Division 5.2 and EPBC Act Approval

Modification Assessment

Proposed changes between Eaton Road, Luddenham and Littlefields Road, Luddenham

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

December 2018

NSW GOVERNMENT | Transport Roads & Maritime Services

Revision	Date	Prepared by	Reviewed by
Draft 1	31/07/2018	Carys Scholefield	Mark Terei
Draft 2	20/08/2018	Carys Scholefield	Damian Williams
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Final Draft	21/11/2018	Carys Scholefield	Mark Terei
Final Version	03/12/2018	Carys Scholefield	Mark Terei

Executive summary

Roads and Maritime Services (Roads and Maritime) is upgrading 16 kilometres of The Northern Road between Mersey Road, Bringelly and Glenmore Parkway, Glenmore Park.

Environmental assessment of The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park ("the project") was carried out under the former Part 5.1 (now, Division 5.2) of the NSW *Environmental Planning and Assessment Act 1979* and Part 8 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. The project was approved by the NSW Minister for Planning on 30 May 2018, and the Commonwealth Minister for the Environment on 15 June 2018.

Specific objectives developed for the project are to:

- Cater for future traffic demand to improve the flow of traffic to provide reliable journeys
- Improve facilities for public and active transport to promote sustainable and efficient journeys.

Since the project was approved, several changes have been made to the design as a result of recommendations from a value engineering study and consultation with stakeholders including:

- Not constructing the approved bridge structure over Adams Road (comprising twin 30 metre long, ten metre high single span bridges)
- Provision of an at-grade signalised intersection, including the addition of left and right turn lanes on Adams Road and The Northern Road to accommodate all vehicle movements
- Provision of pedestrian crossing facilities at the proposed intersection with Adams Road
- Reducing the vertical alignment by up to five metres along The Northern Road extending about 400 metres north and south of the proposed at-grade intersection
- Increasing the vertical alignment of Adams Road by up to eight metres (extending about 400 metres east of the proposed at-grade signalised intersection) and lowering the alignment (extending about 400 metres west of the intersection) to tie-in with the revised vertical alignment of The Northern Road
- Filling one additional privately-owned farm dam at the south-eastern corner of the proposed at-grade signalised intersection to accommodate a fill embankment
- Increase in the partial filling and reforming of a privately-owned farm dam, including dam wall modifications, at the north-western corner of the proposed at-grade signalised intersection to accommodate fill embankments. The capacity of this dam would be reduced as a consequence
- Increasing the construction and operational footprint from the design in the NSW Submissions and Preferred Infrastructure Report and Commonwealth Final Environmental Impact Statement (together referred to as the 'SPIR and Final EIS').

As a result of these design changes at Adams Road, there would be minor changes to the construction methodology and project boundary.

The decision to not construct the approved bridge structure over Adams Road was made following a value engineering study. A comparative analysis of three options for an at-grade signalised intersection layout was carried out to identify the suitability of a preferred option. An at-grade signalised intersection allowing all vehicle movements was selected as the preferred option.

These design changes are considered inconsistent with the description of the approved project, requiring a modification to the NSW approval under the *Environmental Planning and Assessment Act 1979*. This Modification Assessment Report has been prepared to describe the proposed modification, provide justification for the modification, and assess the potential environmental impact of the proposed modification relative to the project's existing approvals.

For the proposed modification, a communication plan was developed that highlighted details such as key messages, stakeholders to be consulted and communication delivery methods. This plan was implemented during August and September 2018 with directly impacted landowners and stakeholders provided with advance information before the public consultation.

This modification report addresses the key issues identified in the approved project Environmental Impact Statement (EIS) and SPIR and Final EIS. In general, the impacts of the proposed modification are considered to be consistent with those described in the EIS, the SPIR and Final EIS and associated documentation, with the exception of:

- An increase in traffic volumes along Adams Road (to about 700 vehicles per hour), which would exceed the Guide to Traffic Generating Developments (Road and Traffic Authority, 2012) guidelines for environmental capacity limit of a local road (300 vehicles per hour). Measures to mitigate this increase in forecast traffic volumes on Adams Road would be developed in consultation with the local Council.
- An increase in visual impact on one property overlooking the proposed changes at Adams Road. This impact would be mitigated through additional planting along the embankments of Adams Road.

Mitigation measures and construction safeguards were set out in the EIS and revised in the SPIR and Final EIS. In addition to the additional mitigation measures noted above, this modification would adopt all relevant revised environmental management measures committed to for the approved project in accordance with Condition A2 of the Minister's CoA.

There are no additional impacts to matters of national environmental significance, or areas of Commonwealth Land.

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1 Introduction

1.1 Background

1.1.1 Approved project

Roads and Maritime Services (Roads and Maritime) is upgrading 16 kilometres of The Northern Road between Mersey Road, Bringelly and Glenmore Parkway, Glenmore Park.

The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park (herein referred to as "the project") was assessed under the former Part 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) (now, Division 5.2 of the EP&A Act, as discussed in Section 3.1) and Part 8 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The location and alignment of the approved project are shown in **Figure 1-1** and key features are summarised in Section 2.1. A full description of the approved project is provided in Chapter 5 of the NSW Environmental Impact Statement (EIS) / Commonwealth Draft EIS (herein referred to as the "EIS") and amended in Chapter 4 of the NSW Submissions and Preferred Infrastructure Report and Commonwealth Final EIS (collectively referred to as the "SPIR and Final EIS").

As identified in Section 5.5 of the EIS, the project is to be delivered in three stages:

- Stage 4 – between Mersey Road, Bringelly and Eaton Road, Luddenham
- Stage 5 – between Littlefields Road, Luddenham and Glenmore Parkway, Glenmore Park
- Stage 6 – between Eaton Road, Luddenham, and Littlefields Road, Luddenham.

Construction of Stage 4 of the project started in November 2018 and is anticipated to be open to traffic in March 2021. Construction of Stages 5 and 6 are anticipated to start in early 2019 and June 2019, respectively, and are anticipated to be open to traffic at the end of 2022 and 2021, respectively.

1.1.2 Conditions of approval

The NSW Minister for Planning approved the project under Section 5.19 of the EP&A Act on 30 May 2018 (herein referred to as the "Division 5.2 Approval"). The Division 5.2 approval incorporated the Minister's Conditions of Approval (CoA). Specifically relevant to this document is Condition A1 of the CoA, which specifies that the project be carried out in accordance with the terms of the approval and generally in accordance with the description in the EIS as amended by the SPIR.

The Commonwealth Minister for the Environment approved the project under Part 8 of the EPBC Act (herein referred to as the "EPBC Approval") on 15 June 2018. Conditions of the EPBC Approval relevant to this report include requirements for biodiversity offsetting, and for notification of any proposed modifications to the Division 5.2 Approval.

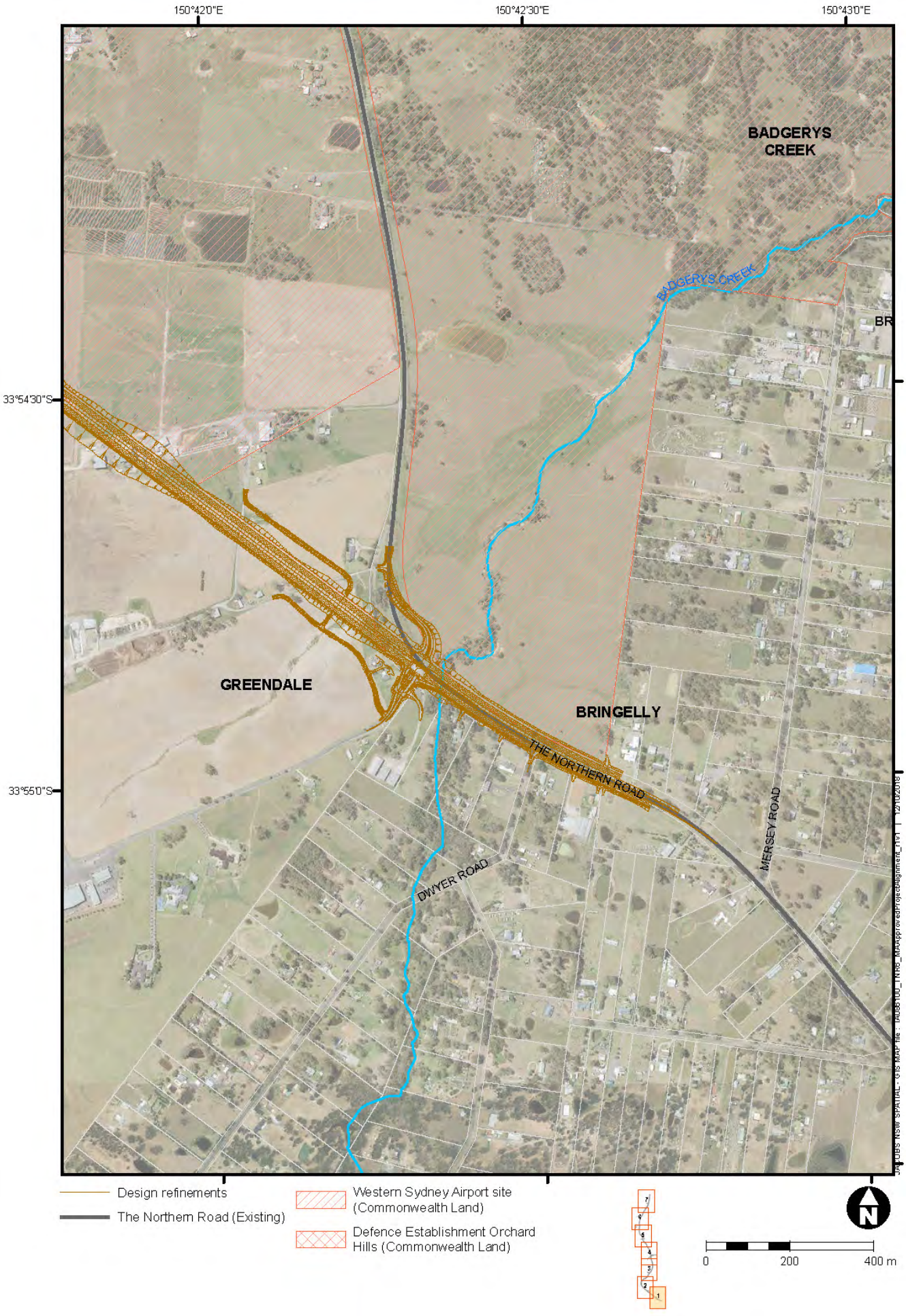

Figure 1-1 Approved project alignment

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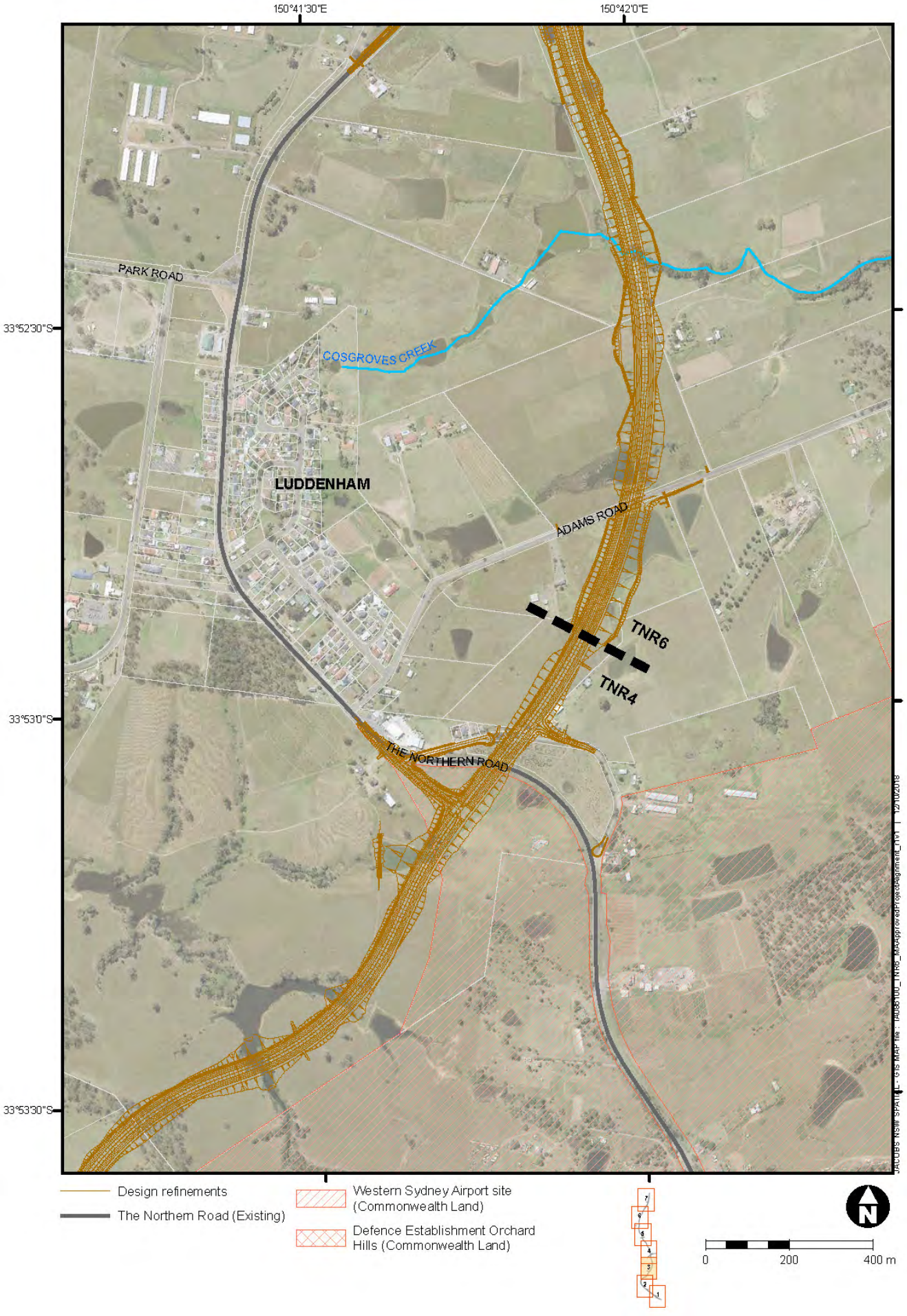

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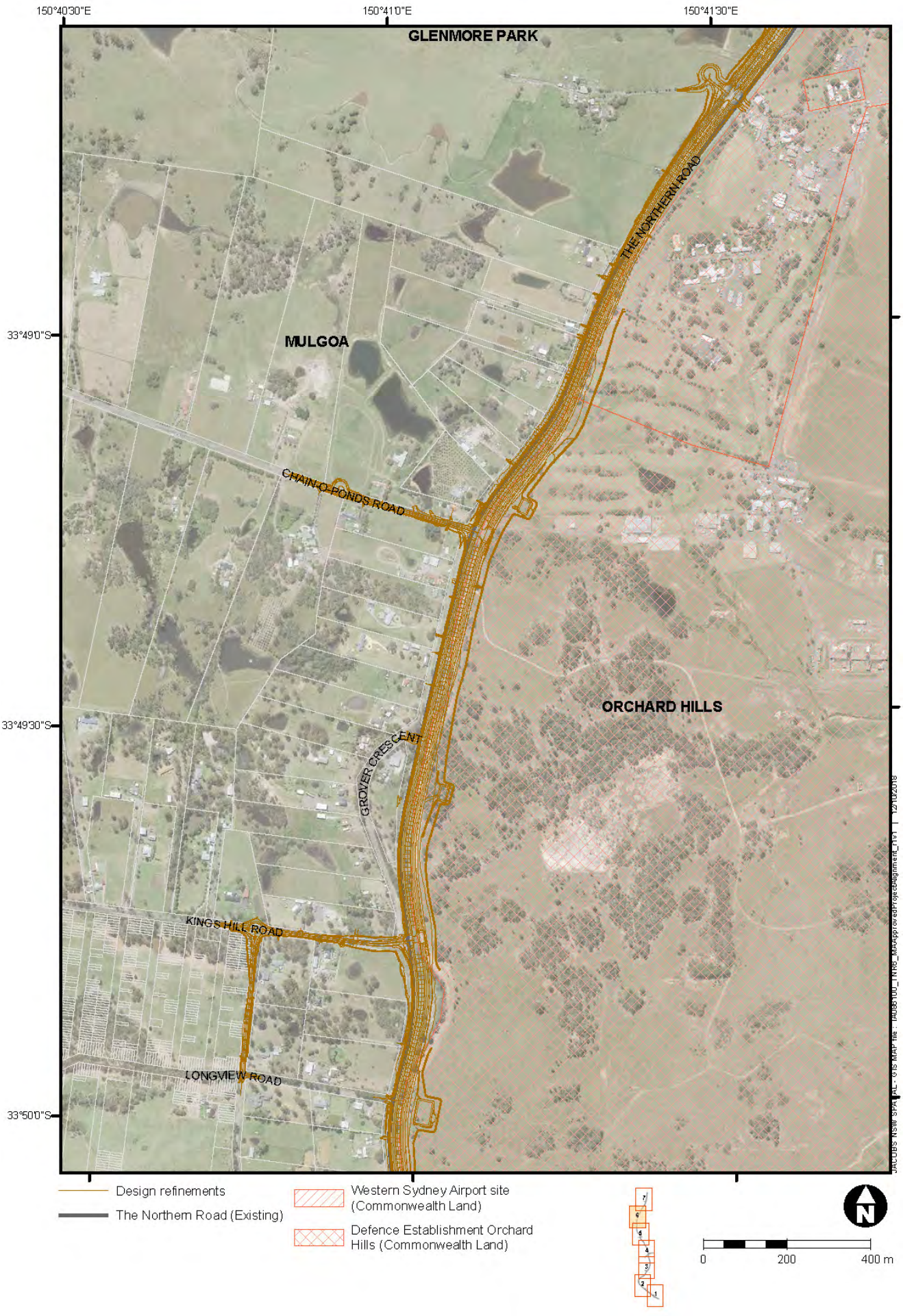

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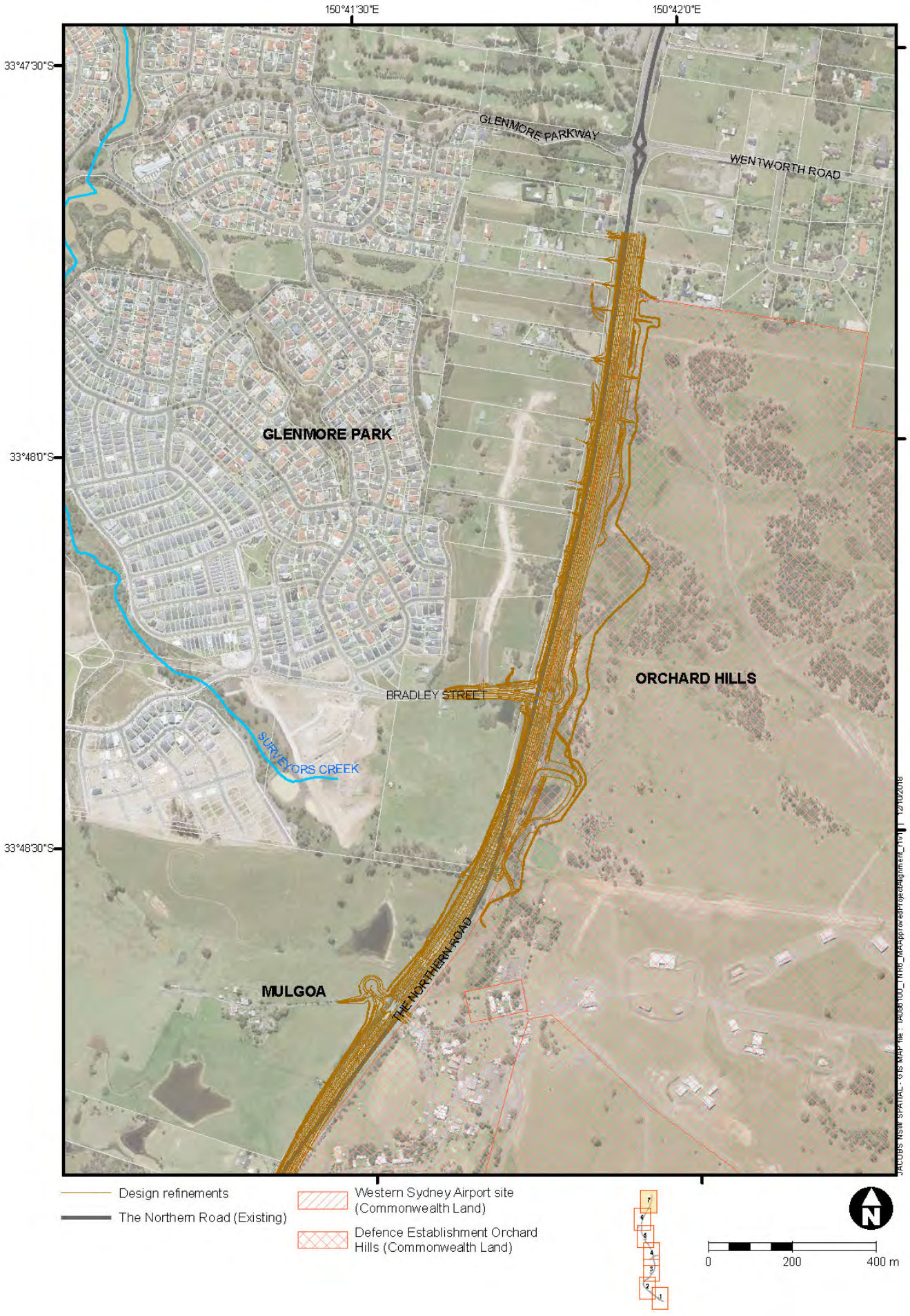


Figure 1-1 Approved project alignment

1.1.3 Consistent changes made to the approved project

Roads and Maritime has made minor changes to the project after receipt of the Division 5.2 Approval and EPBC Approval. Changes to Stages 4 and 5 of the project were documented in the following reports.

Stage 4:

- *Consistency assessment report, Proposed changes between Mersey Road, Bringelly and Eaton Road, Luddenham* (Roads and Maritime, July 2018)
- *Draft Consistency assessment report, Proposed changes between Mersey Road, Bringelly and Eaton Road, Luddenham* (Roads and Maritime, November 2018)

Stage 5:

- Consistency assessment report, Proposed changes between Littlefields Road, Luddenham and Glenmore Parkway, Glenmore Park (Roads and Maritime, October 2018).

Minor, consistent changes to Stage 6 of the project are described in Section 2.3 of this report. Roads and Maritime carried out a consistency assessment of the proposed minor changes to Stage 6 of the project (Consistency assessment report, Proposed changes between Eaton Road, Luddenham and Littlefields Road, Luddenham, (Roads and Maritime, December 2018) see Appendix A). The consistency assessment concluded that the minor changes are consistent with the Division 5.2 Approval and the EPBC Approval and accordingly, the changes can be carried out without modification of the Minister's approval under Section 5.25 of the EP&A Act.

1.2 Proposed modification of the approved project

Roads and Maritime proposes to modify the Minister's approval for Stage 6 of the project to replace the approved twin bridges over Adams Road with an at-grade signalised intersection. Roads and Maritime considers this change to be inconsistent with the Division 5.2 Approval. Specifically, the proposed change would not satisfy Condition A1 of the NSW Minister's Conditions of Approval as it is not '*generally in accordance with the description of the CSSI in the EIS as amended by the SPIR*'. Accordingly, Roads and Maritime seeks a modification of the Minister's approval under Section 5.25 of the EP&A Act. The modification would update the project description, and amend the Conditions of Approval to:

- A1 The CSSI must be carried out in accordance with the terms of this approval and generally in accordance with the description of the CSSI in the EIS as amended by the SPIR and this modification assessment
- A2 The CSSI must be carried out generally in accordance with all procedures, commitments, preventative actions, performance criteria and mitigation measures set out in the EIS as amended by the SPIR and this modification assessment unless otherwise specified in, or required under, this approval.

Condition 1 of the EPBC Approval requires that Roads and Maritime 'undertake the action, including but not limited to those parts of the action that occur on Commonwealth Land, in accordance with all conditions in the NSW Infrastructure Approval'. The definition of 'NSW Infrastructure Approval' includes any amendments to the Division 5.2 Approval from time to time. Accordingly, carrying out the project in accordance with the Division 5.2 Approval as modified from time to time is consistent with the EPBC Approval. Notification of the proposed modification to the Division 5.2 Approval will be provided to the Department of Environment and Energy, in accordance with Condition 2.

1.3 Purpose of this report

This report has been prepared to support an application from Roads and Maritime, the proponent of the project, to modify the existing NSW infrastructure approval for The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore (refs: SSI_7127 and EPBC 2016/7696). It is intended to help the NSW Minister for Planning in forming a view as to the merits of the proposed modification.

