in accordance with the RMS Delineation Guidelines to delineate travel lanes, traffic merges and vehicle movements permitted at intersections. Pavement on new sections of shared path would be marked in accordance with the RMS Delineation and NSW Bicycle Guidelines (RTA, 2005).

#### 5.4.10 Utilities and services

A number of utilities and services may be impacted by the project; some many need to be realigned. The extent of impact cannot be confirmed until the detailed design is finalised. A list of utilities that may require relocation is provided in Table 5-14.

Table 5-14 Potential impacts on existing utilities and services

Asset owner	Asset type	Location	Potential impact
Transgrid	330 kv transmission lines	Single circuit line crossing The Northern Road about 70 m directly south of Vicar Park Lane. Double circuit lines crossing The Northern Road about 350 m south of Glenmore Parkway.	No impact identified.
Endeavour Energy	33 kV transmission lines	Generally along the western side of The Northern Road starting from the intersection with Park Road, travelling north past Littlefields Road to Luddenham substation. At the northern boundary of the project, near Glenmore Parkway.	The lines would be relocated within the road corridor where impacted.



Asset owner	Asset type	Location	Potential impact
	Low voltage cables and street lighting	Numerous locations along The Northern Road and local roads.	Street lighting would be adjusted to comply with the requirements of the upgraded road. Low voltage electrical cables would be relocated where impacted to maintain service to properties. Relocations would be within the proposed footpath where appropriate.
	Substation	Near the WaterNSW Supply Pipelines.	A new driveway access would be required.
WaterNSW	DN3000 and DN2200 mains (WaterNSW Supply Pipelines)	The Northern Road crosses over the WaterNSW Supply Pipelines near Gates Road.	No impact identified on the pipelines which are located beneath the road and concrete encased at the location where the project crosses them. However, some drainage within the construction boundary extend into the pipeline easement to the east of The Northern Road where the pipelines emerge above ground. Consultation and approval from WaterNSW would be sought prior to construction over this asset and prior to any works within the asset easement.
Sydney Water	DN1050, DN900, DN750, DN 450 and <DN375 mains	Numerous locations along The Northern Road, crossing The Northern Road and along local roads. Smaller mains also provide reticulation to properties.	The water main crossing would need to have sufficient protection, otherwise there would be a need to relocate or replace the crossing so that connection to water mains are maintained.
Jemena	Gas	Bradley Street, in the northern footpath.	The gas main would be relocated into the gas allocation within the proposed northern footpath.
Telstra, Optus	Telecommunications	Optic fibre and coaxial cables are present throughout the project area.	The cables would be relocated into the telecommunications allocation within the proposed northern footpath.

Asset owner	Asset type	Location	Potential impact
			The crossing would be relocated or replaced so that connection to cables is maintained.
	Mobile towers	About 380 m north of The Northern Road near Mersey Road. About 230 m south of DEOH entrance on the western side of the alignment. Just south of Littlefields Road on the eastern side. About 80 m west of the proposed alignment halfway between Adams Road and Elizabeth Drive.	No impact identified.

Strategies to address impacts may include protection or relocation of the utility, or adjustments to the project design to avoid any impacts.

Where relocation is required, this would preferably be undertaken within the footpath or shared user path to enable greater access for maintenance activities wherever possible. However, some may need to be relocated into the road corridor, including on local side streets, in order to minimise disruption. The required works would be confirmed during detailed design in consultation with utility providers, taking into consideration tie-ins with local streets.

Either the construction contractor or the relevant utility provider would undertake utility adjustments. This work would result in short-term impacts such as noise, amenity impacts, and soil and water impacts as detailed in Chapters 7.2, 7.4 and 8.2 respectively. Appropriate management measures would be implemented during utility adjustments in order to mitigate and manage these impacts.

#### 5.4.11 Finishing work

Finishing work would be completed towards the end of each stage of the construction program. The main finishing work for the project would typically include:

- Line marking
- Installation of directional signage and roadside furniture, such as street lighting
- Landscaping
- Site demobilisation and rehabilitation of temporary construction compound sites and other areas of construction disturbance.

#### 5.4.12 Temporary ancillary facilities

Temporary ancillary facilities would provide support to the construction of the project and would include compounds and laydowns areas.

The final type, location and number of ancillary facilities would be determined by the construction contractor and identified in an Ancillary Facilities Management Plan, prepared as part of the CEMP. Potential locations are described below and assessed in this EIS. Any additional or alternative sites identified by the construction contractor would be considered against the site selection criteria identified below. Where any alternative sites are located outside the construction footprint, further environmental assessment would be required.

The temporary compounds would generally comprise:

- Temporary buildings (generally prefabricated) including offices and meeting rooms, amenity, first aid and toilet facilities (the size and number of office facilities at the main compounds would be greater than at the secondary compounds)
- Hardstand parking areas with capacity for all construction workers expected at any site
- Materials laydown and storage areas, including purpose-built temporary structures as required
- Perimeter fencing, including visual screening of construction compounds where necessary
- A pug mill (for mixing and working clay) at either compound location C5 or C8.

Some sites would only be used to stockpile and store materials and would therefore contain minimal facilities.