The purpose of this modification assessment is to:

- Describe the proposed modification relative to the Division 5.2 Approval and the EPBC Approval
- Provide justification for the modification
- Assess the potential environmental impact of the proposed modification relative to the Division 5.2 Approval and the EPBC Approval and describe the measures proposed to mitigate any potential impact.

This report also considers the proposed minor changes relative to the Division 5.2 Approval and EPBC Approval, as described in Section 2.3. The environmental impact of these changes has been assessed as consistent with the SPIR and Final EIS (see Appendix A) meaning that the changes can be carried out without modification of the Division 5.2 Approval. However, given the interrelation between the proposed minor changes and the proposed modification, some aspects of the environmental assessments are inextricably linked and as such it has not been possible to fully separate the environmental assessments and potential impacts. Therefore, the minor changes have also been included in this modification assessment report for completeness.

1.4 Project objectives

The Northern Road upgrade comprises part of the Western Sydney Infrastructure Plan (WSIP). Program objectives for the WSIP were developed in February 2015 by Roads and Maritime, Transport for NSW and the Australian Government as set out in Section 3.4 of the EIS. The objectives that are relevant to the proposed modification are:

- Development and demand – support the Western Sydney Airport, land use change and residential growth; balancing functional, social, environmental and value for money considerations
- Integrated network – provide road improvements to support and integrate with the broader transport network
- Customer focus – provide meaningful engagement with customers and stakeholders throughout the program life.

As a key part of WSIP, the project would deliver a combination of new, additional and renewed infrastructure. In consideration of the broader objectives for the WSIP, specific objectives were developed for the project. They are to:

- Cater for future traffic demand to improve the flow of traffic to provide reliable journeys
- Improve facilities for public and active transport to promote sustainable and efficient journeys.

Supporting project assessment criteria were also developed to support the justification of a preferred option. The supporting project assessment criteria relevant to the proposed modification are:

- Minimise environmental impact
- Deliver a cost effective project

- Improve road safety
- Maintain arterial road function.

2 Description of the proposed modification

2.1 The approved project

The approved project comprises an upgrade of 16 kilometres of The Northern Road between Mersey Road, Bringelly and Glenmore Parkway, Glenmore Park. The location and alignment of the approved project are shown in **Figure 1-1**, key features include:

- A four-lane divided road between Mersey Road, Bringelly and Bradley Street, Glenmore Park (two general traffic lanes in each direction, with additional dedicated bus lanes at intersections). A 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 just south of Glenmore Parkway, Glenmore Park (three general traffic lanes and a kerbside bus lane in each direction separated by a central 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 runs through the Western Sydney Airport site
- About eight kilometres of upgraded and widened road between the existing Elizabeth Drive, Luddenham and just south of Glenmore Parkway, Glenmore Park
- Access to the Luddenham town centre from north of the realigned The Northern Road and the existing The Northern Road
- Twin bridges over Adams Road, Luddenham
- Four new traffic light intersections and new traffic lights at existing intersection
- Local road changes and upgrades to current access arrangements for businesses and private properties
- A new shared path for pedestrians and cyclists on the western side of The Northern Road and footpaths on the eastern side of The Northern Road where required.

A full description of the approved project is provided in Chapter 5 of the NSW EIS / Commonwealth Draft EIS and amended in Chapter 4 of the SPIR and Final EIS.

2.2 Description of the proposed modification

2.2.1 Main features of the proposed modification

Roads and Maritime proposes to modify the Minister's approval for Stage 6 of the project to replace the approved twin bridges over Adams Road with an at-grade signalised intersection.

The proposed modification is shown in Figure **2-1** and would comprise:

- Not constructing the approved bridge structure over Adams Road (comprising twin 30 metre long, ten metre high single span bridges)
- Provision of an at-grade signalised intersection, including the addition of left and right turn lanes on Adams Road and The Northern Road to accommodate all vehicle movements
- Provision of pedestrian crossing facilities at the proposed intersection with Adams Road
- Reducing the vertical alignment by up to seven metres along The Northern Road extending about 400 metres north and south of the proposed at-grade intersection
- Increasing the vertical alignment of Adams Road by up to eight metres (extending about 400 metres east of the proposed at-grade signalised intersection) and lowering the

alignment (extending about 400 metres west of the intersection) to tie-in with the revised vertical alignment of The Northern Road

- Filling one additional privately owned farm dam at the south-eastern corner of the proposed at-grade signalised intersection to accommodate a fill embankment for the proposed modification
- Increase in the partial filling and reforming of a privately owned farm dam, including dam wall modifications, at the north-western corner of the proposed at-grade signalised intersection to accommodate fill embankments. The capacity of this dam would be reduced as a consequence.
- Increasing the construction and operational footprint from the design in the SPIR and Final EIS as described in Section 2.4 below.

The proposed signalised intersection would allow all vehicle turning movements between The Northern Road and Adams Road. This would allow access between The Northern Road and Adams Road without the need to travel through Luddenham town centre, and access to the Luddenham town centre from Adams Road intersection. The total number of signalised intersections along the entire The Northern Road Upgrade project would increase to five. A full description of traffic changes as a result of the proposed changes is provided in Section 5.2.

No change to the speed limit along The Northern Road is proposed; it would remain at 80km/h, as per the existing approvals.

2.2.2 Work methodology

The removal of the bridge at Adams Road from the design means that bridging work is no longer required. There would be no need for piling work for the signalised intersection. Additional earthworks are required for the regrading of Adams Road, but these are less than would have been required for the bridge abutments (see Section 2.2.5 for volumes). The spatial extent of earthworks along The Northern Road for the at-grade signalised intersection would be about the same as that required for bridge abutments (chainages 5600 to 8380).

2.2.3 Construction hours and duration

The additional earthworks required along Adams Road are expected to be carried out during standard construction hours and last between four to eight weeks. No out of hours work have been identified for assessment for the proposed modification. Out of hours work may be undertaken for The Northern Road upgrade if it meets the requirements of the CoA (E26) and the Environment Protection Licence. Any out of hours work must also be in accordance with an approved out of hours work protocol.

For the approved project, the bridgeworks were due to be carried out as out of hours work and were assessed as such. This work is no longer required.

2.2.4 Plant and equipment

The typical plant and equipment required for earthworks during construction of the signalised intersection compared to plant and equipment required for the bridgeworks in the approved project is presented in **Table 2-1**.

Table 2-1 Typical construction plant and equipment

Earthworks for signalised intersection	Bridgeworks (no longer required)
Excavator Dump trucks Vibratory roller Light vehicles Bulldozer Grader Water cart Bobcat	Excavators Light vehicles Generator Rock-breaker Concrete trucks and pump Welding equipment Mobile crane Impact piling Oxy-cutting equipment

2.2.5 Earthworks

The construction of the intersection at Adams Road would require additional construction footprint. The cut and fill balances for the signalised intersection, compared to the twin bridges, are provided in **Table 2-2**. Even with the additional raising of Adams Road (east of the intersection with The Northern Road), the volume of fill required for the proposed modification would be about 56 per cent of that required under the SPIR and Final EIS design for the abutments of the twin bridges.

The proposed modification would require a larger volume of cut than considered in the SPIR and Final EIS. This is due to the regrading of Adams Road to the west of The Northern Road alignment, which requires excavation to the level of the proposed intersection with The Northern Road.

Table 2-2 Comparison of the cut and fill balances for the proposed modification and SPIR and Final EIS design

Design	Cut (m^3)	Fill (m^3)
SPIR and Final EIS: Twin bridge design	6,525	340,950
Proposed modification: At-grade intersection design	20,945	192,705
Change in volume	+14,420	-148,245

2.2.6 Management of materials

There is an overall deficit in the cut and fill balance for Stage 6 of The Northern Road Upgrade (including the proposed modification) of about 312,000 m^3, which will need to be imported. The project will look to use resource recovery exemptions and orders to reuse material from other local road projects, where practical. Material would be managed in line with the approved Construction Environmental Management Plan (CEMP) including its appended Construction Soil and Water Management Plan and Construction Waste and Energy Management Plan.

Some of the proposed changes may reduce the quantity of construction materials required. These changes include:

- Removal of the twin bridges at Adams Road
- Reduced median width between intersections
- Steepening of batters

- Refinements to drainage and water quality infrastructure (deletion of kerb and gutter in preference of grass table drains)
- Reduced earthworks required for the regrading of Adams Road compared to bridge abutments.

Some of the proposed changes may increase the amount of construction materials required. These changes include:

- Provision of concrete footpath at signalised intersections
- Refinements to pavement of local roads and property accesses.

Waste generated during construction of the proposed modification will primarily be from civil work associated with site preparation, earthworks, relocation of utilities, construction of road infrastructure and landscaping. To ensure the amount of waste is minimised, earthworks requirements will be managed across the entire project, with construction staging taking into account efficient resource use and opportunities for reusing materials to limit waste generation.

2.2.7 Traffic management and access

The proposed modification would not require additional construction traffic.

No changes to construction traffic access are proposed. The construction traffic would access the construction sites using only designated heavy vehicle routes such as the M4 Motorway, Elizabeth Drive and The Northern Road. The EIS identified the that construction access may be required along Adams Road during construction of the bridge. The section of Adams Road between the existing The Northern Road in Luddenham and the new project alignment was also identified as a haulage route. The rest of Adams Road would not be used for construction traffic access.

It is planned that at least one lane on Adams Road would remain open throughout the construction of the intersection and traffic management would be implemented to facilitate access. Traffic management would be carried out in line with the measures set out in the project's approved Construction Environmental Management Plan including Construction Traffic Management Plan.

2.2.8 Ancillary facilities

No additional ancillary facilities are proposed as part of the modification. There are no changes proposed to the ancillary facilities that facilitate the Adams Road and The Northern Road intersection works.

2.2.9 Public utility adjustments

Minor changes to public utilities are required near the proposed Adams Road intersection. These utility adjustments are subject to the environmental assessment process of the public utility provider.

2.2.10 Property acquisition

The additional construction footprint for the proposed intersection at Adams Road requires increased area of property acquisition at four already affected properties and two additional properties. This strip acquisition is not expected to impact on the wider use of these properties.

2.3 Description of consistent changes

Roads and Maritime has made minor changes to the approved project, in addition to those described in Section 2.2. These changes are also shown on **Figure 2-1** and include:

- Reduced median width and cross-sectional area between intersections, while maintaining provisions for an ultimate eight lane configuration in the future as demand requires
- Replace kerb and gutter with grass swale, except at footpath locations near Adams Road and Elizabeth Drive intersections
- Changes to drainage structures (pit, pipes, culverts, swales) to suit horizontal and vertical geometry
- Reduction of verge (and removal of provision for any future footpath) along the eastern side of The Northern Road from five metres to one metre wide
- Other minor refinements to the vertical and horizontal alignment of the road at various locations
- Cut and fill batter slopes revised from 1:4 to 1:3 in most places. Benching added to high cuts between chainage 6320 – 6620
- Removal of street lighting mid-block
- Street lighting added for turning heads along Elizabeth Drive
- Bus stop areas added on north-bound and south-bound lanes at Adams Road and Elizabeth Drive intersections
- Various private property driveway amendments, including some new accesses
- Provision of two cantilevered variable messaging signs (VMS) over The Northern Road about 700 metres north and south of Elizabeth Drive.
- Changes to the construction and operational footprint from the design in the SPIR and Final EIS as described in Section 2.4.

A consistency assessment has been carried out on these changes, as provided in Appendix A. The assessment concludes that these changes are consistent with the approved project. However, as they are interrelated with the design of the proposed modification (i.e. the replacement of twin bridges over Adams Road with an at-grade signalised intersection), they have been incorporated into this modification assessment and therefore will only proceed as described if the proposed modification is approved.

2.4 Project boundary

Proposed changes to the approved construction and operational project boundaries are shown in Figure **2**-**2** and Figure **2**-**3** and are limited to:

- An increased construction and operational footprint around Adams Road to enable the regrading of this road
- Minor increases to the construction boundary to allow private property access adjustments
- A reduced footprint for the ancillary facility area (and associated construction boundary) at the south-eastern corner of Elizabeth Drive and The Northern Road intersection
- Slight rationalisation (reduction) of the operational boundary at three locations based on the minor vertical, horizontal and cross-section alignment refinements proposed and consultation with affected property owners to reduce and simplify property acquisition.

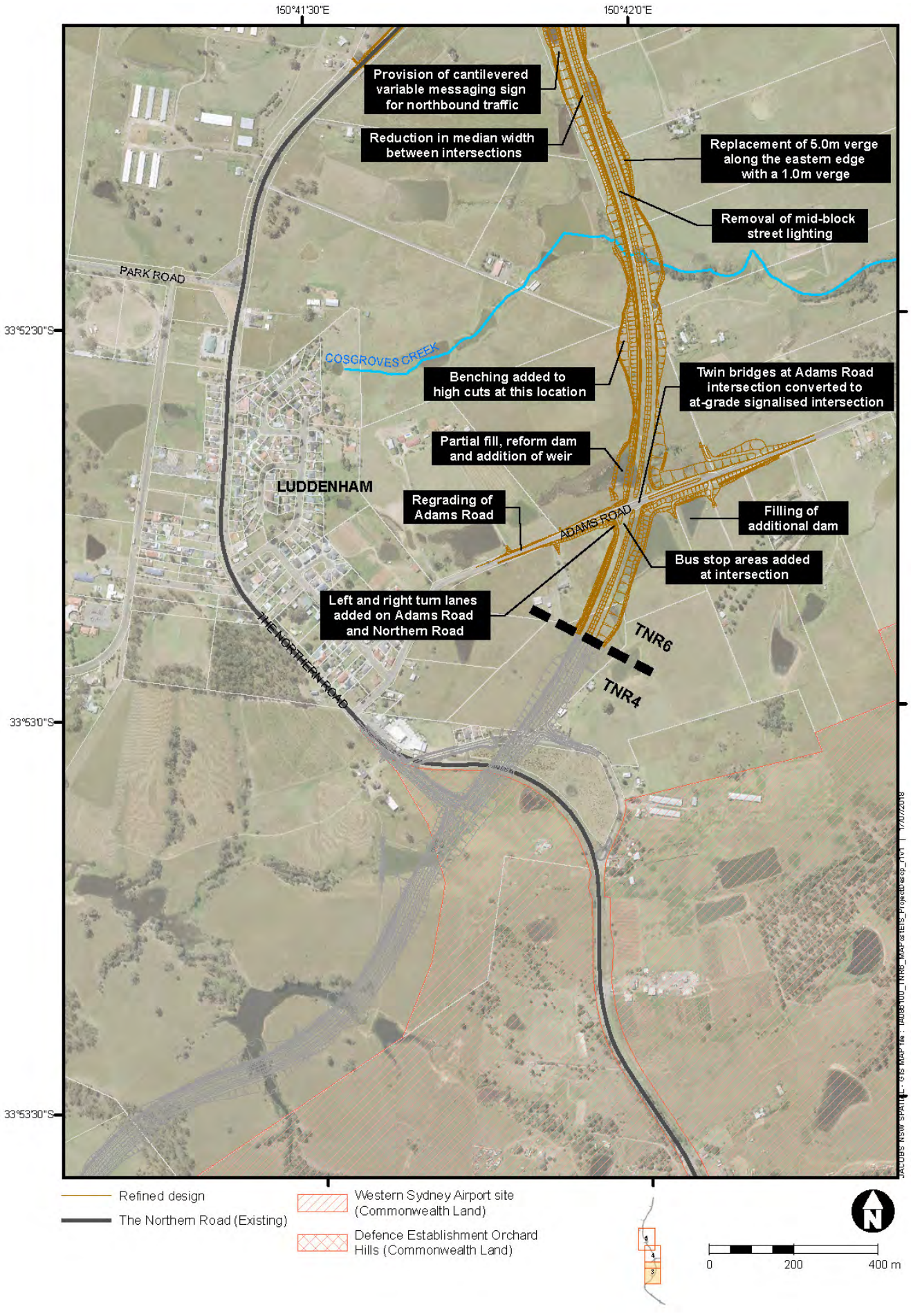


Figure 2-1 Overview of proposed changes for the project

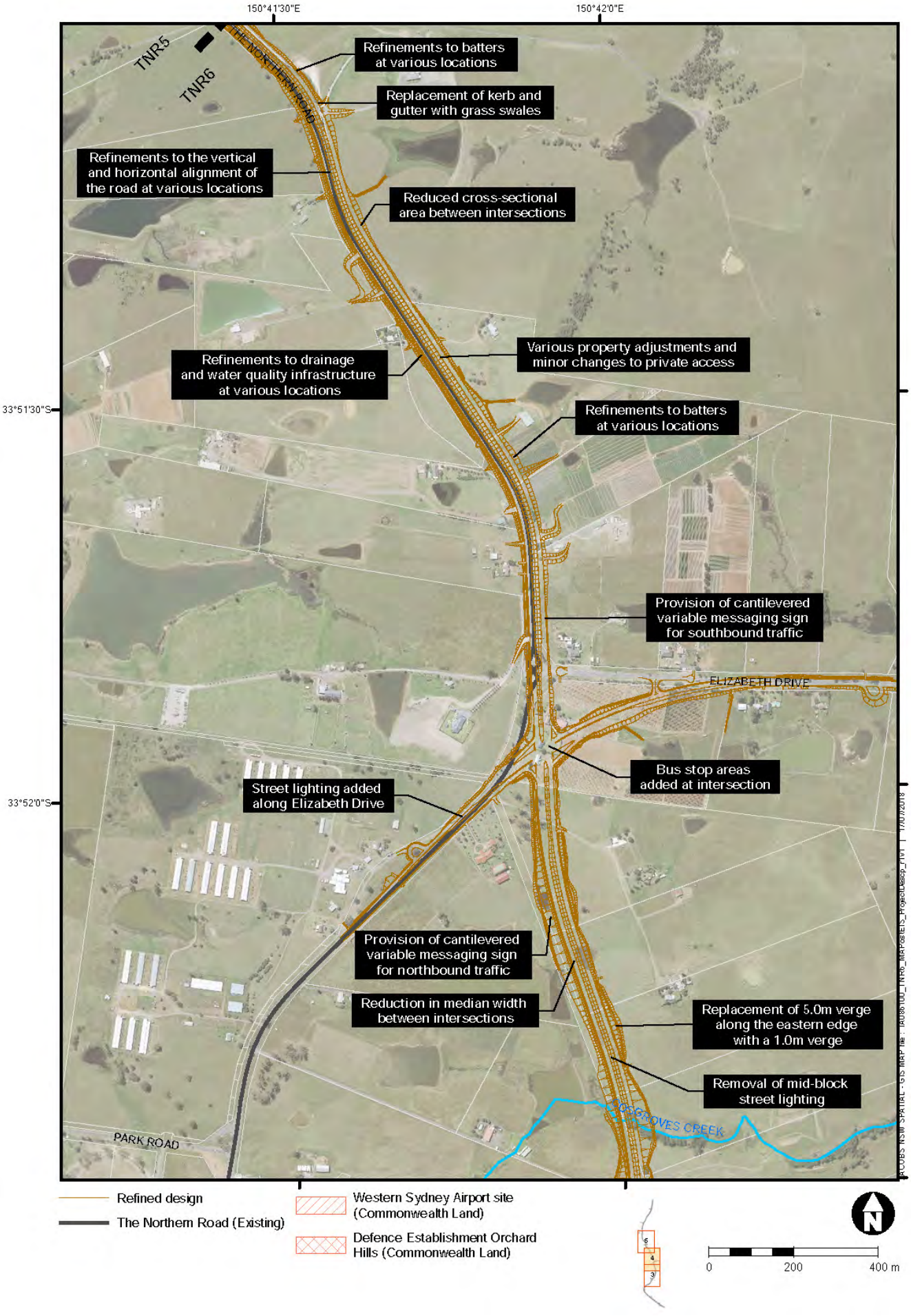
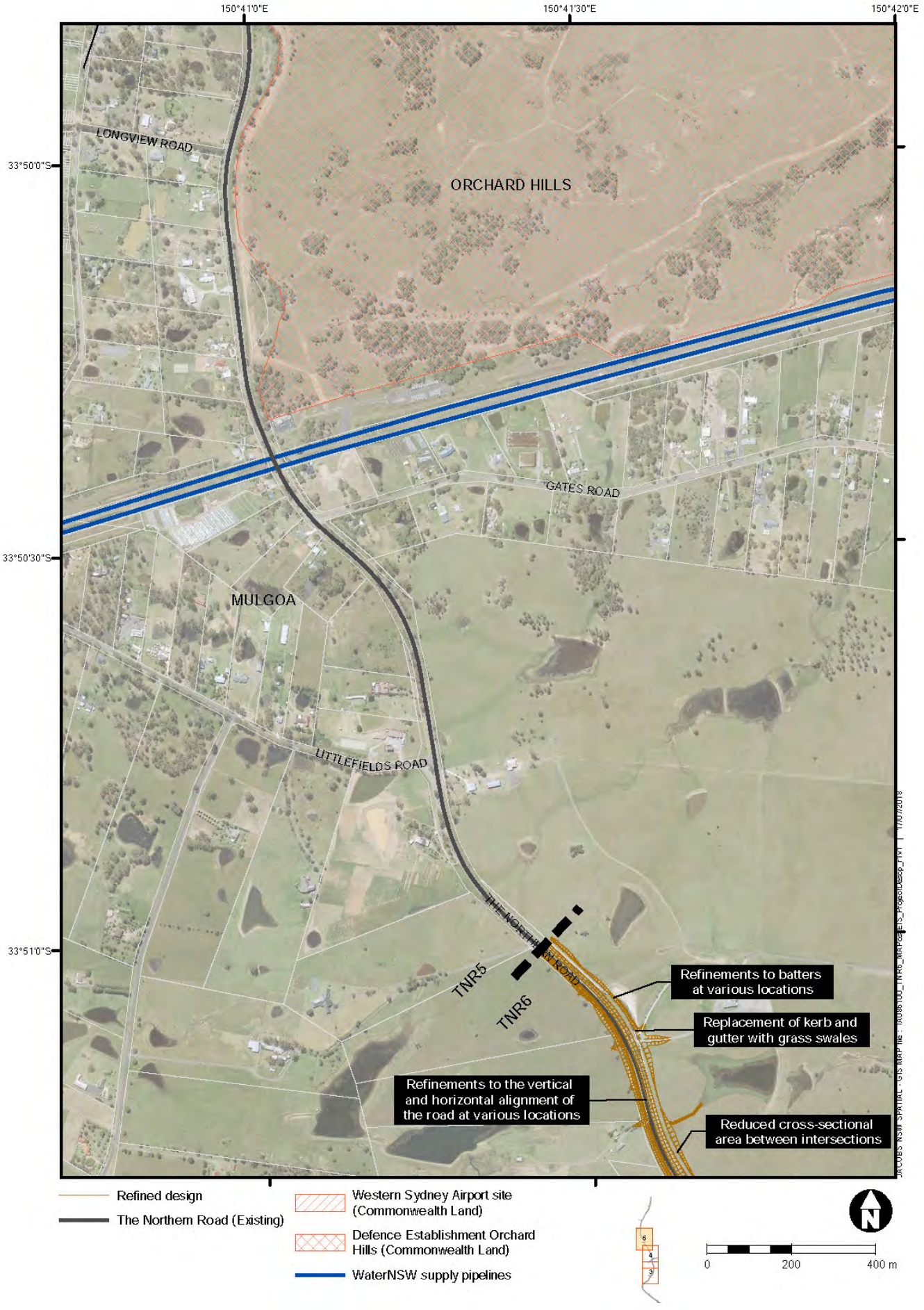


Figure 2-1 Overview of proposed changes for the project Page 2 of 3



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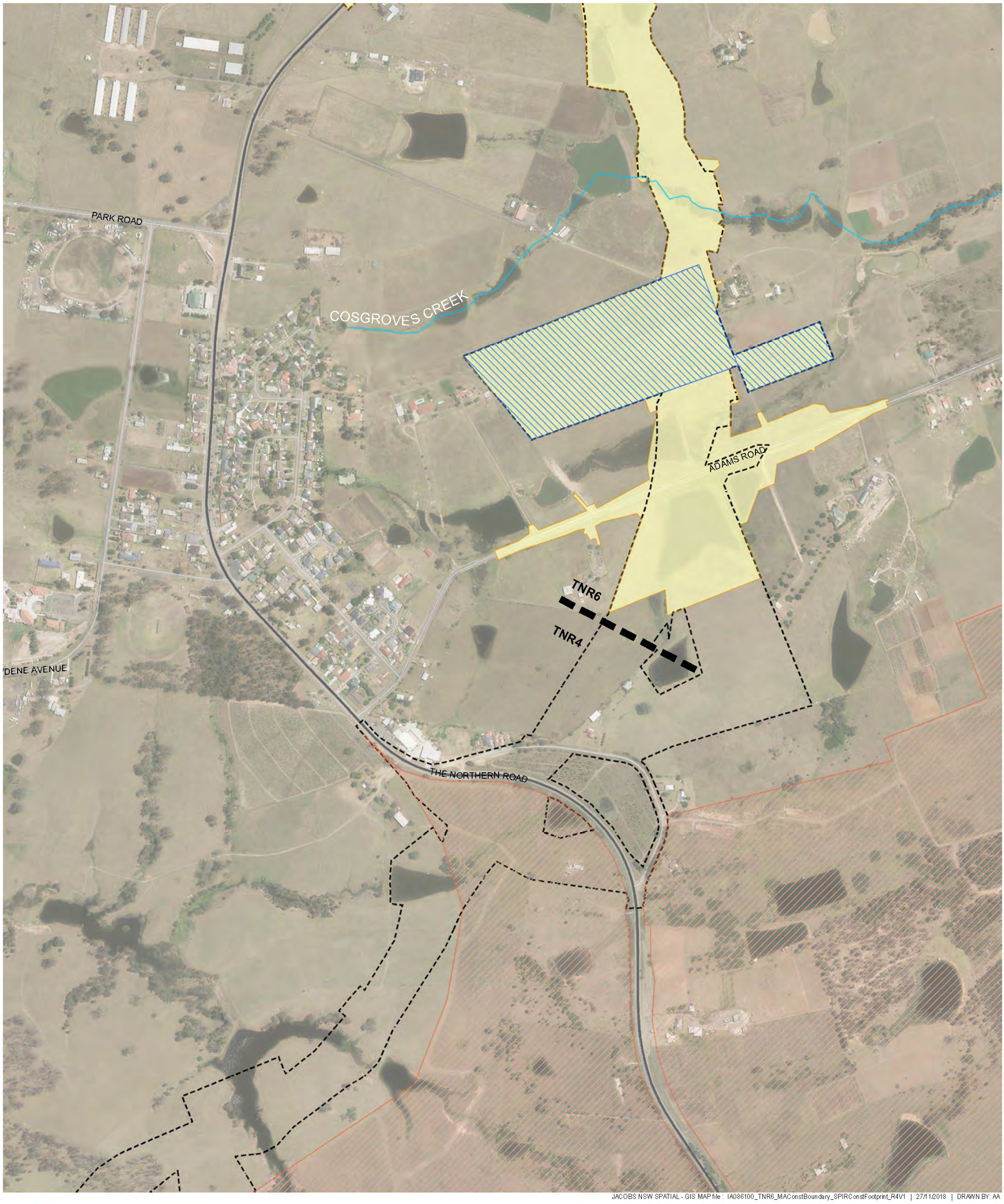

Figure 2-2 Comparison of SPIR and Final EIS and refined construction footprints

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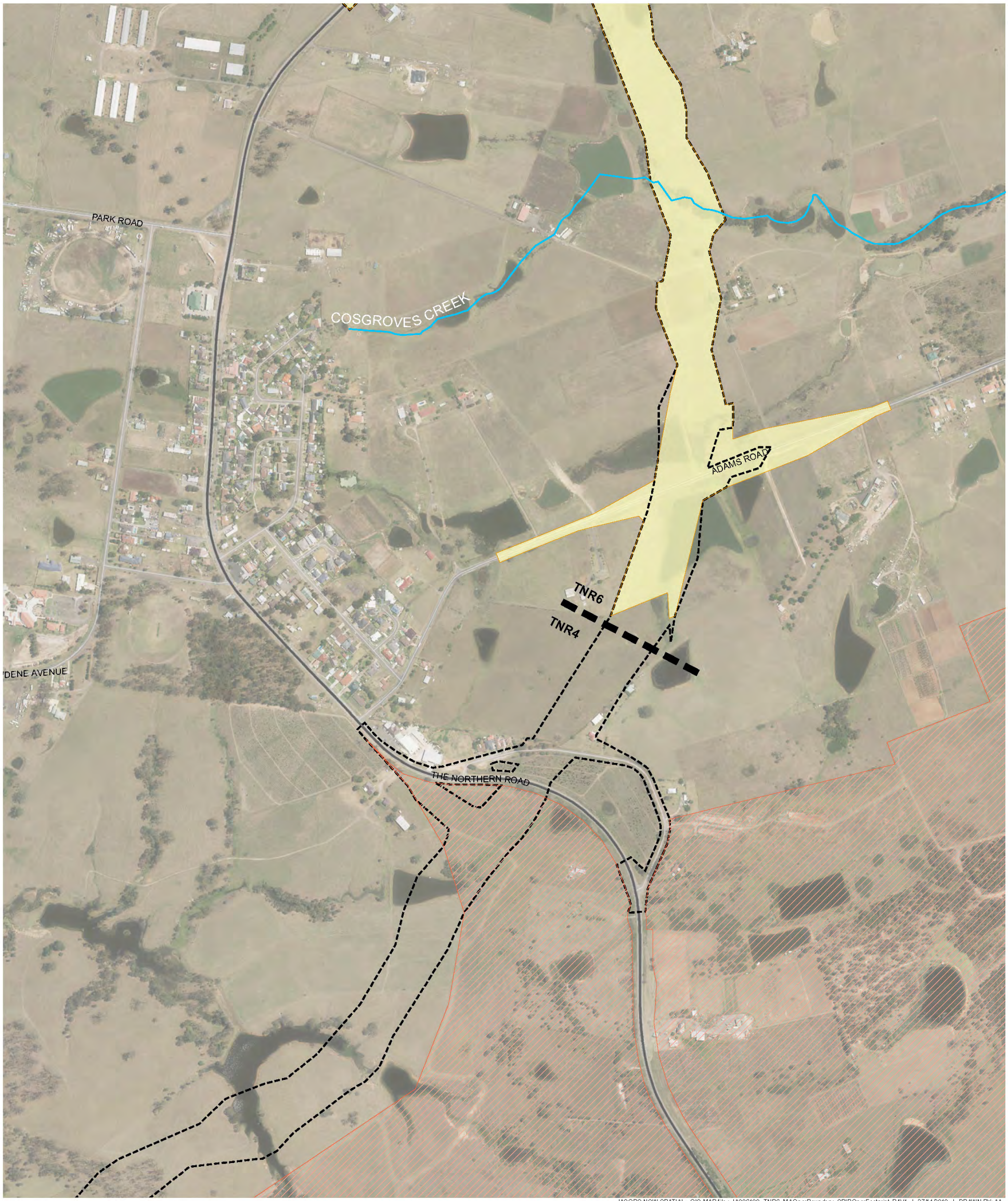
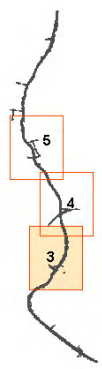


Legend

- Submissions design operational footprint
- Western Sydney Airport site (Commonwealth Land)
- Modification assessment operational boundary



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The Northern Road upgrade - Mersey Road to Glenmore Parkway - TNR6
Operational Boundary

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Figure 2-3 Comparison of SPIR and Final EIS and refined design operational footprints

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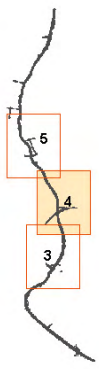
Legend

- Submissions design operational footprint
- Modification assessment operational boundary



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The Northern Road upgrade - Mersey Road to Glenmore Parkway - TNR6
Operational Boundary

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Figure 2-3 Comparison of SPIR and Final EIS and refined design operational footprints

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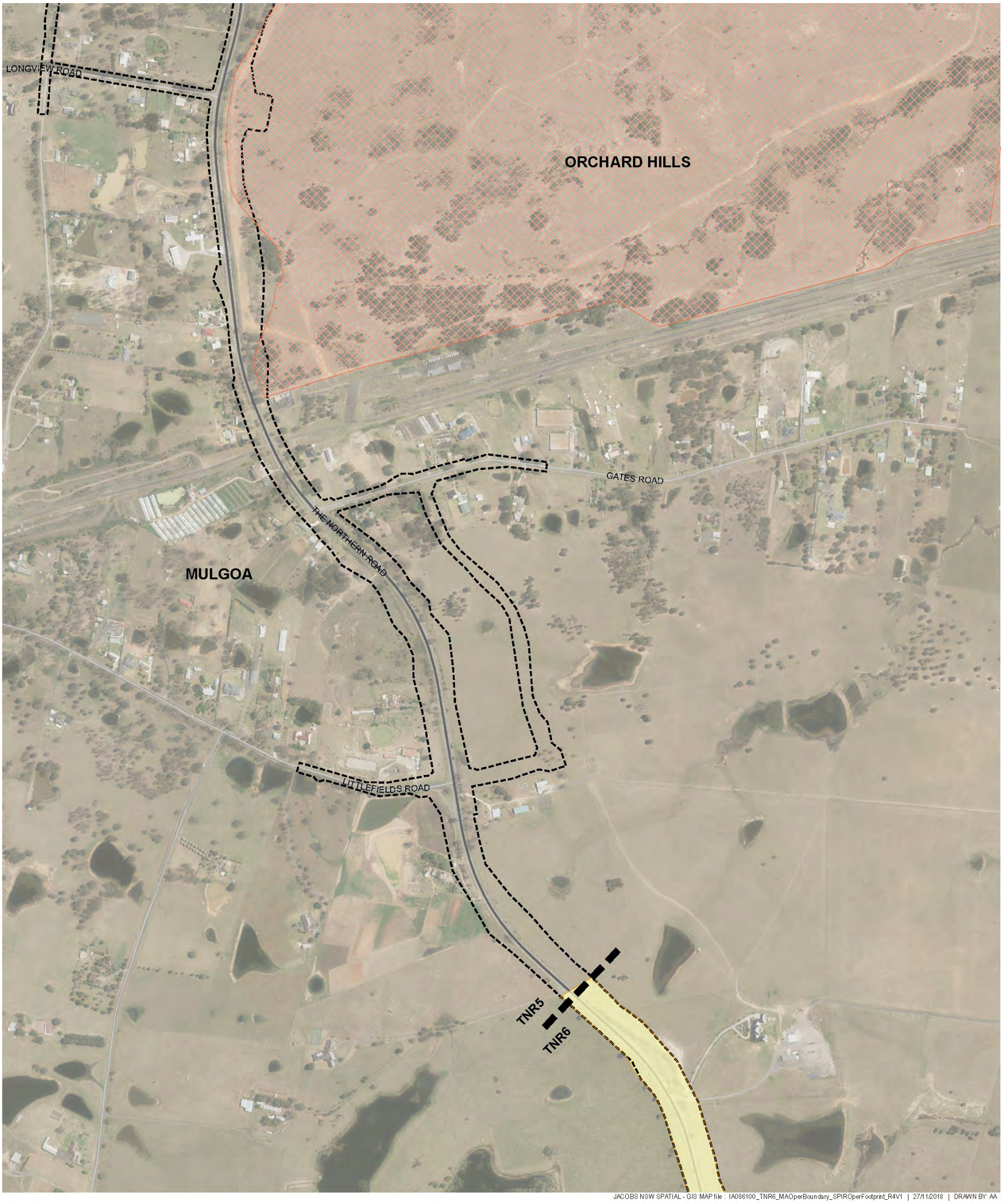

Figure 2-3 Comparison of SPIR and Final EIS and refined design operational footprints

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2.5 Need

Design changes described in Section 2.2 and Section 2.3 were primarily derived from a Final Business Case review of the project by Infrastructure NSW. The review resulted in a number of critical recommendations which needed to be addressed before final funding approval.

A key recommendation was to reconsider all of the recommendations of a Value Engineering Study (April 2017) before finalising the detailed design and Final Business Case, and implement those initiatives that are considered feasible.

The Value Engineering Study identified the need for a number of design changes to reduce the costs associated with the project. The key value engineering options adopted and factors considered in the analysis of the design changes are presented in **Table 2-3**.

Table 2-3 Summary of Value Engineering Study

Key Value Engineering Options Adopted	Factors considered (in no particular order)
Proposed modification: • Replacement of the twin bridges at Adams Road with a signalised intersection (the subject of the proposed modification considered in this report).	• Design, construction and maintenance costs • Property acquisition outcomes • Earthwork extents and environmental impact (biodiversity and other) • Potential project approval implications, program impact and delivery delays • Community and stakeholder consultation requirements • Predicted traffic and pedestrian numbers.
Minor consistent changes: • Reducing median widths and cross-sectional area reducing land take • Optimise cut and fill batter slopes • Reduced culvert lengths • Removing the kerb and gutter and associated long drainage infrastructure, replacing with table drains • Removing shared path lighting • Reducing five metre verge to one metre (and removing provision for any future footpath) on eastern side.	• Design, construction and maintenance costs • Property acquisition outcomes • Earthwork extents and environmental impact (biodiversity and other) • Amenity and social benefit • Previously made public project commitments and Roads and Maritime reputation with the community and stakeholder • Community and stakeholder consultation requirements • Potential project approval implications, program impact and delivery delays • Predicted traffic and pedestrian numbers • Capacity and resilience of the proposed upgrade for the initial period of operation • Sustainability outcomes • Road safety design.

The adoption of these key value engineering options as the outcome of the Value Engineering Study was agreed with Roads and Maritime Sydney Development Committee.

Other proposed minor consistent changes, as listed in Section 2.2, were the outcome of further consultation with stakeholders.

2.6 Options and alternatives considered

2.6.1 Identified options

The Value Engineering Study identified the need to replace the approved twin bridges at Adams Road with an at-grade intersection. Retention of the bridges was considered in the Value Engineering Study, but even with a reduction in the bridge deck width, cost implications did not favour this option. Three options for the intersection were identified through detailed design:

- Option 1: A signalised intersection (see Figure 2-4)
- Option 2: A left in/left out intersection (both sides) (see Figure 2-5)
- Option 3: A left in/left out turn for Adams Road on the eastern side into The Northern Road and provision of a cul-de-sac on the western end of Adams Road (see Figure 2-6).

2.6.2 Analysis of options

A comparative analysis of the three options was carried out to identify the suitability of the preferred option, as described in The Northern Road Stage 6 Adams Road Intersection – Options Analysis memorandum and summarised in this Section of this report. Potential environmental constraints and issues for each of the specialist topics assessed in the EIS were considered for each option. While there was no specific consultation with the community about a preferred option for the intersection, the options analysis considered likely community concerns based on previous engagement throughout the development of the EIS.

To determine a preferred option, a multi-criteria analysis was used similar to that applied in the assessment of options for the wider project as outlined in the EIS. The Northern Road Stage 6 Adams Road Intersection – Options Analysis memorandum describes each criterion and provides commentary for the score for each option. The criteria, sub-criteria and a summary of the results of the options analysis are presented in **Table 2-4**.

Table 2-4 Summary of Adams Road intersection options assessment

Assessment criteria	Weighting	Option 1	Option 2	Option 3
1. Support airport construction (total)		6	6	6
1A Project delivery The length of the option (directly related to length of construction period).	*10 %*	*3*	*3*	*3*
1B Staging of construction Ability to stage construction to support the early development of a Western Sydney Airport at Badgerys Creek while still facilitating traffic flow along The Northern Road.	*10 %*	*3*	*3*	*3*
2. Land-use integration (total)		11	10	10
2A Current development Impact on current land use.	*6 %*	*3*	*4*	*4*
2B Future development The opportunities to support the development of the WSPA and SWPA.	*6 %*	*3*	*3*	*3*
2C Airport connectivity The opportunities to provide road connections to the Western Sydney Airport site during construction and operation of an airport.	*3 %*	*5*	*3*	*3*

Assessment criteria	Weighting	Option 1	Option 2	Option 3
3. Community (total)		13	10	10
3A Property acquisition The number and size of private properties requiring total and partial acquisition.	*7 %*	*3*	*4*	*4*
3B Impact on existing businesses Connectivity and access to existing businesses in Luddenham.	*4 %*	*5*	*3*	*3*
3C Community preference Feedback from community consultation.	*4 %*	*5*	*3*	*3*
4. Environment (total)		19	17	17
4A Traffic	*3 %*	*5*	*4*	*3*
4B Noise and Vibration	*3 %*	*3*	*4*	*4*
4C Biodiversity	*3 %*	*3*	*3*	*3*
4D Socio-economic	*3 %*	*5*	*3*	*4*
4E EIS non-key issues (Flooding, soils, heritage)	*3 %*	*3*	*3*	*3*
5. Functionality (total)		9	10	10
5A Maintain arterial road function The ability to maintain a speed limit of 80 km/h, provide a safe road environment and length of road.	*7 %*	*3*	*4*	*4*
5B Future motorways connection The opportunities, costs and complexity of connections with the proposed M12 Motorway, Outer Sydney Orbital and Elizabeth Drive.	*7 %*	*3*	*3*	*3*
5C Operation The maximum and average grade of road and other design parameters.	*6 %*	*3*	*3*	*3*
6. Relative cost/constructability		4	5	5
6A Cost/constructability	*15 %*	*4*	*5*	*5*
Total		**62**	**58**	**61**

Option 1 scored highest overall unweighted due to:

- 2C Airport connectivity – a signalised intersection would provide the greater opportunity to provide connectivity to the Western Sydney Airport due to allowing all turning movements
- 3B Impact on existing businesses – Option 1 provides the greatest connectivity to Luddenham with all turning movements allowed
- 3C Community preference, subject to community and stakeholder consultation
- 4A Impact on traffic and access – Option 1 would provide the greatest level of access for Adams Road and increased safety for pedestrian and cyclists
- 4D Socio economic – Option 1 scores highest overall due to preferred safety for pedestrians and cyclists associated with signalled crossing.

Option 2 and 3 score highest overall when scores are weighted as these options performed better in terms of maintaining arterial road function and overall project cost.

2.6.3 Preferred option

The selected option was Option 1, a signalised intersection with Adams Road. A full description of the option is provided in Section 2.2.

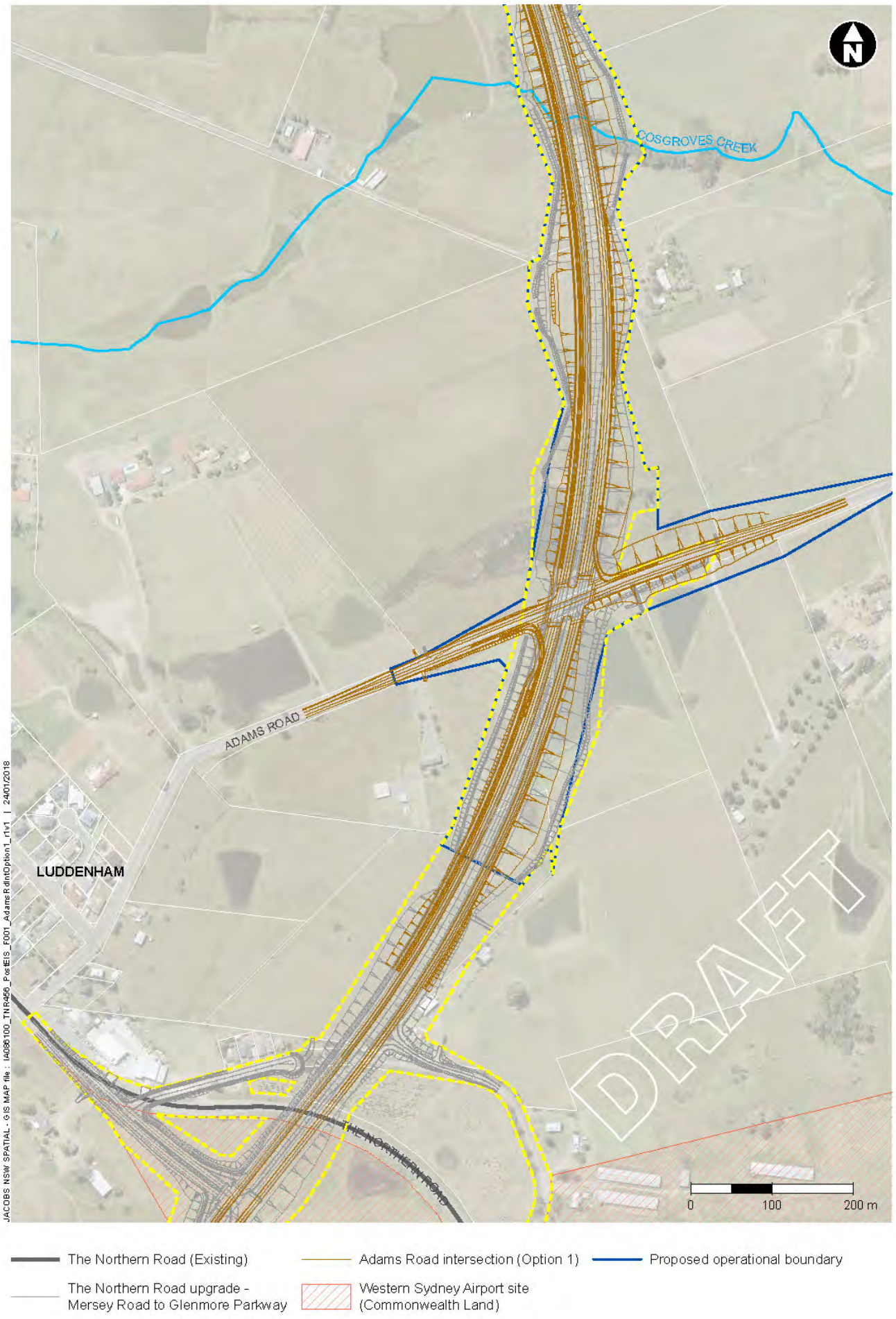

Figure 2-4 Options assessment figure – Option 1 A signalised intersection

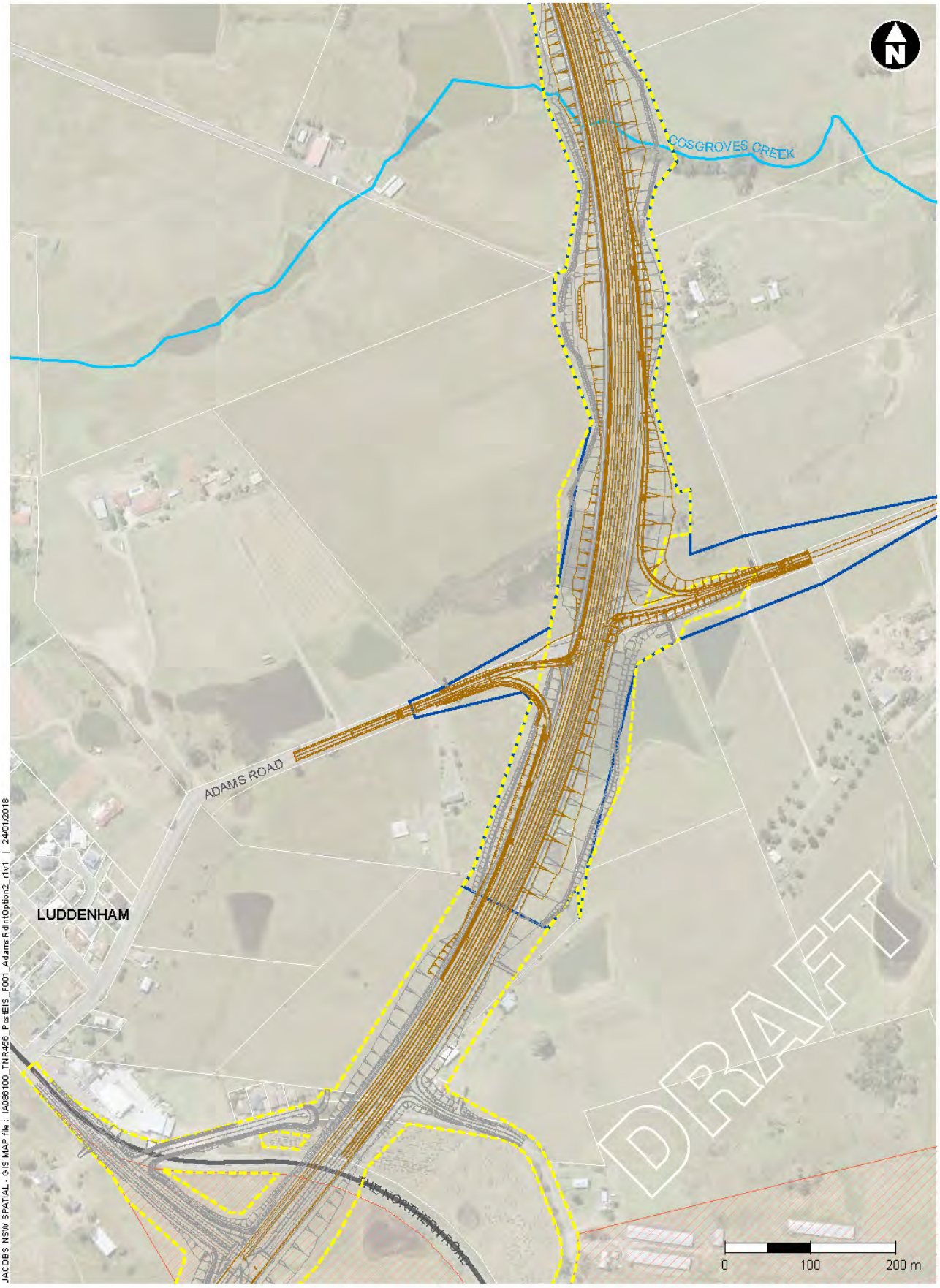

Figure 2-5 Option 2: A left in/left out intersection (both sides)