Potential locations for temporary ancillary facilities are presented in Figure 5-12 and indicative details of the size and purpose of each compound are provided in Table 5-15.

Indicative site layouts for three example ancillary facilities are provided in Figure 5-13, Figure 5-14 and Figure 5-15 below.



Table 5-15 Proposed temporary ancillary facility locations

Ancillary facility location	Approximate size (ha)	Proposed ancillary facility Use	Site access points
C1	2	Storage of pits, pipes and culvert material. No stockpiling of earthworks.	From The Northern Road.
C2	2.25	Storage of pits, pipes and culvert material. No stockpiling of earthworks.	From The Northern Road.
C3	1	Outpost site office (secondary compound). The site would consist of a shed, lunch room, portable toilets and parking.	External access to the compound via the entry road to the Leppington Pastoral Company. This access would initially be available for construction vehicles during construction of the culvert near this location. Upon completion of the culvert, access would revert to the internal access road provided along the construction mainline. Unsignalised entry to all movements.
C4	3.5	Outpost site office (secondary compound). The site would consist of a shed, lunch room, portable toilets and parking. Storage of items such as concrete pits, pipes and culverts. Could be used to stockpile topsoil, mulch and drainage backfill materials.	External access to the compound via the entry road to the Leppington Pastoral Company. This access would initially be available for construction vehicles during construction of the culvert near this location. Upon completion of the culvert, access would revert to the internal access road provided along the construction mainline. Unsignalised entry to all movements.

Ancillary facility location	Approximate size (ha)	Proposed ancillary facility Use	Site access points
C5	12	Storage of concrete pits, pipes and culverts. Could be used to stockpile topsoil, mulch and drainage backfill materials. Possible pug mill site.	Access to construction of the mainline would be direct from the compound. Access to the existing arterial road network would be via the nearest access point to The Northern Road. This compound site would be partially located on Commonwealth land associated with the Western Sydney Airport.
C6	2	Storage of concrete pits, pipes and culverts. Could be used to stockpile topsoil, mulch and drainage backfill materials.	Access to construction of the mainline would be direct from the compound. Access to the existing arterial road network would be via the nearest access point to The Northern Road.
C7	3.5	Storage of concrete pits, pipes and culverts. Could be used to stockpile topsoil, mulch and drainage backfill materials.	From The Northern Road. This compound site would be partially located on Commonwealth land associated with the Western Sydney Airport.
C8	8.5	Main compound. The site would consist of office facilities for the contractor and RMS. It would include toilets, amenities, car parking, a shed and lunch room. Storage of concrete pits, pipes and culverts. Stockpile of topsoil and mulch and drainage backfill materials. Possible pug mill site.	Temporary traffic lights at the intersection of the existing The Northern Road and the proposed new alignment to give access to and from the existing road and access to the main compound.
C9	10	Secondary compound. The site would consist of a shed, lunch room, portable toilets and parking facilities.	Access to construction of the mainline would be direct from the compound.

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Ancillary facility location	Approximate size (ha)	Proposed ancillary facility Use	Site access points
C10	1.5	Storage of concrete pits, pipes and culverts. Could be used to stockpile topsoil, mulch and drainage backfill materials.	Access to construction of the mainline would be direct from the compound.
C11	1.5	Storage of concrete pits, pipes and culverts. Could be used to stockpile topsoil, mulch and drainage backfill materials.	From The Northern Road.
C12	7	Main compound. The site would consist of office facilities for the contractor and RMS, toilets, amenities, tool sheds and car parking.	From The Northern Road and Elizabeth Drive.
C13	1.5	Storage of concrete pits, pipes and culverts. Could be used to stockpile topsoil, mulch and drainage backfill materials.	From The Northern Road.
C14	1	Alternative site compound or small site office shed with amenities and car parking, and storage of concrete pits, pipes and culverts. Could be used to stockpile topsoil, mulch and drainage backfill materials.	From The Northern Road.
C15	3.4	Storage of concrete pits, pipes and culverts. Could be used to stockpile topsoil, mulch and drainage backfill materials.	From The Northern Road.
C16	11	Storage of concrete pits, pipes and culverts. Could be used to stockpile topsoil, mulch and drainage backfill materials.	From The Northern Road.

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Ancillary facility location	Approximate size (ha)	Proposed ancillary facility Use	Site access points
C17	2.5	Stockpile site early in construction. However, once the new southbound carriageway is completed, it is unlikely to be used further as a stockpile site.	From The Northern Road.
C18	1	Storage of concrete pits, pipes and culverts. Could be used to stockpile topsoil, mulch and drainage backfill materials.	From The Northern Road and Kings Hill Road.
C19	4.5	Storage of concrete pits, pipes and culverts. Could be used to stockpile topsoil, mulch and drainage backfill materials.	From The Northern Road.
C20	1.5	Main compound. The site would consist of office facilities for the contractor and RMS, toilets, amenities, tool sheds and car parking.	From The Northern Road.
C21	2.5	Storage of concrete pits, pipes and culverts. Could be used to stockpile topsoil, mulch and drainage backfill materials.	From The Northern Road.

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