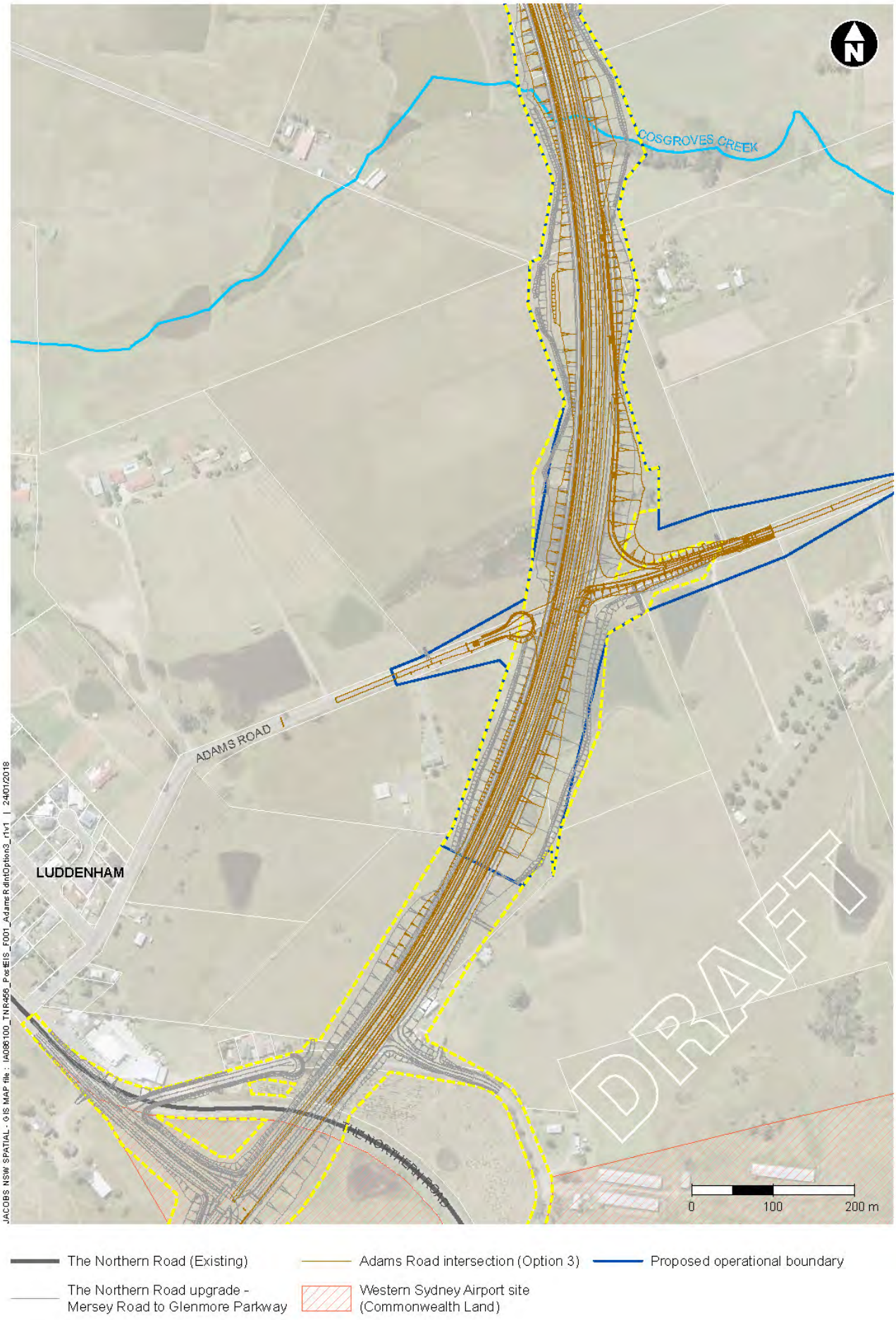

Figure 2-6 Option 3: A left in/left out turn for Adams Road on the eastern side into The Northern Road and provision of a cul-de-sac on the western end of Adams Road

3 Legislative and planning framework

3.1 NSW Environmental Planning and Assessment Act 1979

3.1.1 Approved project context

The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park was assessed under the former Part 5.1 of the EP&A Act. A full description of the approval framework for the project is provided in Section 2.1 of the SPIR and Final EIS and summarised as follows:

- On 31 March 2017 the NSW Minister for Project declared the project to be critical State Significant Infrastructure under Section 115V of the EP&A Act
- Secretary's Environmental Assessment Requirements (SEARs) for the project were issued on 28 July 2015 and amended on 9 March 2016
- EIS was publicly displayed for 60 days between 21 June 2017 and 2 August 2017
- Roads and Maritime prepared a SPIR to respond to issues raised in the 39 submissions received during the exhibition of the EIS, as well as to describe and assess proposed changes and design refinements to the project. The SPIR was issued in December 2017
- On 30 May 2018, the Minister for Planning approved the project, subject to the Minister's conditions of approval.

The EP&A Act was updated in March 2018, before approval of the project. Specifically, Part 5.1 of the EP&A Act was renumbered and became Division 5.2 under the amended EP&A Act. For the purposes of this modification assessment, the Approval issued by the NSW Minister for Planning for The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park is referred to as the "Division 5.2 Approval".

The project must be carried out in accordance with the Division 5.2 Approval, the EPBC Approval (see Section 3.2) and the following documents:

- The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park – NSW Environmental Impacted Statement/Commonwealth Draft Environmental Impact Statement (Roads and Maritime, June 2017)
- The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park – Commonwealth Final Environmental Impact Statement (Roads and Maritime, 2017)
- The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park – Submissions and Preferred Infrastructure Report (Roads and Maritime, December 2017)
- Consistency assessment report, Proposed changes between Mersey Road, Bringelly and Eaton Road, Luddenham (Roads and Maritime, July 2018)
- Consistency assessment report, Proposed changes between Littlefields Road, Luddenham and Glenmore Parkway, Glenmore Park (Roads and Maritime, October 2018).
- Draft Consistency assessment report, Proposed changes between Mersey *Road, Bringelly and Eaton Road, Luddenham* (Roads and Maritime, November 2018)

3.1.2 Approval framework for the Proposed modification

Roads and Maritime seeks the modification described in Section 2.2 to the Division 5.2 Approval. Specifically, it seeks a modification update the project description to include the at-grade signalised intersection at Adams Road and to amend the Conditions of Approval A1 and A2. Roads and Maritime requires the Minister's approval of the modification under Section 5.25 of the EP&A Act in order to carry out the project as currently proposed.

This modification assessment report has been prepared to support an application from Roads and Maritime to modify the Division 5.2 Approval. It is intended to help the NSW Minister for Planning in forming a view as to the merits of the proposed modification.

The environmental assessment of the proposed modification has been prepared to satisfy (where relevant) the amended Secretary's Environmental Assessment Requirements (SEARs) that were issued on 9 March 2016. The SEARs relevant to the proposed modification have been identified in Appendix B.

3.1.3 Approval framework for consistent changes to the approved project

As described in Section 1.1.3, Roads and Maritime also proposes minor changes to the project. A consistency assessment has been carried out and these changes have been assessed as consistent with the Division 5.2 Approval and the EPBC Approval (see Appendix A) meaning that the changes can be carried out without modification of the Division 5.2 Approval. However, given the interrelation between the proposed minor changes and the proposed modification, some aspects of the environmental assessments are inextricably linked and as such it has not been possible to fully separate the environmental assessments and potential impacts. Therefore, the minor changes have also been included in this modification assessment report for completeness and the consistent changes would not proceed as described if the modification is not approved.

3.2 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The project has the potential for significant impact to Matters of National Environmental Significance (MNES) and areas of Commonwealth Land (i.e. Defence Establishment Orchard Hills (DEOH) and the Western Sydney Airport site). Therefore, it was referred to the Commonwealth Government Department of the Environment (now Department of the Environment and Energy) in accordance with the EPBC Act and was subject to separate approval accordingly.

To streamline the environmental assessment requirements under Part 5.1 of the EP&A Act and Part 8 of the EPBC Act, one EIS was prepared that addressed both the SEARs and the Commonwealth EIS Guidelines. A copy of the SEARs and the Commonwealth EIS Guidelines were contained in Appendix B and Appendix C of the EIS respectively.

Roads and Maritime prepared a Final EIS (issued December 2017) to meet requirements under Part 8 of the EPBC Act, specifically Division 6, Section 104 in relation to finalising the draft EIS. Accordingly, this Final EIS was prepared to:

- Take account of any comments received within the period for comment
- Contain a summary of any such comments and how those comments have been addressed.

The Commonwealth Minister for the Environment approved the project under Part 8 of the EPBC Act on 15 June 2018 (ref: EPBC 2016/7696). The conditions of the EPBC Approval included requirements for biodiversity offsetting, archaeological excavation and measures to manage potential impact on DEOH land.

Condition 1 of the EPBC Approval requires that Roads and Maritime 'undertake the action, including but not limited to those parts of the action that occur on Commonwealth Land, in accordance with all conditions in the NSW Infrastructure Approval'. 'NSW Infrastructure Approval' includes any amendments to it from time to time. Accordingly, carrying out the project in accordance with the Division 5.2 Approval as modified from time to time is consistent with the EPBC Approval. Notification of the proposed modification to the Division 5.2 Approval will be provided to the Department of Environment and Energy, in accordance with Condition 2.

The proposed modification to the project does not affect any areas of Commonwealth land.

3.3 Protection of the Environment Operations Act 1997

Under the *Protection of the Environment Operations Act 1997* (POEO), an Environmental Protection Licence (EPL) will be obtained for the project. An EPL would be required for the scheduled activity of road construction, as the project involves the construction of a main road greater than three kilometres long in a metropolitan area. In accordance with Section 5.24 of the EP&A Act, such a licence cannot be refused for an approved project and is to be substantially consistent with the Division 5.2 Approval.

3.4 Biodiversity Conservation Act 2016

The biodiversity impacts of the project were assessed under the *Threatened Species Conservation Act 1995* (TSC Act). The *Biodiversity Conservation Act 2016* (BC Act) commenced on 23 November 2016 and subsequently repealed the TSC Act. The Biodiversity Conservation (Savings and Transitional) Further Amendment Regulation 2018 provides that the BC Act applies to the modification of an approval even if the approval was granted before the commencement of the BC Act.

The BC Act, together with the Biodiversity Conservation Regulation 2017, outlines the framework for addressing impact on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impact on biodiversity from development through the Biodiversity Offsets Scheme, including the requirement for a Biodiversity Development Assessment Report. The implications of the Biodiversity Conservation (Savings and Transitional) Further Amendment Regulation 2018 on the biodiversity assessment of the proposed modification are further considered in Section 5.4.3.

3.5 Other environmental legislation

Other environmental legislation that would be relevant to the proposed modification has been reviewed. The review confirmed that aside from the amendment to the transitional arrangements for the BC Act, there are no other additional legislative requirements to those identified in the SPIR and Final EIS.

4 Consultation

4.1 Consultation strategy

Consultation has been carried out throughout the evolution of the project. Activities carried out before the project approval are detailed in Chapter 6 of the EIS and Section 1.2 of the SPIR and Final EIS.

For the proposed modification, a communication plan was developed that highlighted details such as key messages, identified stakeholders to be consulted and communication delivery methods. This plan was implemented during August and September 2018 with directly impacted landowners and stakeholders provided with advance information before the public consultation.

The changes, if approved, will be communicated as part of the changes to the wider project (including other stages) via briefings to stakeholders, ongoing consultation with affected property owners and public information material.

4.2 Consultation about the design changes

Roads and Maritime conducted comprehensive consultation about the design change which included the activities detailed in **Table 4-1**.

Table 4-1 Consultation activities carried out to date

Tool / Activity	Reach	Details
Community update newsletter	400	A community update newsletter was produced including the reason for the modification, questions and answers about the modification and how to provide feedback. The community update newsletters were letterbox dropped to about 400 properties. The newsletter was also made available on the Roads and Maritime website. A copy of the community update newsletter is provided in Appendix C.
Meetings with directly impacted property owners	6	Meetings were held with six directly impacted property owners in the immediate vicinity of the proposed modification before the formal consultation period. The purpose was to notify and discuss with owners and stakeholders any potential impact to their property and to encourage their feedback. Designs of the traffic signals were given to the property owners and details explained including levels, acquisition, access and impact.
Meetings with stakeholders	2	Meetings were held with Liverpool City Council and Western Sydney Airport Co.
Media release	As per circulation numbers	A media release was issued by Roads and Maritime on Monday 27 August 2018. It was titled '*Have a say on design change for The Northern Road upgrade at Luddenham'* and encouraged local community members and stakeholders to engage in the consultation.

Tool / Activity	Reach	Details
Newspaper advertisement	As per circulation numbers	Newspaper advertisements appeared in local papers *Liverpool Champion, Liverpool Leader, Penrith Press* and *Penrith Weekender* in the week commencing 27 August 2018 to raise awareness of the consultation. A copy of the newspaper advertisement is provided in Appendix C.
Email notifications	152	Roads and Maritime emailed 152 stakeholders (community members and groups) and other Government stakeholders on 28 August 2018 to announce change in design and raise awareness of the consultation.
Webpage		The project webpage was updated on Monday 27 August 2018 with project information including the community update newsletter, Options Report and information on how to submit feedback.
Pop up session	58 attendees	A pop-up session was held on Thursday 3 September 2018, between 3pm and 7pm at the Luddenham IGA, The Northern Road. The preferred design was displayed and attendees could ask the Project Team questions about the proposal as well as the Project itself. A photograph taken at the pop-up session is provided in Appendix C.

4.3 Feedback received and summary of main issues

The consultation resulted in written feedback from 10 community members, one community association and two stakeholders. Feedback was also received from six directly impacted landowners.

This feedback was received from consultation consisting of eight meetings, 289 emails and phone calls and one community pop-up session. A number of comments received supported the proposed modification, some comments opposed the change and some feedback received identified the following issues:

- Increased traffic on Adams Road
- Extra travel time on The Northern Road and Adams Road
- Concern about the condition of Adams Road and its maintenance
- Increased movement of heavy vehicles on Adams Road
- Noise and air pollution from start/stop at the intersection
- Change in access to Adams Road and The Northern Road from private properties as a result of the height change of Adams Road and construction of the at-grade signalised intersection
- The weighting and conclusions in the Options Report.

Western Sydney Airport Company supported the proposal and requested ongoing consultation. Liverpool City Council supported the proposal subject to some concessions. Penrith City Council, local emergency services and utilities did not comment on the proposal.

The main issues raised in feedback relating to the design change are summarised under the following headings:

- Need and justification for the change
- Options Report

- Traffic and congestion
- Noise and vibration
- Air quality
- Adams Road
- Impact on businesses
- Other.

4.4 Response to feedback received

After the display of the proposed modification, one small design change was made. Instead of a combined straight and right turning lane, an additional dedicated right turning bay from Adams Road into The Northern Road was added, on both sides of the intersection.

Table 4-2 provides a summary of the issues raised during the consultation, and the response provided by Roads and Maritime to each issue.

Table 4-2 Summary of issues raised and the response

Issue	Response
Need and justification for the change	
Earlier consultation identified a bridge and this was accepted and there is no reason to change this	Roads and Maritime continually seeks to improve the design of proposed upgrades to provide better connections and value for money. A bridge would have restricted movements and access for users of Adams Road and a signalised intersection provides greater connectivity into and out of Luddenham town centre and the Luddenham shops While there may be some impact from this change, overall the changed design will better cater for the future.
Options Report	
The Options Report is flawed and assumes community support for the change and is a waste of money	The Options Analysis is a requirement of the NSW development approval process before carrying out formal environmental assessment and detailed design of a preferred design. The purpose of the Options Report is to provide a comparative analysis of the options in order to identify the suitability of the preferred option.
A number of issues raised about the Options Report and assumptions	The issues considered and score weightings adopted by the Adams Road intersection Options Analysis were the same approach taken for the wider project Options Assessment, which was carried out as part of the EIS, including Elizabeth Drive intersection options assessment. The weightings are derived to achieve best overall outcomes considering a wide range of factors including local and regional community.

Issue	Response
Traffic and congestion	
The introduction of an additional intersection will slow traffic and increase travel times	An assessment of potential traffic and transport impact resulting from the proposed design changes (Adams Road intersection) has been completed and includes professional traffic modelling based on existing and forecast traffic data. The assessment found that vehicles travelling eastbound along Adams Road would typically experience a 55 second delay due to introduction of the intersection. Vehicles travelling westbound along Adams Road would typically experience an 86 second delay. Transport modelling results indicate that the proposed new intersection of The Northern Road and Adams Road would meet the performance target of Level of Service D. Proposed bay lengths are sufficient to contain maximum queue lengths under 2031 traffic demands. A change has also been made to the proposed modification, to include a dedicated turning bay from Adams Road to The Northern Road (replacing a lane which combined right turning and traffic going straight on Adams Road).
Entry to/from the village will impact north-south traffic flows	Traffic lights will preference the flow of traffic on The Northern Road. Adams Road has relatively low existing and forecast traffic numbers, so traffic will be free-flowing most of the time north and southbound along The Northern Road.
Noise and vibration	
Noise and vibration in the area will increase from trucks braking at the intersection	Traffic lights will preference The Northern Road traffic flow and Adams Road has relatively low existing and forecast traffic numbers. Therefore, traffic will be free-flowing most of the time north and southbound along The Northern Road. Additional traffic noise from operation of the intersection is not expected to have material outcomes given the predominant noise source is flowing traffic along The Northern Road.
Noise increase for residents on Adams Road	A quantitative assessment of potential operational noise impact resulting from the proposed design changes (including Adams Road intersection) has been carried out. The assessment includes professional acoustic modelling based on forecast traffic data, topography and distance to receivers. The assessment has identified additional properties that are adversely affected and require noise mitigation measures. These properties will be offered architectural treatment within six months of start of construction.

Issue	Response
Air quality	
Increased braking, especially from trucks will result in poor air quality around the intersection	Traffic lights will preference The Northern Road traffic flow and Adams Road has relatively low existing and forecast traffic numbers. Therefore, traffic will be free-flowing most of the time north and southbound along The Northern Road. A qualitative assessment of air quality impact resulting from the proposed design changes (Adams Road intersection) is included in Table 5-1 of this Modification Report. It shows that there are no receivers affected over NSW Environment Protection Agency (EPA) criteria thresholds, based on a review of motor vehicle emission factors for traffic conditions of the signalised intersection and distance to nearest receivers.
Adams Road - its use, condition, safety and classification	
Adams Road is a local road and its use should not change	Adams Road is currently a local road providing primarily access to properties along Adams Road with a secondary role providing access to Luddenham town centre. With the realignment and upgrade of The Northern Road, the intended access to Luddenham town centre will be via Elizabeth Drive and The Northern Road. While the function of Adams Road may change as a result of changes to connectivity at The Northern Road, that is not the intention of the proposal. The proposed mitigation for potential change in use is consultation with the local Council, to develop traffic calming measures that discourage through traffic from using Adams Road.
Trucks will be tempted to use Adams Road	Adams Road is a load limited road and trucks above 3 tonnes cannot use it. There is no proposal to change this as a part of The Northern Road upgrade.
Dispute traffic projections on Adams Road	The forecast increased traffic numbers along Adams Road primarily related to a redirection of traffic from The Northern Road to Adams Road as it provides a link to Elizabeth Drive. The forecast increased traffic numbers are not a result of growth. The Adams Road connection will allow increased use of Adams Road to access Luddenham. The forecast traffic data account for the airport and other future developments. The Modification Assessment report includes an evaluation of traffic volume increases along Adams Road (see section 5.2.3).
Condition of Adams Road and its maintenance	Adams Road is a local road and maintained by Council. Roads and Maritime is working closely with Council as a part of this project and has consulted Council about this modification. Consultation will be ongoing to ensure the condition of Adams Road is appropriate to its proposed use.

Issue	Response
Safety of residents leaving their properties on Adams Road, especially the steep driveways as a result of the height change of Adams Road.	The proposed new Adams Road intersection has been designed to relevant safety standards and includes signalised pedestrian crossings at all sides of intersection. The proposed upgrade provides a new shared path for pedestrians and cyclists on the western side of The Northern Road. Affected driveways that connect to Adams Road have been redesigned in consultation with impacted property owners to ensure safe access.
Impact on businesses	
The changed design will give motorists an option to shortcut and not pass all the existing businesses along The Northern Road affecting business numbers	The traffic numbers that would pass the Luddenham village businesses to go to Adams Road under a bridge arrangement were forecast to be very low – in the order of 10 vehicles per day – as these movements would only be made by vehicles accessing Adams Road between The Northern Road and Elizabeth Drive, where there are a few houses and a couple of businesses along Adams Road. In this scenario, any particular vehicle would only incidentally bypass the northern or southern set of Luddenham shops on their way to Adams Road, not pass all of the existing shops. The current intersection design forecasts an increased number of vehicles accessing the village (Adams Road west of the proposed The Northern Road).
Consultation	
Ongoing consultation required about Adams Road	Roads and Maritime will continue to consult about the design change and the construction progress.

4.5 Next steps

A modification report will be lodged with the Department of Planning and Environment, with approval sought for the modification. Once the modification is approved, Roads and Maritime will progress with the implementation and construction of the project.

The project would be constructed by an external contractor who will be selected through a competitive tendering process and assessed by a panel. It is planned to start construction in mid-2019 and be completed by early 2022 (weather permitting). The community will be informed of the exact date of the project start, by advertisement placed in the local media and by newsletter distribution in the areas surrounding the project as well as a media statement that will be offered to local newspapers for publication.

4.6 Conditions of Approval relating to community consultation

The proposed changes do not have any significant potential to cause a change to the intent, meaning or outcomes of Conditions of Approval B1 to B11 relating to community information and reporting, including the production of a Community Communication Strategy and implementation of a Complaints Management System.

4.7 Planned future consultation

In conjunction with the lodgement of the modification approval with the Department of Planning and Environment, Roads and Maritime will respond to those who submitted comments to the proposal. The Department will make a decision on whether further consultation is required, or to approve the modification. Should further consultation be required, Roads and Maritime would consider issues raised during this consultation.

After approval of the modification application, the community would be informed of the approval of the modification and next steps.

5 Environmental assessment and mitigation measures

5.1 Scope of environmental assessment

An assessment has been carried out to compare the environmental impact of the proposed changes to the project (as described in Section 2.2 and Section 2.3) relative to the environmental impact of the approved project. Where appropriate, the assessment is supported by the consistency assessment of the minor changes (provided in Appendix A), due to the interrelation of the design changes and inextricable links between them.

Methods for environmental assessment of the proposed changes are the same or equivalent to those adopted for the EIS and the SPIR and Final EIS, as guided by the relevant SEARs (identified in Appendix B).

Table 5-1 provides a summary of the environmental assessment of the proposed changes.

As indicated in **Table 5-1**, the proposed changes to the project are unlikely to substantially change the approved project's overall impact on the following factors:

- Aboriginal heritage
- Non-Aboriginal heritage
- Air quality
- Resource and waste management
- Climate change and greenhouse gas
- Hazards and risks
- Cumulative impact.

For this reason, a detailed assessment of the above impact has not been undertaken, with the project's overall impact on these factors remaining consistent with those described in the SPIR and Final EIS.

Table 5-1 Environmental assessment of the proposed change

Environmental issue	Anticipated change in impact (relative to the approved project)
Traffic and transport	The proposed changes would introduce a signalised intersection, with the potential for increased travel times and additional delays. The proposed intersection allows for all vehicle movements between Adams Road and the new The Northern Road alignment and provides direct access to Adams Road, without the need to pass through Luddenham town centre. The intersection provides an alternative route between The Northern Road and Elizabeth Drive, allowing vehicles to avoid the intersection of Elizabeth Drive and The Northern Road to travel to and from Luddenham in the west, and between Elizabeth Drive to and from the south. This new route would result in changes in traffic flow along Adams Road. **Detailed consideration of traffic and transport impact is presented in Section 5.2.**

Environmental issue	Anticipated change in impact (relative to the approved project)
Noise and vibration	Changes to the proposed construction footprint and construction activities would have implications for construction noise impact. The changes in road height and predicted traffic flows have the potential to result in changes to noise impact during the operational phase. **A quantitative construction and operational noise assessment is provided in Appendix D and summarised in Section 5.3**. This assessment also considered the consistent changes described in Section 2.3.
Biodiversity	The proposed changes would result in the removal of an additional 0.27 hectares of native vegetation consisting of the following vegetation zones as outlined in the SPIR and Final EIS: • Vegetation Zone 8: Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion = 0.03 hectares • Vegetation Zone 9: *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion = 0.24 hectares. Vegetation Zone 8 has been identified as part of the Cumberland Plain Woodland in the Sydney Basin Bioregion Critically Endangered Ecological Community (CEEC) under the TSC Act.. Some areas of this vegetation zone meet the thresholds for the EPBC listed CEEC, however none of these areas occur within the area subject to impact within this report. This change is considered minor and generally in accordance with the SPIR and Final EIS. While this is an increase in vegetation clearance, the project's impact on biodiversity is calculated based on the entire construction footprint, which is conservative. Requirements for Contractors to minimise clearing during construction could reduce the impact calculated in the SPIR and Final EIS, and associated offset requirements. This assessment has been based on the maximum clearing anticipated. The actual vegetation cleared would be equal to or lower than assessed. Final offset calculations will be based on survey of actual vegetation cleared and reported in the Biodiversity Offset Package in consultation with OEH. **Detailed consideration of biodiversity impact is presented in Section 5.4. This assessment also includes consideration of the consistent changes described in Section 2.3 and Appendix A.**

Environmental issue	Anticipated change in impact (relative to the approved project)
Hydrology and flooding	The potential impact of the project on flooding behaviour and the scour potential within receiving drainage lines has been considered during the detailed design phases of the project. Detailed flood modelling has also been carried out to identify the potential residual flooding and drainage related impact of the project after the incorporation of a preferred set of transverse drainage upgrade and flood mitigation measures into the detailed design. The results indicate that the impact of the project (as per the current revised design) on flooding behaviour in the Cosgroves Creek catchment would generally be the same as was assessed in the SPIR and Final EIS. By extension, the impact of the project on scour potential in the receiving drainage lines would also generally be the same as what was assessed in the SPIR and Final EIS. There are minor exceptions to this, which have been assessed. The locations where runoff from the project corridor will discharge to the receiving drainage lines is generally the same as was assessed in the SPIR and Final EIS. The only exception is along the northern side of Adams Road, west of its intersection with The Northern Road, whereby runoff from the eastbound lanes will sheet off the road into the adjacent privately owned dam. Given the relatively small paved area that will drain to the adjacent property, combined with the sheet flow nature of the flow, the discharge of runoff from Adams Road will not cause scour of the adjacent grassed area. Overall, the proposed design changes are consistent with both the Division 5.2 Approval and the EPBC Approval. **The hydrology and flooding impact assessment is outlined in Section 5.5. This assessment also includes consideration of the consistent changes described in Section 2.3 and Appendix A.**

Environmental issue	Anticipated change in impact (relative to the approved project)
Soils, water and contamination	The current operational drainage design of the proposed modification comprises 48 water quality controls (37 vegetated swales and 11 vegetated batter buffer areas) treating about 27.1 hectares of disturbed catchment area. The SPIR and Final EIS operational drainage design comprised 12 vegetated swales treating about 29.9 hectares of disturbed catchment area. MUSIC modelling was carried out to determine pollutant load reductions that can be achieved by the proposed controls and indicates that the updated road geometry and drainage design would deliver a slight increase in water quality treatment effectiveness compared to that what was previously achieved by the SPIR and Final EIS design. Given the nature of the proposed changes, no additional risks to groundwater have been identified and the assessment of impact to groundwater is consistent with the SPIR and Final EIS. **The assessment of soils, surface water and contamination impact is summarised in Section 5.6. The assessment of water quality impacts also includes consideration of the consistent changes described in Section 2.3 and Appendix A.**
Urban design and visual impact	The key change to the design from the SPIR and Final EIS is the replacement of the twin bridges over Adams Road with an at-grade intersection. The intersection is considered to integrate The Northern Road alignment more seamlessly into the existing landscape than the bridge design and has therefore been deemed to be an improved outcome from an urban design perspective. However, the introduction of high embankments and increased road infrastructure on Adams Road results in locally increased landscape character and visual impact. The proposed changes in embankment topography and highway infrastructure (including the introduction of two VMS, and removal of mid-block lighting) would have local impact on landscape character and visual impact. The proposed changes would not alter the overall magnitude of the project and therefore the landscape character impact rating identified in the SPIR and Final EIS remains unchanged at moderate-high. The combined visual impact of the current revised design results in the magnitude rating remaining high at a viewpoint nearest to the proposed Adams Road intersection. **The urban design and visual impact assessment is provided in full in Appendix E and summarised in Section 5.7. This assessment also includes consideration of the consistent changes described in Section 2.3 and Appendix A.**

Environmental issue	Anticipated change in impact (relative to the approved project)
Aboriginal heritage	The marginal additional project footprint of the current revised design was assessed as part of the archaeological survey and cultural heritage assessment completed for the SPIR and Final EIS. The proposed changes would not result in any additional impact on Aboriginal heritage and the proposed modification is consistent with the impact identified in the SPIR and Final EIS. The proposed modification would be carried out in accordance with the CEMP and Heritage Management Sub-plan. The proposed changes do not have any significant potential to cause a change to the intent, meaning or outcomes of 'Aboriginal Cultural Heritage' Conditions of Approval. **No further detailed assessment of impact on Aboriginal heritage is required.**
Non-Aboriginal heritage	The marginal additional project footprint of the current revised design was reviewed as part of this assessment. There are no non-Aboriginal heritage items identified in the additional footprint areas. The proposed changes would not result in any additional impact on non-Aboriginal heritage and is consistent with the impact identified in the SPIR and Final EIS. The proposed modification would be carried out in accordance with the CEMP and Heritage Management Sub-plan. The proposed changes do not have any significant potential to cause a change to the intent, meaning or outcomes of 'non-Indigenous Heritage' Conditions of Approval. **No further detailed assessment of impact on non-Aboriginal heritage is required.**

Environmental issue	Anticipated change in impact (relative to the approved project)
Socio-economic and land use	The additional construction footprint for the intersection at Adams Road requires increased area of property acquisition at four already affected properties and two additional properties. This additional strip acquisition is not expected to impact on the wider use of these properties. The addition of bus stops at the Adams Road and Elizabeth Drive intersections is likely to have benefits for public transport access. The intersection would also improve connectivity due to improved access to and from Adams Road. The reduction of the verge on the eastern side of the proposed main alignment from 5.0 metres to 1.0 metre would remove the provision for a future shared path on this side. As the SPIR and Final EIS only provided provision for a shared path on the eastern side of the road, this change is considered a benefit that is no longer being provided, rather than an additional impact. The impact of this change is considered minor as a shared path is provided along the western side, and pedestrian and cycle access and connectivity is maintained by the western shared path. Impact on amenity from construction and operation, and the social and economic impact of the project to the local community and businesses were assessed in detail in the SPIR and Final EIS. It is expected that the impact of the proposed changes would be consistent with these findings. The proposed changes do not have any significant potential to cause a change to the intent, meaning or outcomes of the 'Property and Land Use' Conditions of Approval. **No further detailed assessment of socio-economic and land use impact is required.**

Environmental issue	Anticipated change in impact (relative to the approved project)
Air quality	Sensitive receivers near the proposed intersection at Adams Road have the potential to experience a minor increase in air quality impact during construction as a result of the additional construction footprint and increase in earthworks. During operation, the introduction of the signalised intersection would change traffic conditions along The Northern Road and Adams Road as vehicles would be stopping and starting, and decelerating and accelerating accordingly. The effect of these changes will typically result in increased emissions to air due to congested traffic conditions. The forecast increased volume of traffic along Adams Road is considered to cause negligible air emissions. The NSW EPA motor vehicle emission factors have been reviewed to determine the differences between traffic in free-flow conditions (as per the approved project layout) and traffic in a signalised intersection. The emission factors (i.e. intensity of emissions from different vehicles) would be in the order of 1.5 times higher (on average for PM, CO and NOx) for the traffic conditions modelled for the proposed modification relative to the EIS. This difference is based on an assumption of the peak hourly free flow speeds reducing to a highly conservative value of around 10 km/h. The SPIR and Final EIS calculated the predicted concentrations of exhaust emission pollutants (PM_{10}, $PM_{2.5}$, CO, NO_2 and VOCs) at the nearest sensitive receiver to the twin bridges across Adams Road (a distance of about 100 metres). Only the $PM_{2.5}$ value was not compliant with the threshold criteria, and this was noted to be due to elevated background concentrations. All other predicted values reported in the SPIR and Final EIS were compliant and at least below 75 per cent of the threshold criteria. Therefore, the increase in incremental contributions of pollutants due to the proposed intersection would only be a marginal increase and would not materially change the cumulative results. No additional exceedances of the thresholds are predicted to occur from the introduction of the signalised intersection. Overall the design refinements would not substantially alter the distance to sensitive receivers or air quality impact during operation. Therefore, there are no changes to the mitigation measures proposed and the proposed changes do not have any significant potential to cause a change to the intent, meaning or outcomes of ‘Air Quality’ Conditions of Approval. **No further detailed assessment of air quality impact is required.**

Environmental issue	Anticipated change in impact (relative to the approved project)
Resources and waste management	The proposed changes would not result in any additional waste streams from those identified in the SPIR and Final EIS. Some of the proposed changes may reduce the amount of construction materials required. These changes include: • Removal of the twin bridges at Adams Road • Reduced median width between intersections • Steepening of batters • Refinements to drainage and water quality infrastructure (deletion of kerb and gutter in preference of grass table drains) • Reduced earthworks required for the regrading of Adams Road as opposed to bridge abutments. Some of the proposed changes may increase the amount of construction materials required. These changes include: • Provision of concrete footpath at signalised intersections • Refinements to pavement of local roads and property accesses. While the increase in additional footprint required would increase the amount of waste from vegetation clearance, overall the proposed changes would not substantially alter resource consumption or waste generation as identified in the SPIR and Final EIS. The proposed changes do not have any significant potential to cause a change to the intent, meaning or outcomes of 'Waste' Conditions of Approval. A Sustainability Strategy for the approved project would be prepared in accordance with NSW Minister's CoA E51 and E52. This Sustainability Strategy would cover the proposed modification. **No further detailed assessment of impact on resources and waste management is required.**
Climate change and greenhouse gas	The proposed changes would not result in any significant changes to emission generating activities assessed in the SPIR and Final EIS and therefore would be unlikely to result in more than a negligible increase in the greenhouse gas emissions during construction. The proposed changes would not result in a substantial change in total traffic volumes, congestion (level of service), or average speeds and therefore would be unlikely to result in more than a negligible increase in greenhouse gas emissions during operation. The proposed changes would not result in a change to the climate change risks assessment outlined in the SPIR and Final EIS. **No further detailed assessment of climate change and greenhouse gas is required.**

Environmental issue	Anticipated change in impact (relative to the approved project)
Hazard and risks	The proposed changes would not result in any additional hazards or risks during the construction and operation of the project. **No further detailed assessment of hazards and risks is required.**
Cumulative impact	The proposed changes assessed in this report would generally be consistent with the outcomes of the Final SPIR and EIS, taking into account revised impact of the project as outlined in Chapter 5 of this report. There is a combination of marginally reduced and marginally increased impact relating to the proposed changes, which do not significantly increase cumulative impact. **No further detailed assessment of cumulative impact is required.**

5.2 Traffic and transport

5.2.1 Introduction

The traffic and transport impact for the approved project were addressed in Section 7.1 and Appendix G of the EIS and updated in the SPIR and Final EIS. This Section addresses the traffic, transportation and access impact of the proposed design changes as described in Section 2.2 and 2.3 of this report.

5.2.2 Existing environment

The proposed modification would involve the construction and operation of a signalised intersection at Adams Road. Adams Road is a rural collector road managed by Liverpool City Council. It is a two-lane undivided carriageway that runs between Elizabeth Drive and The Northern Road. The road is signposted at 70 km/h and is eight metres wide with unsealed shoulders. Adams Road provides access to a number of rural properties as well as some residential properties at the southern end near The Northern Road. As a local road, Adams Road primarily serves an access function. There are no public bus services that use this road.

In the approved project design, Adams Road retains its existing configuration and The Northern Road passes over it on twin bridges. There is no intersection between the approved alignment of The Northern Road to the east of Luddenham. Access to Adams Road from The Northern Road is via Luddenham town centre.

5.2.3 Impact assessment

Assessment methodology

A quantitative construction traffic assessment was not completed for the proposed design changes as the traffic volumes associated with the proposed modification would be consistent with those described in the SPIR and Final EIS.

Operational traffic assessment of the proposed design changes to The Northern Road Upgrade generally adopts a method consistent with that carried out for the EIS and the SPIR and Final EIS. The following key modelling assumptions have been made:

- Land use and traffic generation assumptions still based on EIS traffic forecasts
- Traffic arrangements along Adams Road modified to include a signalised intersection at Adams Road and The Northern Road (previously grade-separated with no connection)

- Existing load limit and sign posted speed limit on The Northern Road retained under current revised design
- Existing load limit and 70 km/h sign posted speed limit on Adams Road retained under current revised design.

Additional traffic monitoring was completed along Adams Road during August 2018 and used to update the traffic model for the whole project. This was done to refine the traffic models and provide greater accuracy for the new traffic volumes caused by the interchange at Adams Road.

A summary of the impact of the outcomes of the updated traffic assessment is presented in the following Sections.

Construction traffic

The removal of the bridge at Adams Road would result in a change in construction methodology for the proposed signalised intersection at Adams Road, as described in Section 2.2.2, with bridgeworks no longer being required. However, the proposed changes would not result in substantial changes to construction traffic generation as assessed in the SPIR and Final EIS. Therefore, no change to the assessment findings of the construction traffic assessment is expected.

During construction, at least one lane would remain open on Adams Road, managed by traffic control. The traffic volumes are low for this road and the lane closures are not expected to cause any significant delays for vehicles. Traffic control measures would be implemented in line with the approved Construction Environmental Management Plan.

Operation traffic

Intersection Performance

Transport modelling results provided in **Table 5-2** indicate that the intersection of The Northern Road and Elizabeth Drive would perform at a comparable level of service to the SPIR and Final EIS design and would meet the performance target of Level of Service D for both opening year (2021) and 10 years after opening (2031). The proposed new intersection of The Northern Road and Adams Road would also meet the performance target of Level of Service D for both opening year (2021) and the 10 years after opening (2031). The intersection configurations are comparable, with proposed bay lengths that are sufficient to contain maximum queue lengths under 2031 traffic demands.

Table 5-2 Intersection performance summary

Intersection	SPIR and Final EIS Design		Current Revised Design		Difference
	Av Delay (s)	LoS	Av Delay (s)	LoS	Av Delay (s)
2021 Morning Peak					
The Northern Road/Elizabeth Drive	41	C	31	C	-10
The Northern Road/Adams Road	-	-	20	B	-
2021 Evening Peak					
The Northern Road/Elizabeth Drive	44	D	35	C	-9
The Northern Road/Adams Road	-	-	21	B	-
2031 Morning Peak					
The Northern Road/Elizabeth Drive	41	C	36	C	-5

Intersection	SPIR and Final EIS Design		Current Revised Design		Difference
	Av Delay (s)	LoS	Av Delay (s)	LoS	Av Delay (s)
The Northern Road/Adams Road	-	-	26	B	-
2031 Evening Peak					
The Northern Road/Elizabeth Drive	45	D	42	C	-3
The Northern Road/Adams Road	-	-	36	C	-

Travel Times

The introduction of the signalised intersection with Adams Road would take the total number of signalised intersections along the project to five. Traffic modelling has indicated this additional intersection would increase travel times along The Northern Road between Mersey Road and Elizabeth Drive by less than one minute compared to the SPIR and Final EIS design, as shown in **Table 5-3**. Travel times along The Northern Road would be consistent with the SPIR and Final EIS design, as they would still be substantially lower than under the Do Minimum scenario without the project.

Vehicles travelling eastbound along Adams Road would typically experience a 55 second delay due to introduction of the intersection. Vehicles travelling westbound along Adams Road would typically experience an 86 second delay.

Table 5-3 Travel time summary between Mersey Road and Elizabeth Drive

Segment	Direction	SPIR and Final EIS Travel Time (mm:ss)	Revised Design Travel Time (mm:ss)	Difference (mm:ss)
2021 Morning Peak	Northbound	06:41	07:10	00:29
	Southbound	06:03	07:00	00:57
2021 Evening Peak	Northbound	06:57	07:21	00:24
	Southbound	06:11	06:49	00:38
2031 Morning Peak	Northbound	07:11	07:22	00:11
	Southbound	06:59	07:13	00:14
2031 Evening Peak	Northbound	07:24	07:25	00:01
	Southbound	06:27	07:23	00:56

Traffic Volumes

A summary of traffic volumes along The Northern Road between Eaton Road and Littlefields Road for the SPIR and Final EIS design and the current revised design is provided in **Table 5-4**. Comparison shows that there would be an increase in traffic volumes along The Northern Road, generally due to changes in travel patterns that result from the inclusion of a signalised intersection at The Northern Road and Adams Road.

The twin bridge in the SPIR and Final EIS design meant that Adams Road did not intersect with the upgraded alignment of The Northern Road. The proposed modification facilitates this connection, as Adams Road would provide an alternative route between The Northern Road and Elizabeth Drive. It allows vehicles to use Adams Road to avoid the intersection of Elizabeth Drive and The Northern Road to travel to and from Luddenham in the west and Elizabeth Drive to the south. This would also reduce traffic volumes on The Northern Road between Elizabeth Drive and Adams Road in the northbound direction but increase volumes in the southbound direction. The proposed

design for The Northern Road has sufficient capacity to carry the additional traffic volumes resulting from the modification.

This new route would increase traffic volumes along Adams Road by up to 700 vehicles per hour in the peak period, to avoid travelling via the intersection of Elizabeth Drive and The Northern Road. This increase is above the environmental capacity limit for a local road of 300 vehicles per hour (*RTA Guide to Traffic Generating Developments, 2012*). The RTA guideline specifies suitable traffic volumes from a road network hierarchy perspective to meet acceptable environmental (amenity) outcomes for the local area. Potential mitigation measures for this impact are outlined in Section 5.2.4.

Table 5-4 Traffic volumes summary

Segment	Direction	SPIR and Final EIS Design volume (veh/hr)	Current Revised Design volume (veh/hr)	Difference (veh/hr)	Percentage Increase
2021 Morning Peak					
The Northern Road South of Elizabeth Drive	NB	726	631	-95	-13 %
	SB	365	564	199	55 %
The Northern Road south of The Northern Road (south Luddenham Access)	NB	767	760	-7	-1 %
	SB	698	640	-58	-8 %
Adams Road east of The Northern Road	EB	40	279	239	598 %
	WB	67	147	80	119 %
2021 Evening Peak					
The Northern Road South of Elizabeth Drive	NB	850	806	-44	-5 %
	SB	662	682	20	3 %
The Northern Road south of The Northern Road (south Luddenham Access)	NB	962	991	29	3 %
	SB	913	846	-67	-7 %
Adams Road east of The Northern Road	EB	26	206	180	692 %
	WB	158	215	57	36 %
2031 Morning Peak					
The Northern Road South of Elizabeth Drive	NB	1,281	919	-362	-28 %
	SB	521	608	87	17 %
The Northern Road south of The Northern Road (south Luddenham Access)	NB	1,439	1,439	0	0 %
	SB	807	797	-10	-1 %
Adams Road east of The Northern Road	EB	40	524	484	1210 %
	WB	26	244	218	838 %
2031 Evening Peak					
The Northern Road South of Elizabeth Drive	NB	863	751	-112	-13 %
	SB	1,265	1,136	-129	-10 %
The Northern Road south of The Northern Road (south Luddenham Access)	NB	1,062	1,054	-8	-1 %
	SB	1,520	1,494	-26	-2 %
Adams Road east of The Northern Road	EB	120	285	165	138 %
	WB	200	415	215	108 %

Local roads and access

No changes are proposed to turning movements as proposed under the SPIR and Final EIS for the intersection of Elizabeth Drive and The Northern Road.

The proposed modification would provide for additional movements to the SPIR and Final EIS design. Under the SPIR and Final EIS design, Adams Road and the upgraded alignment of The Northern Road to the east of Luddenham do not intersect and no movements are possible between them. Access to Adams Road from The Northern Road is via Luddenham town centre. Under the proposed modification, all movements between Adams Road and The Northern Road would be permitted. This would increase the access for vehicles at this location, particularly for properties on Adams Road east of The Northern Road.

Public transport

The proposed modification allows for bus stop areas at the intersections with Adams Road and Elizabeth Drive for the existing 789 bus route. This allows designated space for public transport users away from the footpath and for the installation of bus shelters at a later date.

Freight and aviation

The project would reduce travel time and improve reliability for freight travelling to the Sydney Motorway network via the M4 Western Motorway and providing an alternative route for freight traffic travelling to and from the Western Sydney Airport. No substantial change in road network performance is expected. Therefore, no change in impact to freight and airport access are expected.

Design of the project has been undertaken based on requirements to conform to restrictions associated with height and visibility when in close proximity to the Western Sydney Airport, and to account for access to the Western Sydney Airport. These aspects of design have not changed due to the proposed modification and consequently there is unlikely to be any impact of the project on associated aviation activities.

Active transport

The provision of pedestrian crossings around the Adams Road intersection means that all pedestrian movements along Adams Road would be possible. Therefore, no substantial change in pedestrian movement at intersections is expected.

The proposed changes to The Northern Road Upgrade design would not significantly change the outcomes of the project for pedestrians and cyclists. The proposed modification would not affect the proposed shared path provided on the western side of The Northern Road.

Parking

Parking is currently not permitted on The Northern Road and was not proposed by the design at the SPIR and Final EIS stage. Therefore, there would be no impact on parking.

Road safety

The increase in traffic volumes on Adams Road has the potential for adverse impact on road safety as increased traffic volumes increase the risk of collisions between vehicles and pedestrians along this road. The increased risk is small and is generally acceptable, however it will nonetheless be a greater residual risk than if the volumes were lower.

5.2.4 Mitigation / management

The traffic management measures documented in the SPIR and Final EIS would be implemented for the proposed modification as per the Traffic and Transport Sub-Plan within the Construction Environmental Management Plan for the approved project. The measures would be developed in accordance with Ministers CoA E53-E59.

The additional mitigation measure proposed to mitigate the impact of the proposed modification on Adams Road is consultation with the local Council to develop measures to dissuade vehicles from using Adams Road and therefore mitigate the increase in forecast traffic volumes on Adams Road. For example, suggested measures could include reducing the speed limit on Adams Road, introducing load limits, or introducing local area traffic management such as speed humps or other traffic calming devices.

5.3 Noise and vibration

5.3.1 Introduction

A construction and operational noise assessment of the proposed changes to the approved project (described in Section 2.2 and 2.3) is provided in **Appendix D** and summarised in this Section.

5.3.2 Existing environment

Presently, daytime and night-time ambient noise in the vicinity of the proposed modification is determined primarily by traffic conveyed along the existing The Northern Road, and secondarily, by traffic on adjoining roads such as Elizabeth Drive and Adams Road. Traffic count surveys have been conducted along Adams Road to establish the level of background noise due to this traffic and to support the noise assessment for this proposed modification.

As described in the SPIR and Final EIS, the noise environment would be affected by the construction of the approved project, and during operation of the new The Northern Road alignment.

5.3.3 Impact assessment

Assessment methodology

A quantitative construction and operational noise assessment was prepared for the proposed modification. Information about the noise model used for the assessment including the algorithm, model parameters, and input data is provided in **Appendix D**.

The potential for construction noise impact is assessed using the Roads and Maritime Construction Noise and Vibration Guideline (CNVG) which is Roads and Maritime's application of the Interim Construction Noise Guideline (ICNG). The CNVG provides a consistent approach to identifying construction noise management levels and noise impact for Roads and Maritime projects.

The operational noise models were informed by the traffic modelling carried out for the assessment of the proposed modification. As described in Section 5.2.3, these traffic models were updated to account for additional noise monitoring along Adams Road carried out in August 2018.

The new traffic monitoring and modelling changed the traffic volumes in the NO BUILD and BUILD noise assessment scenarios for the main alignment and local roads. These traffic changes were incorporated into the noise models for this assessment.

A separate noise model was produced to assess the potential noise impact of the audible traffic control signals (tonal beepers providing 'walk'/ 'don't walk' signals). A noise penalty of 5dB was added to the model predictions in accordance with the latest guidance given in the Noise Policy for Industry (NSW EPA, 2017). The combined noise emissions from all the tonal beepers was then predicted.

The study area for the noise assessment in shown in **Appendix D**.

The study area and noise model area are equal to that adopted by the EIS noise assessment and as required by the Noise Criteria Guideline. It is defined by a 600 metre buffer next to either side of the main project alignment. At the ends of the project a 'hard' edge is drawn which extends perpendicularly to the project alignments out to a distance of 600 metres. The study area defines the receivers that are assessed.

In addition, the study area has been expanded past the hard edge of the southern boundary of Stage 6 to include a small number of receivers in the study area of the Stage 4 Consistency Assessment (Roads and Maritime, July 2018). As explained in the Consistency Assessment, this is because the vertical alignment changes that occur between the Stage 4 and Stage 6 noise models could not be accurately assessed until the Stage 6 design was complete. At the time of the Stage 4 Consistency Assessment the Stage 6 design was incomplete so the new bypass section of The Northern Road could not be modelled as a continuous section of road. The new bypass section of The Northern Road can now be modelled as a continuous section of road and so the Stage 6 assessment study area has been expanded to include the potentially affected receivers in the Stage 4 assessment study area.

Four Noise Catchment Areas (NCAs) identified in the EIS are in the current study area: NCA02, NCA03, NCA04 and NCA05. No new NCAs were required for the assessment of the proposed modification.

Construction

The replacement of the twin bridges with a signalised intersection at Adams Road would change the construction methodology from the approved project, as bridgeworks are no longer required.

The earthworks footprint for the proposed modification is generally the same as the SPIR and Final EIS footprint except for an increase around the new interchange at Adams Road. To accommodate the embankments required and create the new at-grade interchange, the footprint extends along Adams Road in both the East and West directions for a distance of about 400 metres.

NCA04 and NCA05 are the two noise catchment areas in proximity to the new Adams Road interchange.

Earthworks

The proposed modification increases the earthworks construction footprint at the new Adams Road interchange. The earthworks construction stage will only take place during standard construction hours, but the new interchange extends the duration of the earthworks affecting the receivers in NCA04 and NCA05.

The construction noise assessment for the updated earthworks footprint shows a significant number of the affected receivers only experience small changes (< 2 dB) in construction noise levels. It also shows a small number of receivers experience noise levels change greater than 4 dB. An average increase in noise of 2.7 dB was observed across NCA04 and NCA05 for the revised earthworks construction stage when compared to the SPIR and Final EIS. Within the assessment study area 95.6 per cent of all receivers have noise level changes of < 6 dB.

Appendix G of the construction and operational noise assessment in **Appendix D** presents a map of the predicted construction noise level changes between the two completed assessments (current assessment minus EIS assessment) during the earthworks construction stage for all receivers in the study area.

Overall, the earthworks construction noise level between the revised design and approved project are dissimilar. Therefore, it is expected that the noise impact outcomes / mitigation will be different as a result.

Bridgeworks

Since bridgeworks are no longer necessary due to the new interchange at Adams Road there are no bridgeworks noise predictions for the construction stage in this region (i.e. affecting NCA04 & NCA05). Therefore, the standard hours and out-of-hours noise impact at all receivers will be substantially reduced in this region.

Construction traffic

The construction traffic for the proposed modification will access construction sites using only designated heavy vehicle routes such as the M4 Motorway, Elizabeth Drive and The Northern Road. No construction traffic access is proposed for Adams Road.

An updated assessment found that construction traffic will not increase existing traffic noise levels by more than 2 dB at any location in the study area. Therefore, the construction traffic noise impact outcomes are equivalent and comparable to the SPIR and Final EIS assessment.

Operation

Generally, the revised horizontal alignment either exactly follows the SPIR and Final EIS alignment or the lanes have been shifted towards the overall centre line of the design. However, the proposed removal of the bridge over Adams Road reduces levels in the vertical alignment of The Northern Road, and increases levels in the vertical alignment of Adams Road to form the at-grade signalised intersection at Adams Road.

Noise level change summary

The current revised design operational noise predictions have been compared against those for the EIS. The findings of the noise modelling indicate that:

- On average the proposed design changes noise levels by -0.1 dB during the day and +0.1 dB during the night compared to the EIS design
- The majority of the receivers, 96.8 per cent (day) and 85.3 per cent (night) show a noise level change ≤0.2 dB
- Up to 3.2 per cent of the receivers show small noise level increases of between 0.2 and 1.2 dB during the day
- Up to 14.7 per cent of the receivers show small noise level increases of between 0.2 and 1.5 dB during the night.

Overall, the noise level predictions between the proposed design and SPIR and Final EIS alignments are similar. Therefore, it is expected that the noise impact outcomes / mitigation will be comparable as a result.

Maximum noise levels

The new interchange at Adams Road will cause a change to the number of maximum noise level events, which are typically driven by heavy vehicles decelerating at an intersection. Based on traffic data, one extra event per night would be generated with the potential to cause sleep disturbance events near the Adams Road interchange. The area affected by these potential sleep disturbance events is also small, extending up to 160 metres from the new intersection along the main alignment. This is a minor increase in the number of potential sleep disturbance events and is not considered a detrimental or significant noise impact.

No significant changes between the SPIR and Final EIS design and the current revised design have been identified with respect to maximum noise level events and sleep disturbance for all other design elements. Therefore, the assessment of maximum noise levels completed during the EIS is considered sufficient except for the potential impact at the new Adams Road intersection.

Signalised pedestrian tonal beepers

The intersection has eight pedestrian crossings with a total of sixteen signalised pedestrian tonal beepers. The noise from the signals has the potential to contain annoying characteristics due to the tonal nature of the beepers. Each signalised tonal beeper was assumed to generate a noise level of at least 80 dB at one metre. The noise model indicated that no receivers experience noise emissions over 40 dB due to the traffic signals at the intersection. Therefore, the potential for sleep disturbance events is negligible.

5.3.4 Mitigation / management

Construction

The construction noise impact outcomes show an increase of five receivers that require additional mitigation measures as per the CNVG when compared to the SPIR and Final EIS assessment. The five receivers which require additional mitigation measures due to the earthworks construction stage are:

- 151 Adams Rd, Luddenham
- 180 Adams Rd, Luddenham
- 145 Adams Rd, Luddenham
- 161 Adams Rd, Luddenham
- 125 Adams Rd, Luddenham.

The required additional mitigation measures are notification (i.e. letters during construction) and verification (i.e. noise measurements during construction).

Construction traffic noise mitigation measures are not necessary given that construction traffic will not increase existing traffic noise levels by more than two dB at any location, as per the Roads and Maritime CNVG.

Combining the low number of additional receivers which require treatment with the short duration of construction work and the removal of out-of-hours bridgework in the area, this assessment concludes that the overall change to construction noise impact are minor. The current revised design construction noise results are comparable the SPIR and Final EIS design results, with no significant modifications. The proposal therefore satisfies the requirements of the Roads and Maritime CNVG.

Operation

The results of the operational noise assessment indicate that three receivers previously identified as eligible for architectural treatment in the SPIR and Final EIS no longer exceed the criteria threshold for additional mitigation. Five additional receivers previously not identified in the SPIR and Final EIS as eligible for architectural treatment now exceed the criteria threshold for additional noise mitigation. These receivers are presented in Table 5-5 and shown in Appendix D of the construction and operational noise assessment (**Appendix D)**.

Architectural treatments are committed to all the receivers identified in the SPIR and Final EIS assessment. That is, architectural treatment would be provided to the five additional receivers that exceed the criteria threshold for additional noise mitigation and still be provided to the three receivers that no longer exceed the criteria threshold for additional noise mitigation. The mitigation requirement for architectural treatment at all other receivers is the same as identified in the EIS. This means the combined SPIR and Final EIS and current revised design assessments result in a total of 26 receivers that qualify for architectural treatment.

Table 5-5 Summary of changes to receivers qualifying for architectural treatment

Noise Catchment Area	Address	Noise level difference between current and SPIR and Final EIS design		Qualify for architectural treatment	
		Daytime	Night time	SPIR and Final EIS design	Current revised design
NCA02	2778-2828 The Northern Road, Luddenham	1.1	1.5	N	Y
NCA04	2422-2430a The Northern Road, Luddenham[1]	0.1	0.4	N	Y
NCA04	151 Adams Road_1, Luddenham	-0.9	-0.8	N	Y
NCA05	2292 The Northern Road_1, Luddenham	0.2	0.3	N	Y
NCA05	2215a The Northern Road, Luddenham	0.2	0.3	N	Y
NCA03	2859 The Northern Road_1, Luddenham	-0.1	0.2	Y	N
NCA05	Luddenham Public School_3	-0.6	-0.6	Y	N
NCA05	Luddenham Public School_1	-0.7	-0.6	Y	N

Since the noise impact and mitigation requirements are typically comparable between the SPIR and Final EIS and the proposed design, no further consideration of additional noise mitigation is required.

The project satisfies the requirement of Condition E36 of the NSW Minister's Conditions of Approval.

5.4 Biodiversity

5.4.1 Introduction

As outlined in Section 2.4, the proposed changes to the project would result in minor changes to the project's construction and operational footprint. These changes have been considered against the outcomes of the biodiversity assessment that was carried out for the SPIR and Final EIS.

5.4.2 Existing environment

Vegetation communities and threatened species are shown in relation to the proposed project construction footprint in Figure **5-1**.

[1] Address cannot be verified through online mapping services. Precise coordinates and location of receiver provided in Appendix D and E of the construction and operational noise assessment.

The construction of the proposed intersection at Adams Road requires an additional area of construction footprint. Within this area there are a number of artificial wetlands, specifically farm dams, and a second order intermittent stream. Minor increases to the construction boundary are also required to allow private property access adjustments. Within these areas there are small areas of vegetation grassy woodland. Vegetation zones and plant community types within the proposed additional construction footprint are described in **Table 5-6**.

Table 5-6 Vegetation zones present within the footprint of the proposed modification

Vegetation zone	Plant Community Type (PCT)	Condition	Status (TSC Act)
8	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Moderate/Good_Derived grassland	CEEC Cumberland Plain Woodland in the Sydney Basin Bioregion
9	*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate/Good_Other	Not part of an Threatened Ecological Community

Vegetation Zone 8 has been identified as part of the Cumberland Plain Woodland in the Sydney Basin Bioregion Critically Endangered Ecological Community (CEEC) under the TSC Act. Some areas of this vegetation zone meet the thresholds for the EPBC listed CEEC, however none of these areas occur within the area subject to impact within this report.

There are no other critically endangered ecological communities in the vicinity of the proposed modification.

5.4.3 Impact assessment

Assessment methodology

Design refinements have resulted in changes to the construction and operational footprints which have affected the calculated direct impact of the project as assessed within the Biodiversity Assessment Report (BAR) and subsequently presented within the EIS and the SPIR and Final EIS.

This Section provides a revised assessment of the impacts under the Framework for Biodiversity Assessment (FBA) including recalculation of landscape values, and reassessment of impacts to native vegetation, threatened species, and Matters of National Environmental Significance (MNES).

Whilst the BC Act 2016 is now applicable to the proposed modification, a Biodiversity Development Assessment Report (BDAR) has not been produced for this assessment due to the minor nature of the additional impacts on biodiversity values generated by the proposed modification. The results of the assessment under the FBA are discussed in the context of the BC Act in order to justify this approach.

Landscape values

Alteration to the proposed construction footprint can alter the landscape value assessment carried out according to the Framework for Biodiversity Assessment (FBA) (NSW Office of Environment and Heritage 2014). The change to the construction footprint consists primarily of the additional area required for the construction of the intersection with Adams Road.

Alteration to the proposed construction footprint has resulted in the need for recalculation of landscape value components applicable to linear shaped developments including:

- Percent extent of native vegetation cover in the landscape
- Area to perimeter ratio.

The connectivity value and patch size calculations in the SPIR and Final EIS remain valid with the design change and therefore no recalculation was required.

The revised percent extent of native vegetation cover in the landscape and area to perimeter ratio calculations were undertaken using ESRI ArcGIS software. To undertake the revised assessment of landscape values, a 550 metre buffer was established from the outside edge of the revised construction footprint. While this is a linear road project there are some detached construction compounds which made using a buffer from the centreline problematic.

Percent Native Vegetation Cover

Once the native vegetation cover was digitised, the extent of native vegetation in the landscape before and after the development was recalculated based on the revised construction footprint (see **Table 5-7**). The 550 metre landscape buffer is 2,675.85 hectares in size. Current percent native vegetation cover is estimated at 12 per cent (score 2.5 as outlined in Table 16 of Appendix 5 of the FBA). After the development, percent native vegetation cover is estimated at 11 per cent (score 2.5). The score for percent native vegetation cover is 0 as no change in category is predicted.

There is no change in score for percent native vegetation cover from that assessed in the SPIR and Final EIS.

Table 5-7 Percent native vegetation cover in the landscape before and after development

	Before development	After development
Assessment buffer (550m from the edge of the construction footprint)	2,675.85 ha	2,675.85 ha
Native vegetation cover (ha)	326.73	285.77
Cover (%)	12 (score 2.5)	11 (score 2.5)
Score for % native vegetation cover in the development footprint buffer	**0**	

Area to Perimeter Ratio

For a major project that is a linear shaped development or multiple fragmentation development, the change in area to perimeter ratio of patches impacted must be assessed.

The total area (square metres) and perimeter (metres) of vegetation patches impacted by the development within the 550 metre buffer is outlined in **Table 5-8**. The area to perimeter ratio before the development is 24 and after development is 21. The proportional change in area to perimeter ratio as calculated by the credit calculator is 12.5 and the score for the proportional change in area to perimeter ratio is two according to Table 19 in Appendix 5 of the FBA (see **Table 5-8**).

There is no change in score for area to perimeter ratio from that assessed in the SPIR and Final EIS.

Table 5-8 Area to perimeter ratio of vegetation patches before and after development

	Before development	After development
Vegetation area (m^2)	462,329.27	342,393.32
Vegetation perimeter (m)	19,653.96	16,340.50
Area to perimeter ratio (whole number)	24	21
Proportional change	**12.5**	
Score	**2**	

Landscape Value Score

As noted above, the connectivity value and patch size calculations remain valid with the design change therefore no recalculation was required for these. There is a small increase in native vegetation removal from the current revised design but this is not large enough to cause a change in score for the landscape assessment of percent native vegetation cover. Likewise, the area to perimeter ratio does not change from that assessed in the SPIR and Final EIS.

The overall landscape score is 17. The landscape component scores are as follows:

- Percent native vegetation cover = 0
- Connectivity value class = 2.5
- Area / perimeter ratio score = 2
- Average patch size score = 12.5.

Removal of native vegetation

The SPIR and Final EIS indicates that the construction footprint would impact on up to about 40.79 hectares of native vegetation. The proposed changes would result in the removal of an additional 0.27 hectares of native vegetation from the following vegetation zones:

- Vegetation Zone 8, the Grey Box – Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (Derived Native Grassland)
- Vegetation Zone 9, the *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion plant community type.

Vegetation Zone 8 has been identified as part of the Cumberland Plain Woodland in the Sydney Basin Bioregion Critically Endangered Ecological Community (CEEC) under the TSC Act. Some areas of this vegetation zone meet the thresholds for the EPBC listed CEEC, however none of these areas occur within the area subject to impact within this report.

The overall impact to the critically endangered Cumberland Plain Woodland in the Sydney Basin Bioregion ecological community has increased slightly by 0.03 hectares due to a small change in the footprint in an area of Derived Native Grassland. This change is not substantial.

There is no change to the impact to the River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions endangered ecological community.

Removal of threatened fauna species habitat and habitat features

The additional impact to Vegetation Zones 8 and 9 will not increase the impact of the project on the Cumberland Plain Land Snail or Regent Honeyeater (the two species credit fauna species for which offsets are required in the SPIR and Final EIS). Vegetation Zones 8 and 9 do not provide suitable habitats for these two threatened species.

Removal of threatened plants

The additional impact to Vegetation Zones 8 and 9, will not increase the impact of the project on *Pultenaea parviflora* or the *Marsdenia viridiflora* subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith Local Government Areas (the two species credit flora species for which offsets are required in the SPIR and Final EIS). Vegetation Zone 8 and 9 do not provide suitable habitats for these two threatened species.

Consideration of the Biodiversity Conservation (Savings and Transitional) Further Amendment Regulation 2018

As described in Section 3.4, the recent gazettal of the Biodiversity Conservation (Savings and Transitional) Further Amendment Regulation 2018 means that the *Biodiversity Conservation Act 2016* (BC Act) now applies to modifications of planning approvals granted or applied for before the commencement of the BC Act. As such, the BC Act applies to this modification and a BDAR would normally be required. The amended transitional arrangements only require the BDAR to take into account the additional impact on biodiversity values resulting from the proposed modification. A summary of the assessment of the biodiversity values prescribed in the BC Act and Biodiversity Conservation Regulation 2017 is presented in Table 5-9. It is considered that the impact on biodiversity values as identified under the BC Act has been suitably assessed.

Table 5-9 Summary of assessment of biodiversity values

Biodiversity value	Definition	Assessment
Vegetation integrity	The degree to which the composition, structure and function of vegetation at a particular site and the surrounding landscape has been altered from a near natural state	Assessed under the FBA as part of the SPIR and Final EIS. The proposal is considered unlikely to substantially and adversely modify the composition of the TEC in the locality as the current composition of the TECs is highly modified.
Habitat suitability	The degree to which the habitat needs of threatened species are present at a particular site	Assessed under the FBA as part of the SPIR and Final EIS. There is no change to the assessment as a result of the proposed modification. The vegetation zones were assessed as being habitats of low habitat quality in the SPIR and Final EIS and not likely to provide habitat for the threatened species.
Threatened species abundance	The occurrence and abundance of threatened species or threatened ecological communities, or their habitat, at a particular site	Assessed as part of the SPIR and Final EIS. There is no change to the assessment as a result of the proposed modification. The vegetation zones were assessed as being habitats of low habitat quality in the SPIR and Final EIS and not likely to provide habitat for the threatened species.
Vegetation abundance	The occurrence and abundance of vegetation at a particular site	Assessed as part of the SPIR and Final EIS. There is no change to the assessment as a result of the proposed modification. The absolute impact in hectares and the proportional impact in terms of the extent of the TEC within the broader locality are considered negligible.
Habitat connectivity	The degree to which a particular site connects different areas of habitat of threatened species to facilitate the movement of those species across their range	Assessed as part of the SPIR and Final EIS. There is no change to the assessment as a result of the proposed modification. There is unlikely to be any further increase in fragmentation or isolation.

Biodiversity value	Definition	Assessment
Threatened species movement	The degree to which a particular site contributes to the movement of threatened species to maintain their lifecycle	Assessed as part of the SPIR and Final EIS. There is no change to the assessment as a result of the proposed modification. There is unlikely to be any further increase in fragmentation or isolation.
Flight path integrity	The degree to which the flight paths of protected animals over a particular site are free from interference	There will be no impact on flight path integrity as a result of the proposed modification.
Water sustainability	The degree to which water quality, water bodies and hydrological processes sustain threatened species and threatened ecological communities at a particular site	Assessed as part of the SPIR and Final EIS. There is no change to the assessment as a result of the proposed modification.

The additional impacts from the proposed modification are small, comprising clearing of approximately 0.27 ha of vegetation consisting of derived native grassland (which now may be cropped) and wetland vegetation fringing artificially created farm dams. These habitats were assessed as being of low habitat quality in the SPIR and Final EIS and not likely to provide habitat for the threatened species. The derived native grassland is part of the Cumberland Plain Woodland Threatened Ecological Community (TEC), but the proposed modification is predicted to remove around 0.03 hectares, which is a negligible impact.

In summary, the modification is considered unlikely to have an adverse effect on the extent of the TEC to such a degree that the local occurrence would be placed at further risk of extinction. The impact is negligible in terms of the absolute impact in hectares and the proportional impact in terms of the extent of the TEC within the broader locality. The proposal is considered unlikely to substantially and adversely modify the composition of the TEC in the locality as the current composition of the TECs is highly modified. There is unlikely to be any further increase in fragmentation or isolation. This patch of vegetation to be impacted is not recognised as important to the long-term survival of the TEC in the locality.

Considering the context of the ecological community and intensity of the potential impact from the modification, an overall conclusion has been made that the modification is likely to result in a minor effect on biodiversity values and as such does not warrant a BDAR, under clause 30A (2)c) of the amended transitional arrangements.

5.4.4 Impact to Matters of National Environmental Significance

Listed ecological communities

There is no additional impact to the critically endangered Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community.

While there is a small increase in impact to Vegetation Zone 8, the vegetation does not form part of the EPBC Act listed Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community.

The impacted Derived Native Grassland in this area is an isolated patch that does not have connectivity to large native vegetation remnants so does not fall under the condition thresholds for this community.

Listed threatened flora species

There is no additional impact to *Pultenaea parviflora* from the proposed changes.

Listed threatened terrestrial fauna species

Vegetation Zones 8 and 9 do not provide suitable habitats for the after four threatened species listed on the EPBC Act that were identified in the SPIR and Final EIS:

- Grey-headed Flying-fox
- Regent Honeyeater
- Swift Parrot
- Large-eared Pied Bat.

Therefore, the additional impact to Vegetation Zones 8 and 9 will not increase the impact of the project on these threatened species.

5.4.5 The environment of Commonwealth land

The proposed changes and the identified biodiversity impact do not involve Commonwealth land.

5.4.6 Mitigation / management

The current mitigation measures for biodiversity outlined in the SPIR and Final EIS are comprehensive and cover all potential impact as identified in the EIS. The mitigation measures for biodiversity were taken from the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority, 2011). The additional removal of 0.27 hectares of vegetation due to the proposed modification is covered by the mitigation measures provided in the SPIR and Final EIS. No new mitigation measures are required for the proposed modification.

The Infrastructure approval under Section 5.19 of the EP&A Act outlines a condition that during vegetation clearing, timber and root balls must be retained where practicable for reuse in habitat enhancement and rehabilitation work. The retained timber and root balls may be used on or off the CSSI site. Before the start of vegetation clearing, the Proponent must consult with community groups, the Mulgoa Valley Landcare Group and relevant Government agencies to determine if retained timber and root balls could be used for environmental rehabilitation projects, before pursuing other disposal options.

The current mitigation measures outlined in the SPIR and Final EIS prescribe separation of woody vegetation to identify suitable items for secondary re-use according to the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority, 2011).

Offsetting

The Infrastructure approval under Section 5.19 of the EP&A Act and the EPBC approval include conditions that relate to biodiversity centre around offsets. Notably, NSW Minister's CoA E2 and Condition 3 of the EPBC approval require Roads and Maritime to develop a Biodiversity Offset Strategy (BOS), and then to submit for approval, a Biodiversity Offset Package, consistent with the BOS.

Although the additional impact is a small change, the change will alter the offset requirement for the project. The required offset for HN630 (*Phragmites australis* and *Typha orientalis* coastal

freshwater wetlands of the Sydney Basin Bioregion) and HN529 (Grey Box – Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion) plant community types would increase from the credits required as outlined in the SPIR and Final EIS.

Roads and Maritime are currently working in consultation with OEH to determine the quantum of offsets or supplementary measures that are required for the project. The final offset requirement for the Project would be determined during development of the BOS and offset package in consultation with the OEH. All offsets required will be provided to meet the conditions of approval. Any supplementary measures identified in consultation with NSW OEH would be incorporated into the final BOS and BOP.

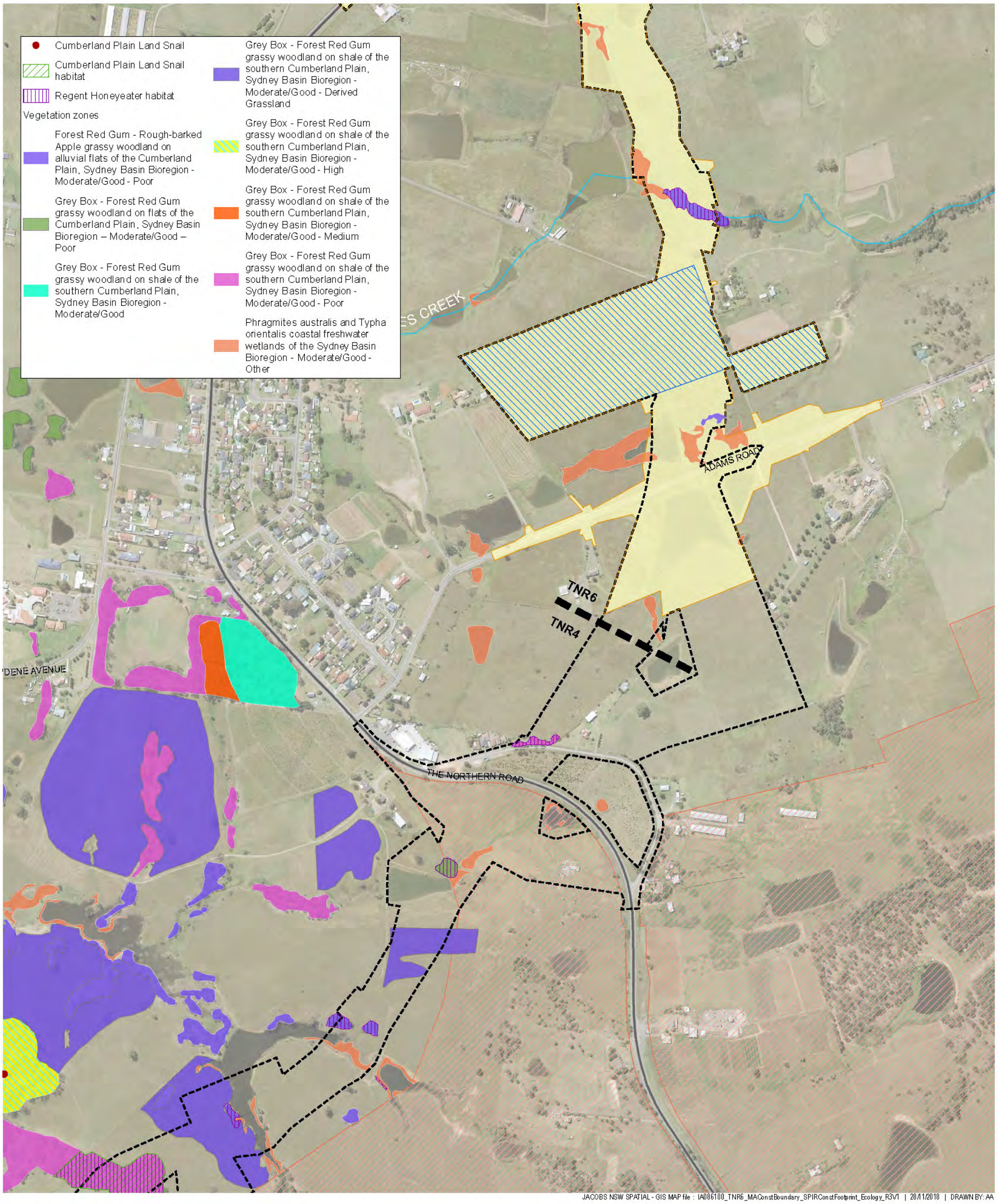

Figure 5-1 Vegetation communities and threatened species

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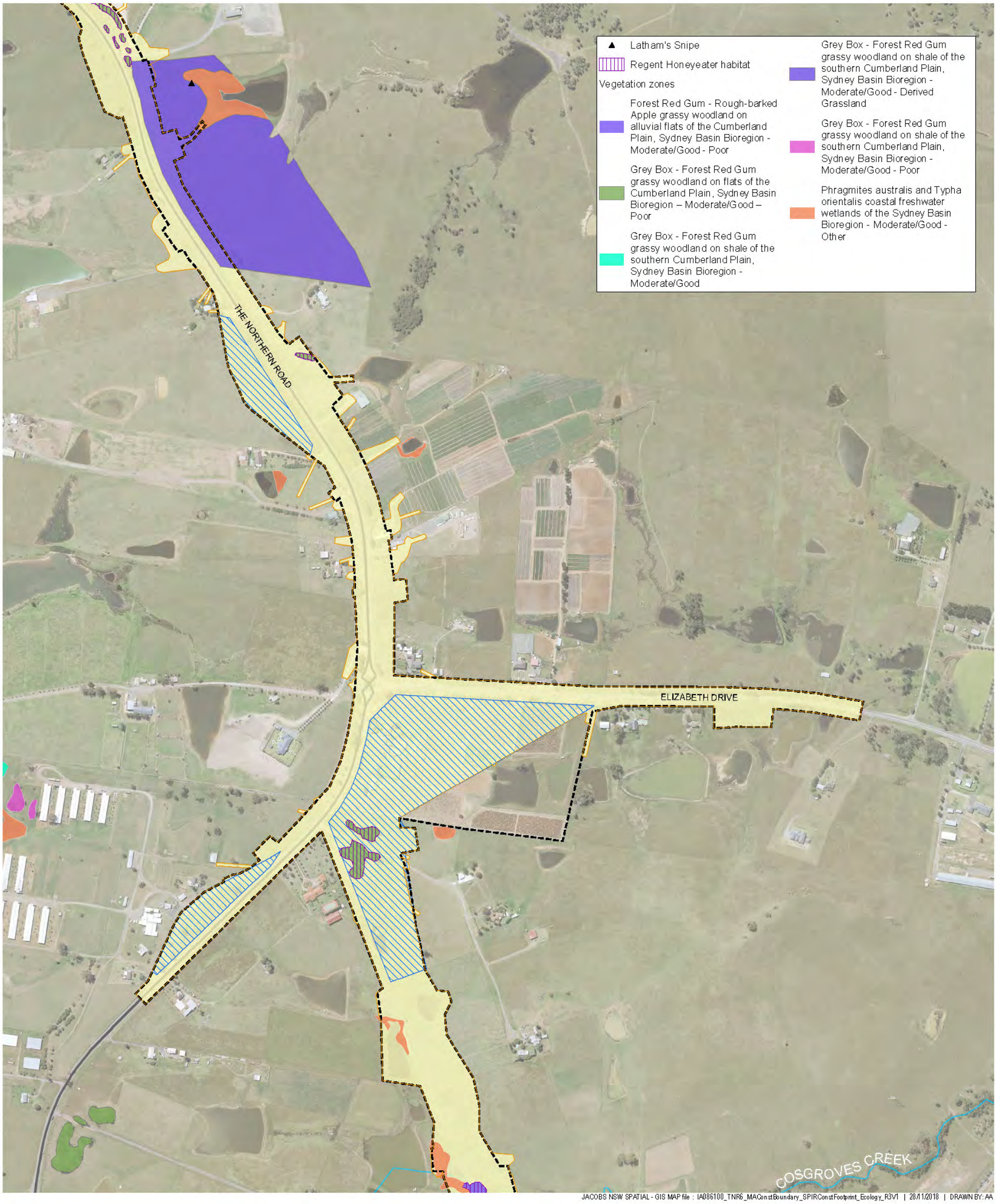
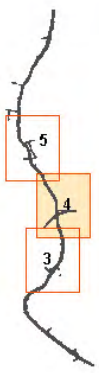


Legend

- Submissions design construction footprint
- Modification assessment boundary
- Construction compound sites



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The Northern Road upgrade - Mersey Road to Glenmore Parkway
Construction Boundary - Ecology

Figure 5-1 Vegetation communities and threatened species

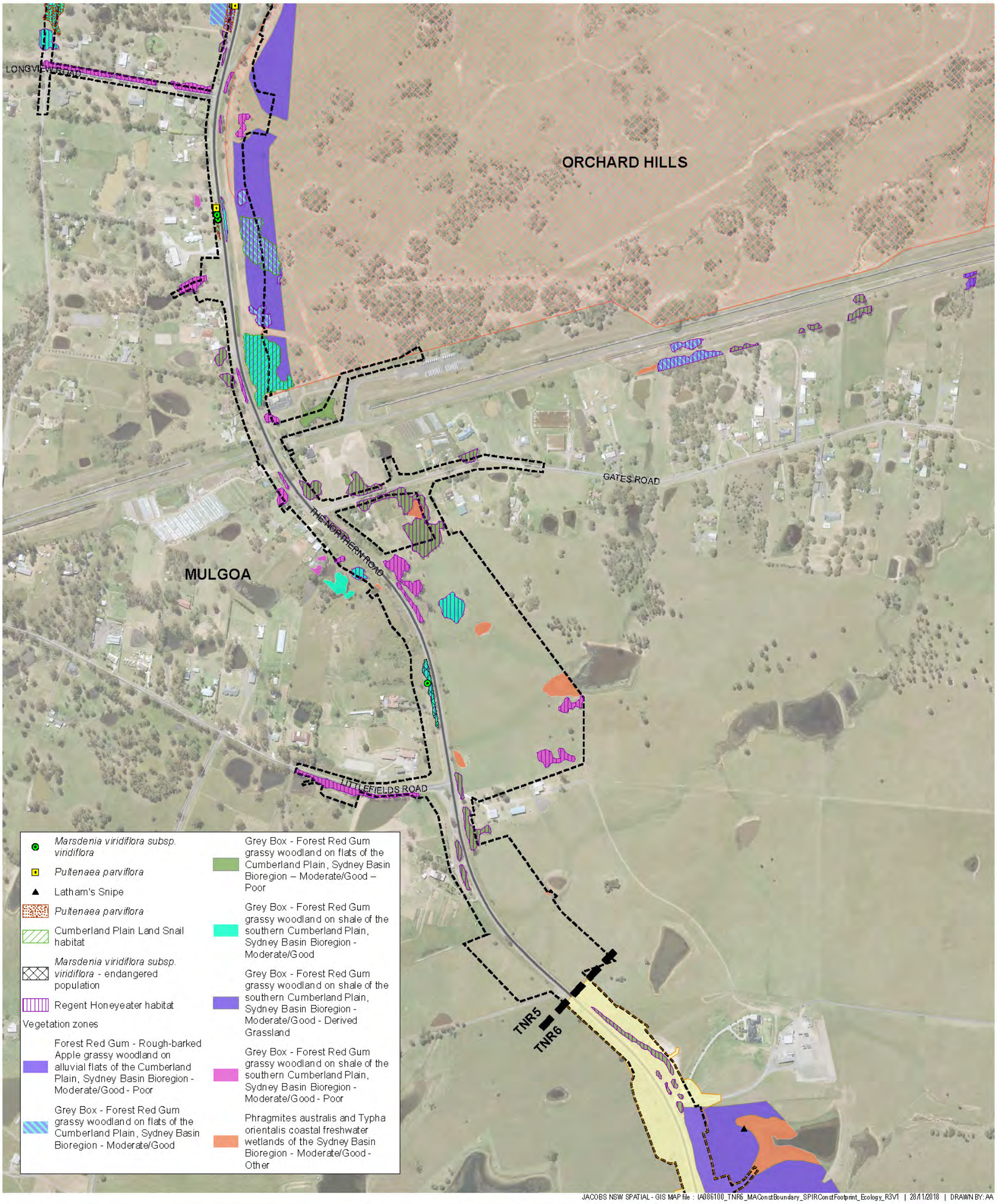

Figure 5-1 Vegetation communities and threatened species

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5.5 Hydrology and flooding

5.5.1 Introduction

This Section describes the environmental values relating to hydrology and flooding and identifies the potential impact to these values as a result of construction and operation of the proposed changes to the approved project. This chapter also recommends environmental management measures to reduce the impact to and of the project. The potential impact of the approved project were described in Section 8.1 of the EIS.

5.5.2 Existing environment

The proposed modification falls within the catchment areas for a number of waterways and drainage lines including Cosgroves Creek, Mulgoa Creek, and the unnamed tributary of South Creek, as described in the SPIR and Final EIS. The summary of existing flood behaviour for these catchments is provided in **Table 5-10**.

Table 5-10 Summary of existing flooding behaviour

Catchment	Summary of existing flood behaviour
Cosgrove Creek catchment	Depths of ponding exceed one metre in the various farms dams, flow in the various drainage lines between each water storage is generally relatively shallow for events up to 100-year Average Recurrence Interval (ARI). There are also no existing dwellings that are presently impacted by flooding for events up to the Probable Maximum Flood (PMF). High hazard flooding is generally confined to the farm dams and the incised reaches of the drainage system which are typically located downstream of the project corridor for events up to 100 year ARI.
Mulgoa Creek catchment	Flooding is limited to catchment runoff ponding along the upslope side of the road. It is noted that drainage swales have been constructed along the western side of the road corridor in the vicinity of the Chain-O-Ponds Road intersection, along which several pipes are located where it is crossed by local access driveways.
Unnamed tributary of South Creek Catchment	Flooding is limited to catchment runoff ponding along the upslope side of the existing The Northern Road next to the inlet of the existing transverse (or cross road) drainage structure.

5.5.3 Impact assessment

Design checks have been carried out to compare and check the consistency of the design exhibited in the EIS and the proposed design changes. The transverse drainage was checked by:

- Comparing culvert locations, types and dimensions
- Remapping of the catchments contributing to each structure and comparison of those areas
- Re-running of the TUFLOW model for the section of the main alignment where it runs through the Cosgroves Creek catchment to confirm that flooding conditions were not exacerbated in existing development located downstream of the road corridor

The road drainage was checked by:

- Comparing outlet locations with those shown in the EIS
- Remapping of the catchments draining to outlets and comparing with the areas shown in the EIS

- Comparing the peak flows at the outlet of the road drainage lines north of Elizabeth Drive with those presented in the SPIR and Final EIS
- Catch drain types, lengths and locations were checked against the SPIR and Final EIS design
- The lengths of scour protection at the inlets and outlets of transverse drainage structures have been compared against the SPIR and Final EIS design..

The potential impact of the project on flooding behaviour and the scour potential within receiving drainage lines has been considered during the detailed design phases of the project. Detailed flood modelling has also been carried out to identify the potential residual flooding and drainage related impact of the project after the incorporation of a preferred set of transverse drainage upgrade and flood mitigation measures into the detailed design.

Figure A1, A2, A3 and A4 in **Appendix E** show the impact the project would have on flooding behaviour, while Figure A5, A6 and A7 and A8 show the difference between the results of the flood modelling that was undertaken as part of the EIS and the current assessment for storms with ARI's of 2, 10 and 100 years, as well as the Probable Maximum Flood (PMF) in the Cosgroves Creek catchment.

By inspection of Figures A1 to A8, the impact of the project (as per the proposed design changes) on flooding behaviour in the Cosgroves Creek catchment would generally be the same as was assessed in the SPIR and Final EIS. By extension, the impact of the project on scour potential in the receiving drainage lines would also generally be the same as what was assessed in the SPIR and Final EIS

The exception to the above finding is the area on the northern side of Adams Road, upstream of the project corridor. While the EIS assessed the removal of the existing farm dam at this location, the SPIR and Final EIS committed to it being retained. Measures have been incorporated into the proposed design changes to maintain the remnant portion of the farm dam. A rock lined spillway channel will be provided between the remnant portion of the farm dam and the inlet of the nearby transverse drainage structure. The spillway channel has been sized to convey flows up to 1 per cent AEP in magnitude, while the rock lining will prevent it from scouring.

The locations where runoff from the project corridor will discharge to the receiving drainage lines is generally the same as was assessed in the SPIR and Final EIS, even though the previously assessed kerb and gutter has been replaced by grassed swales at a number of locations. The only exception is along the northern side of Adams Road, west of its intersection with The Northern Road, where runoff from the eastbound lanes will sheet off the road into the nearby privately owned dam. Given the relatively small paved area that will drain to the adjacent property, combined with the sheet flow nature of the flow, the discharge of runoff from Adams Road will not cause scour of the adjacent grassed area.

Based on the consistency assessment in this report, the proposed changes are consistent with both the Division 5.2 Approval and the EPBC Approval.

5.5.4 Mitigation / management

The mitigation measures described in the EIS are sufficient to cover the potential impact associated with the proposed modification. The proposed changes do not change the means or outcomes of the Minister's 'Flooding and hydrology' CoAs.

5.6 Soils, water and contamination

5.6.1 Introduction

This Section considers impact to soils, surface water and contamination, which were previously assessed in Section 8.2 and Appendix L of the EIS.

5.6.2 Existing environment

Soils

The approved project and proposed modification are located on the Cumberland Plain, a low lying and gently undulating sub-region of the Sydney Basin. The underlying geology is Bringelly Shale (Rwb), described in the EIS as shale, carbonaceous claystone, laminate and coal in parts. The Penrith 1:100,000 Soil Landscape sheet 9030 (Soil Conservation Service of NSW, 1990) indicated that the soil landscape groups of the area is erosional Luddenham. The area to the north of Adams Road is identified as being of high salinity potential. The acid sulfate soils (ASS) probability within the proposed alignment was classified as Extremely Low Probability of occurrence. ASS is therefore not considered to be a risk to the project.

Surface Water

The proposed alignment crosses a number of farm dams and Cosgrove Creek, an intermittent stream that is a tributary of South Creek. There are no active Water Access Licences within 400 metres of the proposed alignment. The majority of watercourses in the vicinity of the project are ephemeral and most flow events occur in direct response to major rainfall, with no evidence of baseflow feeding any of the streams.

Contamination

The SPIR and Final EIS identified areas of environmental interest (AEIs) including filling, stockpiles, a market garden, a cemetery, service stations and dumped tyres. In order to identify any additional AEIs related to contamination associated with the proposed modification around the Adams Road intersection, a site inspection was conducted on 13 July 2018 by Jacobs environmental scientists. The site inspection focussed on the areas of additional construction footprint required for the Adams Road interchange, as well as nearby land uses and potential AEIs. It was a non-intrusive, visual inspection only, carried out from areas that were accessible to the public.

At the time of the inspection, Adams Road was an asphalt sealed road with no formal kerb and guttering. The road verge comprises exposed soils and grass. The construction footprint of the Adams Road Interchange and the surrounding areas comprised rural residential properties and general agricultural land use. Based on observations during the site inspection, the after AEIs were identified within or in close proximity to the extended construction footprint:

- Hummocky areas were located next to a dam wall on a private property to the south of Adams Road and maybe disturbed as part of construction activities. Hummocky areas maybe indicative of filling. The quality of the fill (if present) is unknown
- Small stockpiles of fill were located on a private property to the south of Adams Road and may be disturbed as part of construction activities. The quality of the material within the stockpiles is unknown
- General agricultural use of the regional area.

5.6.3 Impact assessment

Soils

The construction of the intersection at Adams Road would require the clearance and excavation of additional area for regrading. However, a smaller volume of fill would be required for the earthworks to regrade the proposed The Northern Road alignment and Adams Road than to create the bridge abutments in the SPIR and Final EIS design. There have not been any additional impact identified further to those set out in the SPIR and Final EIS.

Surface Water

Construction Phase

The previous construction drainage design assessed in the EIS and SPIR and Final EIS featured 13 sediment basins along the alignment. The current design features 22 basins covering 37 hectares of disturbed catchment area during the construction stage. The updated design also specifically includes an Erosion and Sedimentation Management Report and set of Plans to address issues regarding erosion and sedimentation during the construction stage, with local control locations proposed in areas that sediment basins cannot be feasibly included due to terrain constraints. The Erosion and Sedimentation Management Report and Plans recommend construction practices to reduce the risk of erosion impact during the work.

As such, the current plans for temporary construction phase sediment control is considered to be more robust and mature than the previous SPIR and Final EIS design and is considered to have improved upon impact to water quality during the construction phase of the proposed modification.

Operational Phase Controls

The current operational drainage design of the proposed modification comprises 48 water quality controls (37 vegetated swales and 11 vegetated batter buffer areas) treating around 27.1 hectares of disturbed catchment area. The vegetated batter buffer controls have been utilised since changes to road drainage in various areas along the alignment has increased sheet flow runoff and decreases the effectiveness of swales.

The SPIR and Final EIS operational drainage design comprised 12 vegetated swales treating around 29.9 hectares of disturbed catchment area.

As per the SPIR and Final EIS design, there are no permanent water quality basins proposed.

A comparison of the total lengths of swales and catchment areas for the SPIR and Final EIS design and the proposed modification drainage design is provided in **Table 5-11** and the amended design water quality control measures are shown in Figure 5-**2**.

Water quality modelling using the eWater Model for Urban Stormwater Improvement Conceptualisation (MUSIC) was carried out to determine the pollutant load reductions that can be achieved by the proposed controls for total suspended solids, total nitrogen and total phosphorus.

The MUSIC modelling estimated the pollutant load reductions of each of the 48 water quality controls proposed by the current revised design, and included any catchment areas that could not be feasibly treated due to terrain constraints. The results indicate that pollutant load reduction can be achieved as follows:

- Suspended Solids (TSS) (65 per cent to 97 per cent as compared with 22 per cent to 93 per cent in the SPIR and Final EIS)
- Total Phosphorous (TP) (47 per cent to 83 per cent as compared with 17 per cent to 68 per cent in the SPIR and Final EIS)

- Total Nitrogen (TN) (19 per cent to 100 per cent as compared with 5 per cent to 49 per cent in the SPIR and Final EIS).

The results indicate that the updated road geometry and drainage design would deliver a slight increase in water quality treatment effectiveness compared to that what was previously achieved by the SPIR and Final EIS design (**Table 5-12**).

Table 5-11 Comparison of operational water quality controls in the SPIR and Final EIS and current design

Design	Total swale length (m)	Total buffer area (ha)	Total catchment area (ha)
SPIR and Final EIS design	1,005	-	29.9
Current modified design	4,020	1.848	27.1

Table 5-12 Annual average residual pollutant loads

Design	TSS (kg/yr)	TP (kg/yr)	TN (kg/yr)
SPIR and Final EIS design	9,550	27.2	274
Current modified design	9,422	25.7	234
Change	-1.3 %	-5.4 %	-14.5 %

Figure 5-2 Proposed construction and operational water quality controls (sediment basins and swales) Page 1 of 2

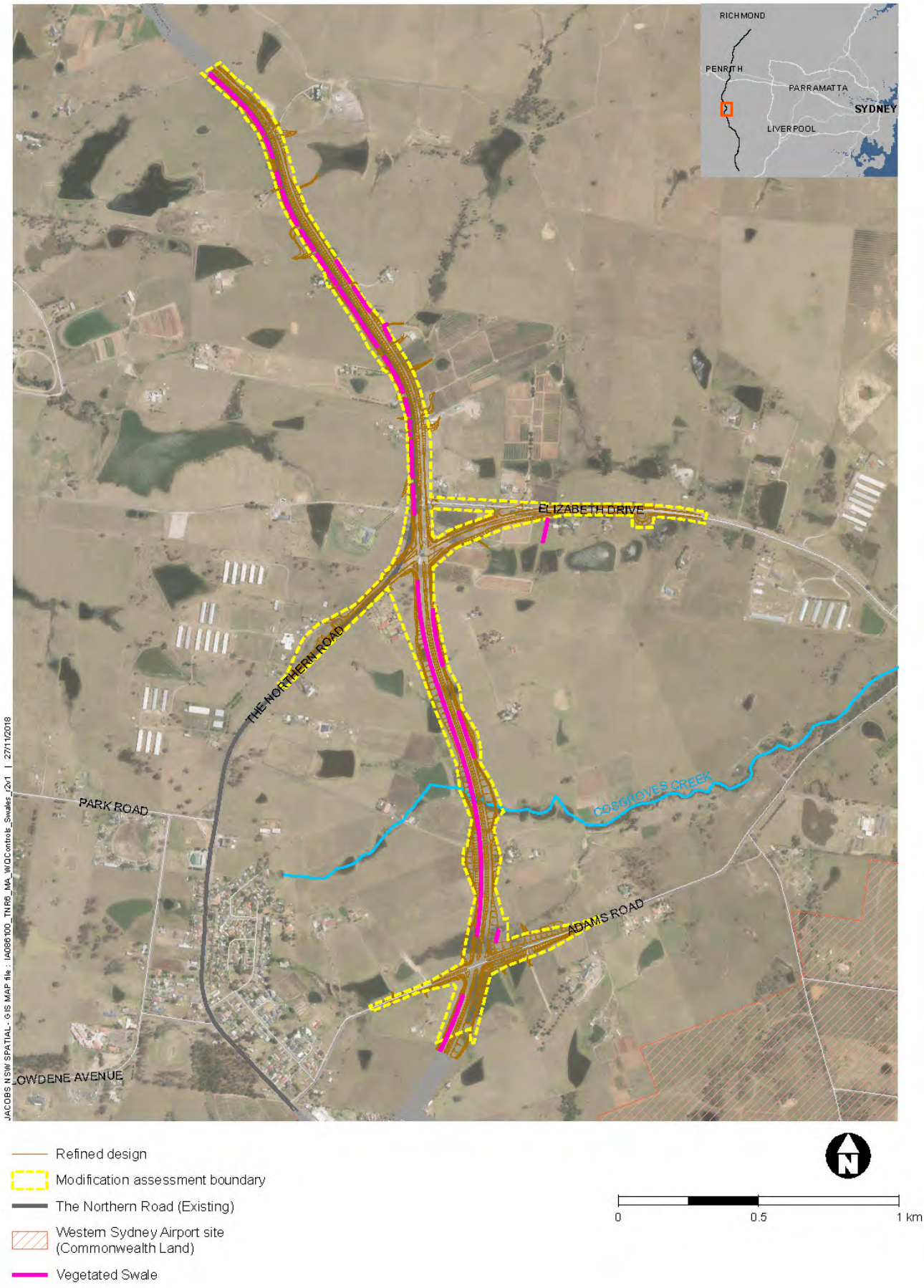

Figure 5-2 Proposed construction and operational water quality controls (sediment basins and swales) Page 1 of 2

Contamination

The hummocky areas and small stockpiles of fill located to the south of Adams Road may be disturbed as part of construction activities.

The degradation of asphaltic road surfaces can contaminate surface soils with hydrocarbon compounds. The absence of formalised kerb and guttering along Adams Road may have caused asphalt to enter surface soils next to the road.

The widespread agricultural land use within and in the vicinity of the proposed interchange represent a potential source of contamination which could be exposed during construction activities. The contamination from agricultural activities is generally either point source (e.g. localised chemical storage and use, waste disposal) or diffuse (broad acre pesticide or herbicide application). The biggest risk of exposure to agricultural contamination would be associated with point sources of contamination. No agricultural chemical storage or waste areas (i.e. point sources) were observed within the additional construction footprint areas around the Adams Road intersection.

Table 5-13 outlines the potential AEIs identified within the proposed interchange footprint and their associated risks to environmental receptors and site users (associated with the construction of the road upgrades). The risks have been assessed qualitatively. The potential risks have not been confirmed / quantified through a sampling and analysis program.

Table 5-13 Potential areas of environmental interest

AEI	Location	Contaminants	Potential Contamination Distribution	Exposure Risk
Filling	Private property, southern side of Adams Road	Heavy metals, hydrocarbons, pesticides, polychlorinated biphenyls, asbestos	Surface and shallow soils	Moderate – Filled areas may need to be disturbed during construction activities.
Stockpiles	Private property, southern side of Adams Road	Heavy metals, hydrocarbons, pesticides, polychlorinated biphenyls, asbestos	Surface and shallow soils	Moderate – Stockpiles may need to be disturbed during construction activities.
Deterioration of Asphalt	Areas next to Adams Road	Hydrocarbons	Surface soil	Moderate – Surface soils next to Adams Road may need to be disturbed during construction activities.
Agricultural Land Use	Within and next to the proposed intersection	Heavy metals, hydrocarbons, pesticides, asbestos	Soils	Low – Contamination (if present) likely to be diffuse (no point sources observed).

Land use along The Northern Road alignment where minor adjustments to the construction boundary are proposed are consistent with nearby areas previously assessed (Given rural residential and small scale agricultural land use) and therefore the same contamination assessment conclusions (risk profile) in the EIS are considered applicable to these additional areas.

5.6.4 Mitigation / management

Soils

The mitigation measures for soil and spoil management measures outlined in the SPIR and Final EIS are comprehensive and cover all potential identified impact. These measures are also suitable for the earthworks required by the proposed modified design. No additional mitigation measures are proposed in relation to the modification.

Erosion and sediment controls would be installed and maintained in accordance with the NSW Minister's CoA E45.

Surface Water

The SPIR and Final EIS identified environmental management and mitigation measures that Roads and Maritime would adopt to avoid or reduce environmental impact in addition to design-related water quality controls (refer to Section 12 of the SPIR and Final EIS). An Operational Water Quality Management Plan would be established which would outline monitoring and reporting requirements to confirm the effectiveness of water quality control measures, and determine if any additional measures are required. No further environmental management measures have been identified due to the latest design refinements of the project.

The proposed modification would be carried out in accordance with the NSW Minister's CoA E71 and E72.

Contamination

Based on the contamination assessment carried out, a number of moderate risk potential AEIs have been identified. Further investigations of these AEIs should be conducted to quantify the risk. These investigations should be carried out before construction activities so that contamination (if present) can be adequately planned for and managed.

The additional contamination assessment conclusions (risk profile) are consistent with those of the EIS, as is the recommended mitigation measures and management advice. The recommended mitigation measures and management advice as per the EIS is reiterated below, and should be assumed to apply to the increased construction footprint of the current revised design.

Any further investigations should be carried out in accordance with NSW EPA endorsed guidance including the *NEPM guidelines* (NSW EPA, 2013). The investigations should be designed in consideration of the potential contamination identified within this report and the proposed construction activities to be carried out for the proposed interchange (i.e. investigations should provide lateral and vertical coverage in context of the proposed construction activities across areas which are to be disturbed).

Should contamination be identified, appropriate remediation action plans and/or environmental management plans would be developed to remove or suitably reduce the contamination risks during construction activities.

Any soil/fill materials surplus to construction needs would be classified in accordance with the *Waste Classification Guidelines* (NSW EPA, 2014).

Where excavation work are required within low risk areas, a Construction Environmental Management Plan (CEMP) should detail contingency measures. These measures would manage potentially contaminated materials if materials are suspected and/or encountered during construction activities.

The proposed modification would be carried out in accordance with the NSW Minister's CoA E46 to E50.

5.7 Urban design and visual impact

5.7.1 Introduction

Urban design and visual impact were addressed in Section 8.5 of the EIS.

An additional urban design and visual impact assessment of the proposed changes is provided in **Appendix F** and summarised in this Section.

The proposed changes were reviewed against the urban design principles and objectives, and urban design directives (urban design vision, strategy and opportunities) detailed in the Landscape Character and Visual Impact Assessment (LCVIA) presented in Appendix O of the EIS.

5.7.2 Existing environment

The approved project is located in a rural setting around the periphery of the Western Sydney Airport. Between Eaton Road and Elizabeth Drive, the proposed upgrade runs along a new alignment, through agricultural and rural residential land. There are two (of five identified in the EIS) Landscape Character Zones (LCZ) located within the area of proposed project changes:

- LCZ3 Luddenham Plateau: characterised by a broad ridge with scenic panoramic views over a gently sloping pastoral landscape
- LCZ4 Cosgrove Creek: comprised of a rural valley surrounded by steep slopes leading up to the ridges of the surrounding Luddenham Plateau.

There are a large number of viewers in Luddenham that overlook the valley, including sensitive residential and recreation users.

The native vegetation within the study area generally consists of Cumberland Plain Woodland. It is highly modified as a result of past and current land uses, including agricultural uses which have resulted in significant clearing of the original vegetation. An assessment of impact to native vegetation is provided in Section 5.4. A number of farm dams also contribute to the character of the area.

5.7.3 Impact assessment

Urban design principles and objectives

A review of the current revised design against the urban design objectives and principles outlined in the EIS was carried out as part of this assessment. The result of the review, which is provided in **Appendix F,** indicates that the current revised design meets the urban design objectives and principles developed for the approved project. The key change to the design from the SPIR and Final EIS is the replacement of the twin bridges at Adams Road with an at-grade intersection. The intersection is considered to integrate The Northern Road alignment more seamlessly into the existing landscape than the bridge design and has therefore been deemed an improved outcome from an urban design perspective.

A review of the modified design against the urban design strategy outlined in the SPIR and Final EIS was also carried out as part of this assessment. The result of the review, which is provided in **Appendix F**, indicates that the current revised design also meets the overall urban design strategy developed for the project.

Landscape character impact

The introduction of high embankments and increased road infrastructure on Adams Road results in locally increased landscape character impact. However, as the landscape character impact rating

identified in the EIS for these LCZs was high to moderate for LCZ3 and high for LCZ4, there has been no significant change in the impact overall.

5.7.4 Visual impact

Of the 19 viewpoints assessed in the EIS, eight are located within Stage 6 of the project and were re-assessed with respect to the current revised design:

- Viewpoint 5: looking north-east into Cosgrove Valley from Wilmington Reserve on Jamison Street, Luddenham
- Viewpoint 6: looking west along Adams Road
- Viewpoint 7: looking south from private property driveway at 2901 The Northern Road
- Viewpoint 8: looking east at The Northern Road Luddenham, opposite the Park Road intersection
- Viewpoint 9: looking west from private property driveway at 2901 The Northern Road
- Viewpoint 10: looking west along Elizabeth Drive
- Viewpoint 11: looking south at the existing roundabout at the Elizabeth Road intersection at The Northern Road
- Viewpoint 12: looking west at 2776 The Northern Road.

No additional viewpoints were introduced as part of the assessment.

Photomontages were produced for viewpoints 5 and 6.

There would be no changes to the visible project elements as a result of the revised design from viewpoints 8 and 10. While there are a number of proposed changes that would be perceptible from viewpoints 5, 7, 9, 11 and 12, the changes to the visual impact as assessed previously have been assessed to be relatively minor in nature, given the overall scale of the project. The design changes have not altered the *magnitude* rating for these viewpoints. Visual *sensitivity* has also remained the same, resulting in no changes to the visual impact assessment of these viewpoints.

The visual impact of the proposed replacement of the twin bridges over Adams Road with an at-grade intersection is assessed by Viewpoint 6, looking west along Adams Road. The sensitivity of Viewpoint 6 remains high due to the rural nature of the area, meaning viewers would be susceptible to change. Visible changes to the design include embankments resulting from the regrading of Adams Road and the introduction of new street furniture. Landscape planting would help mitigate the impact of the embankments but would take time to mature. Traffic signals and street lighting would be visible at night. Therefore, the combined visual impact of the current revised design results in the magnitude rating of Viewpoint 6 remaining high.

5.7.5 Mitigation / management

The mitigation strategies outlined in the LCVIA developed for the EIS still apply for the proposed modified design. One additional mitigation measure is recommended as a result of the modified design, relating to the new embankments to be constructed along Adams Road east of the intersection. These are up to eight metres high on the southern side of Adams Road and located about 150 metres from a rural property at 125 Adams Road. The property is also elevated on a hill and looks down towards the proposal. Additional planting will be included in the 100 per cent landscape design to screen the road and embankments from the property.

5.8 Matters of national environmental significance

Under the environmental assessment provisions of the *Environment Protection and Biodiversity Conservation Act 1999*, matters of national environmental significance (MNES) and impact on Commonwealth land are required to be considered for the proposed modification.

There are no areas of Commonwealth land within the footprint of the proposed modification and no additional impact (either direct or indirect) on Commonwealth land relating to the proposed changes. The proposed modification would not have any additional impact on the Commonwealth listed ecological communities, flora or fauna species identified within the EIS and the Final EIS.

Therefore, the assessment of the proposed modification is consistent with the assessment as described in the Final EIS, in terms of impact on MNES and Commonwealth land.

6 Conclusion

6.1 Conclusion

Roads and Maritime seeks a modification of the Minister's approval for The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park to replace the approved twin bridges over Adams Road with an at-grade signalised intersection.

This report has been prepared to support an application from Roads and Maritime, the proponent of the project, to modify the existing NSW infrastructure approval for The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore (refs: SSI_7127 and EPBC 2016/7696). It is intended to help the NSW Minister for Planning in forming a view as to the merits of the proposed modification.

The report addresses they key issues identified in the approved project EIS and SPIR and Final EIS.

In general, the impact of the proposed modification are considered to be consistent with those described in the EIS, the SPIR and Final EIS and associated documentation, with the exception of:

- An increase in traffic volumes along Adams Road (to about 700 vehicles per hour), which would exceeding the Guide to Traffic Generating Developments (Road and Traffic Authority, 2012) guidelines for environmental capacity limit of a local road (300 vehicles per hour).
- an increase in visual impact on one property overlooking the proposed changes at Adams Road, contributing to a high-moderate impact on landscape character.

Potential additional mitigation measures to address these impacts are described in Section 6.2.

There is no additional impact to matters of national environmental significance.

6.2 Summary of proposed mitigation measures

The adopted approach to environmental mitigation and management was described in Chapter 12 of the EIS, including:

- Refinement of project design to minimise environmental impact
- A Construction Environmental Management Plan (CEMP), including topic specific sub-CEMPs to document the management of environmental impact during construction.

Mitigation measures and construction safeguards were set out in the EIS and revised in the SPIR and Final EIS. This modification would adopt all of the relevant revised environmental management measures committed to for the approved project in accordance with Condition A2 of the Minister's CoA.

Additional mitigation measures have also been identified through this modification assessment:

- Measures to mitigate the increase in forecast traffic volumes on Adams Road would be developed in consultation with the local Council (see Section 5.2 – Traffic and transport)
- Five receivers require additional noise mitigation measures due to the earthworks construction stage. The required additional mitigation measures are Notification (i.e. letters during construction) and Verification (i.e. noise measurements during construction) (see Section 5.3 – Noise and vibration)

- Five additional receivers previously not identified in the EIS as eligible for architectural treatment to mitigate operational noise now exceed the criteria threshold for additional noise mitigation. Architectural treatment would be provided to the five additional receivers (see Section 5.3 – Noise and vibration)
- Although the additional impact is a small change, an additional 0.27 ha of native vegetation clearing will alter the offset requirement for the project. The required offset for HN630 (*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion) and HN529 (Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion) plant community types would increase from the credits required as outlined in the SPIR and Final EIS (see Section 5.4 – Biodiversity
- Additional planting to screen the proposed alignment from a property at 125 Adams Road (see Section 5.7 – Urban design and visual impact).

6.3 Summary of conditions of approval

Where possible, the proposed modification would be delivered in accordance with the relevant conditions of approval from the approved project. The relevant conditions have been identified in **Table 6-1**.

Table 6-1 Conditions of approval

No.	Condition of Approval	Discussion
A1	The CSSI must be carried out in accordance with the terms of this approval and generally in accordance with the description of the CSSI in the EIS as amended by the SPIR	The proposed changes are not in accordance with the description of the CSSI in the EIS as amended by the SPIR.
A2	The CSSI must be carried out in accordance with all procedures, commitments, preventative actions, performance criteria and mitigation measures set out in the EIS as amended by the SPIR unless otherwise specified in, or required under, this approval.	The proposed changes can be undertaken in accordance with all procedures, commitments, preventatives actions, performance criteria and mitigation measures set out in the EIS as amended by the SPIR. Furthermore, additional mitigation measures have been identified relating to traffic and transport, construction and operational noise, biodiversity and visual impact.
E2	The Proponent must develop a **Biodiversity Offset Strategy** (BOS) to outline how the ecological values impacted by the CSSI will be offset in perpetuity. The BOS must be developed from the draft BOS detailed in the documents listed in **Condition A1** and include the threatened ecological communities identified in The Northern Road, Submissions and Preferred Infrastructure, Biodiversity Addendum technical memo (Jacobs, 26 October 2017). The BOS must be submitted for the approval of the Secretary within 12 months of the commencement of Construction or within another timeframe agreed with the Secretary.	Roads and Maritime will identify the offset requirement associated with the additional 0.27 ha of vegetation removal and incorporate this requirement in the final BOS. The proposed changes to the project would not impact on the ability to comply with this requirement.

No.	Condition of Approval	Discussion
E3	Within 12 months of the approval of the BOS or within another timeframe agreed with the Secretary, the Proponent must develop and submit to the Secretary for approval, a **Biodiversity Offset Package**, consistent with the BOS approved under condition E2. The Package must be prepared in consultation with OEH and confirm how the impacts of the CSSI will be offset. The Package must be consistent with the biodiversity offset strategy requirements of the *NSW Biodiversity Offsets Policy for Major Projects* (OEH, 2014b), unless otherwise agreed by OEH. The Package must include, but not necessarily be limited to: • Identification of the number of biodiversity credits required to offset the impact of the CSSI • Details on the biodiversity credits identified to offset the impact of the CSSI and evidence that they can be attained and secured in accordance with the *NSW Biodiversity Offsets Policy for Major Projects* (OEH, 2014b) • For offsets not secured through the retirement of biodiversity credits, details on the supplementary measures that would be implemented to offset the residual impacts, in accordance with Appendix B of the *NSW Biodiversity Offsets Policy for Major Projects* (OEH, 2014b) and the *Framework for Biodiversity Assessment* (OEH, 2014a). Should supplementary biodiversity offset measures be proposed, the Biodiversity Offset Package must also provide details on the management and monitoring requirements for compensatory habitat work and other biodiversity offset supplementary measures proposed to ensure that outcomes of the package are achieved.	Roads and Maritime will identify the offset requirement associated with the additional 0.27 ha of vegetation removal and incorporate this requirement in the final BOS and Biodiversity Offset Package. The proposed changes to the project would not impact on the ability to comply with this requirement.
E4	All required offsets must be secured, in consultation with the OEH, within 12 months of the approval of the **Biodiversity Offset Package** or within another timeframe agreed with the Secretary. The Proponent must submit to the Secretary a copy of the **Credit Retirement Report** issued by the OEH once the offsets are secured, within one month of receiving the report.	The proposed changes to the project would not impact on the ability to comply with this requirement.

No.	Condition of Approval	Discussion
E5	During vegetation clearing, timber and root balls must be retained where practicable for reuse in habitat enhancement and restoration work. The retained timber and root balls may be used on or off the CSSI site. Before the start of vegetation clearing, the Proponent must consult with community groups, the Mulgoa Valley Landcare Group and relevant Government agencies to determine if retained timber and root balls could be used for environmental repair projects, before pursuing other disposal options.	The proposed changes to the project would not impact on the ability to comply with this requirement.
E6	Measures identified in the documents listed in **Condition A1** to maintain or improve flood characteristics must be incorporated into the detailed design of the CSSI after consultation with adversely affected landowners and businesses, DPI Water, DPI Fisheries, SES and relevant Councils. These measures must be reviewed and endorsed by a suitably qualified person.	The potential impact of the project on flooding behaviour and the scour potential within receiving drainage lines has been considered during the detailed design phases of the project. Detailed flood modelling has also been carried out to identify the potential residual flooding and drainage related impact of the project after the incorporation of a preferred set of transverse drainage upgrade and flood mitigation measures into the detailed design. The results indicate that the impact of the project (as per the current revised design) on flooding behaviour in the Cosgroves Creek catchment would generally be the same as was assessed in the SPIR and Final EIS. Consultation with affected landowners would be ongoing and the proposed changes to the project would not impact on the ability to comply with this requirement.

No.	Condition of Approval	Discussion
E8	For property/ies where modelling in the documents listed in **Condition A1** predicts that the CSSI will potentially reduce the available stormwater runoff yield to a farm dam, the Proponent must, in consultation with the affected landowner: (a) calculate the nature and extent of impacts on water supply; (b) determine what measures may be implemented to prevent, mitigate or offset a loss in water supply; and (c) implement the measures agreed with the potentially affected landowner at no cost to the landowner. The agreed measures must be implemented before and during Construction of any works that may potentially affect the flow of water into the farm dams. In the event that the Proponent and the relevant property owner cannot agree on the measures to mitigate the impact, the Proponent shall engage a suitably qualified and experienced independent person to advise and assist in determining the impact and relevant mitigation measures.	The proposed changes to the project would not impact on the ability to comply with this requirement.
E36	A review of the proposed operational noise mitigation measures for the CSSI must be undertaken by the Proponent. The review must be submitted to the Secretary for approval prior to commencing Construction which would affect the identified receivers, or within another timeframe agreed by the Secretary. The review must: (a) confirm the operational noise predictions of the CSSI based on detailed design. The operational noise assessment shall be based on an appropriately calibrated noise model (which has incorporated additional noise monitoring, where necessary for calibration purposes); (b) review the suitability of the operational noise mitigation measures identified in the documents listed in **Condition A1**. The review must take into account the detailed design of the CSSI and where necessary, refine the proposed measures with the objective of meeting the criteria outlined in the *NSW Road Noise Policy* (DECCW 2011), based on the operational noise performance of the CSSI predicted under (a) above; and (c) Where necessary, investigate additional or alternative noise mitigation measures to achieve the criteria outlined in the *NSW Road Noise Policy* (DECCW, 2011).	The proposed changes have been incorporated into the noise assessment provided in **Appendix D**.

No.	Condition of Approval	Discussion
E37	Operational noise mitigation measures as identified in **Condition E36** (such as at-property architectural treatments) that will not be affected by construction work must be implemented within six (6) months of the commencement of Construction which would affect the identified receivers or within another timeframe agreed with the Secretary. These measures, and a schedule that outlines the timing for their delivery, must be detailed in the **Noise and Vibration CEMP Sub-plan** for the CSSI required by **Condition C4(b)**. Where early implementation of noise mitigation measures is not proposed, the Proponent must submit to the Secretary a report providing justification as to why, along with details of temporary measures that would be implemented to reduce construction noise impacts, until such time that the operational noise mitigation measures identified in **Condition E36** are implemented. The report must be provided to the Secretary for approval prior to the commencement of Construction which would affect the identified receivers.	The proposed changes to the project would not impact on the ability to comply with this requirement.
E38	All operational noise mitigation measures identified in Condition E36 must be implemented prior to Operation.	The proposed changes to the project would not impact on the ability to comply with this requirement.
E46	A Site Contamination Report, documenting the outcomes of Stage 1 and Stage 2 contamination assessments of land upon which the CSSI is to be carried out, that is suspected, or known to be, contaminated must be prepared by a suitably qualified and experienced person in accordance with guidelines made or approved under the *Contaminated Land Management Act 1997* (NSW).	The proposed changes to the project would not impact on the ability to comply with this requirement.

No.	Condition of Approval	Discussion
E47	If a Site Contamination Report prepared under Condition E46 concludes that specified land is contaminated such that it is and will remain unsuitable for the CSSI, even after completion of all physical works required to construct the CSSI, then: (a) a Remediation Action Plan must be prepared in relation to the specified land, by a suitably qualified and experienced person and in accordance with all guidelines made or approved under the Contaminated Land Management Act (NSW); (b) the Remediation Action Plan must be approved in writing by a NSW EPA Accredited Site Auditor, and that approval must state that the specified land can be made suitable for the purpose approved by this approval, if the works described in the Remediation Action Plan are carried out; and (c) the specified land must be remediated in accordance with the Remediation Action Plan, as approved by the Site Auditor.	The proposed changes to the project would not impact on the ability to comply with this requirement.
E53	The CSSI must be designed and operated to meet relevant road design standards, and ensure it does not adversely impact network connectivity, or the safety and efficiency of the road network in the vicinity of the CSSI.	The proposed changes to the project associated with the refined design has been design in accordance with relevant standards and guidelines.
E60	The CSSI must be designed to retain as many trees as possible. The planting, retention and replacement of trees is to be carried out in accordance with the EIS. Trees removed during construction that are not within an endangered ecological community are to be replaced at a rate of two trees for every tree removed. Tree planting must occur within the CSSI boundary unless otherwise envisaged in the EIS, in consultation with the relevant Council, or otherwise agreed by the Secretary.	While the proposed modification has been designed to retain as many trees as possible, it is anticipated that the proposed changes will require the removal of additional trees. However, removal and replacement of such trees would be carried out in accordance with this condition. Therefore, the proposed changes to the project would not impact on the ability to comply with this requirement.

No.	Condition of Approval	Discussion
E61	Tree species selection is to be consistent with the plans and planting palette in the EIS. Pot sizes of selected tree species are to be consistent with part 3.2.1 (Rural road reserves) in the RMS *Landscape Guideline* (Roads and Maritime, 2008), subject to the long-term viability of the plant.	This condition would be adhered to through an update to the Urban Design and Landscape Plan for the approved project, to cover the proposed modification.
E62	An **Urban Design and Landscape Plan** must be prepared based on the detailed design, and in accordance with the commitments made in the documents listed in **Condition A1**.	An updated Urban Design and Landscape Plan would be prepared based on the detailed design for the proposed modification.
E63	The **Urban Design and Landscape Plan** must incorporate monitoring and maintenance procedures for the built elements, rehabilitated and replacement vegetation and landscaping (including visual screening and weed control) and performance indicators, responsibilities, timing and duration and contingencies where rehabilitation of vegetation and landscaping measures fail.	An updated Urban Design and Landscape Plan would be prepared based on the detailed design for the proposed modification. The proposed changes to the project would not impact on the ability to comply with this requirement.
E64	The **Urban Design and Landscape Plan** must be finalised following consultation with the relevant Councils and the community. The Urban Design and Landscape Plan shall incorporate evidence of consultation on the proposed urban design and landscape measures and the monitoring and maintenance procedures.	The Urban Design and Landscape Plan would be updated to reflect the proposed modification and the outcome of consultation with the relevant Councils and the community. The modified design does not require a change to the intent or overall outcomes of this condition.
E72	Drainage feature crossings (permanent and temporary watercourse crossings and stream diversions) and drainage swales and depressions must be designed and constructed in accordance with relevant guidelines and designed by a suitably qualified and experienced person in consultation with DPI Fisheries.	The drainage and water quality infrastructure associated with the refined design has been design in accordance with relevant guidelines.

7 Other considerations

7.1 Permits, licenses and other approvals

There are no additional approval requirements or changes to any permits, licenses or other approvals as a result of the proposed change.

8 References

Biodiversity Conservation Act 2016 (BC Act)

Biodiversity Conservation Regulation 2017

Biodiversity Conservation (Savings and Transitional) Further Amendment Regulation 2018

Contaminated Land Management Act 1997

Commonwealth Environment Protection and Biodiversity Conservation Act 1999

Department of Environment, Climate Change and Water, 2011. NSW Road Noise Policy

Environmental Planning and Assessment Act 1979

NSW Environment Protection Authority (EPA), 2013. National Environment Protection (Assessment of Site Contamination) Measure Guidelines

NSW EPA, 2017. Noise Policy for Industry

NSW EPA, 2014. Waste Classification Guidelines

Office of Environment and Heritage, 2014a. Framework for Biodiversity Assessment

Office of Environment and Heritage, 2014b. NSW Biodiversity Offsets Policy for Major Projects

Protection of the Environment Operations Act 1997 (POEO)

Roads and Maritime, 2008. Landscape Guideline

Roads and Maritime, June 2017. The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park – NSW Environmental Impacted Statement/Commonwealth Draft Environmental Impact Statement

Roads and Maritime, December 2017. The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park – Commonwealth Final Environmental Impact Statement

Roads and Maritime, December 2017. The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park – Submissions and Preferred Infrastructure Report

Roads and Maritime, July 2018. Consistency assessment report, Proposed changes between Mersey Road, Bringelly and Eaton Road, Luddenham

Roads and Maritime, October 2018. Consistency assessment report, Proposed changes between Littlefields Road, Luddenham and Glenmore Parkway, Glenmore Park

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Roads and Traffic Authority, 2011. Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects

Roads and Traffic Authority, 2012. Guide to Traffic Generating Developments