New England Highway upgrade between Belford and the Golden Highway

Submissions Report

Roads and Maritime Services | July 2018

NSW GOVERNMENT

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Roads and Maritime Services | June 2018

Prepared by Arup and Roads and Maritime Services
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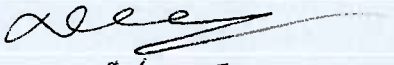
Approval and authorisation

Title	New England Highway upgrade between Belford and the Golden Highway
Accepted on behalf of NSW Roads and Maritime Services by:	Natasha Waeger Project Manager, Regional Project Office - Hunter
Signed:	
Dated:	10th July 2018

Executive summary

The Proposal

Roads and Maritime Services (Roads and Maritime) proposes to upgrade the New England Highway between Belford and the Golden Highway (the proposal). The upgrade would improve traffic flow, travel times and safety for motorists along a busy section of the New England Highway.

The key features of the proposal as presented in the Review of Environmental Factors (REF) include:

- Widening the New England Highway to provide a divided road with two travel lanes in each direction between Belford and the Golden Highway. This is the last section of the route between Newcastle and the Golden Highway intersection to be upgraded to a four lane divided road
- Replacing the existing right turn movement from the Golden Highway to the New England Highway with a right turn flyover
- Establishing a road corridor for future development of the New England Highway towards Singleton.

The proposal forms part of the New England Highway Draft Corridor Strategy to provide an efficient and sustainable corridor that caters for increasing growth and improves safety along the New England Highway corridor. The New England Highway and the Golden Highway are both crucial connection corridors and are used extensively by local industries in the Hunter Valley and Central West region.

The proposal was subject to assessment under Division 5.1 of the *Environment Planning and Assessment Act 1979* (EP&A Act). A review of environmental factors (REF) was prepared for the proposal.

REF display

The REF was placed on public display to seek feedback on the proposal from the community, government agencies and other stakeholders.

The REF was publicly displayed for 29 days between 30 June 2017 and 28 July 2017. The REF was available in hard copy at the Service NSW Singleton Service Centre in Singleton and electronically on the Roads and Maritime project website. The display location and website link were advertised directly to around 2,600 households in the surrounding area and in the Singleton Argus and Maitland Mercury.

A total of 32 submissions were received by Roads and Maritime in response to the REF. Most of the submissions were received from the community, including individuals, businesses and one group submission. Submissions were also received from Singleton Council, Hunter Business Chamber and Singleton Business Chamber.

This submissions report considers all submissions received during the REF display.

Summary of key issues

The main issues raised in submissions by the community related to access into the abattoir and proposed u-turn facility on the Golden Highway, specifically concerns regarding safety, future use by higher productivity vehicles and impacts to efficiency of the road network.

Singleton Council's submission provided support for the proposal and requested that further consultation be carried out with the abattoir regarding access to and from their site. The submission from both business chambers related to ensuring the proposal caters for higher productivity vehicles and ensuring a safe access to and from the abattoir.

The main issues raised and their responses are summarised below.

Abattoir access and u-turn facility

The majority of the submissions received comment on access to and from the abattoir and the proposed u-turn facility on the Golden Highway, particularly:

- Issue: Concern regarding the safety of the abattoir access and u-turn facility, particularly related to travel during peak periods, slow acceleration of heavy vehicles with fast flowing traffic, sight distances and driver confusion.

  Response: The concept design has been revised with access arrangements for vehicles entering and exiting the abattoir modified in response to the submissions received. A roundabout replaces the previously proposed u-turn facility at the Golden Highway. The roundabout will maintain safe access to and from the Golden Highway for vehicles accessing the abattoir and properties to the north, and enable access to the flyover entry ramp.

- Issue: The proposal doesn't provide for the use of higher productivity vehicles in the future, in particular the u-turn facility, which would restrict the use of higher productivity vehicles accessing the abattoir.

  Response: The concept design has been revised with a roundabout replacing the previously proposed u-turn arrangement at the Golden Highway. The size and alignment of the roundabout has been designed to provide for turning movements by higher productivity vehicles, specifically Performance-based specifications (PBS) 2B vehicles up to 30 metres.

- Issue: The u-turn facility and associated manoeuvres would increase travel times for vehicles exiting the abattoir and accessing the New England Highway.

  Response: A roundabout and new access road replaces the previously proposed u-turn facility at the Golden Highway. Traffic modelling has been carried out to assess the performance of the proposal. The traffic modelling indicated that overall the proposed roundabout would perform with good operation. This included sensitivity testing for the "worst-case" scenario where abattoir traffic was doubled in addition to the forecast traffic growth.

Intersection of Golden Highway and New England Highway

- Issue: There does not appear to be any improvements to the road alignment for both the left hand turn into the Golden highway and the left turn out. The potential for driver confusion and vehicle conflict still exists.

  Response: In response to submissions, the proposal includes improvements to the intersection of the New England Highway and Golden Highway. Specifically:

  - The existing give-way sign and linemarking at the New England Highway left turn lane has been removed
  - Raised traffic islands at the intersection to provide improved delineation for all turning movements, including separation between vehicles
  - Provision for vehicles turning onto the Golden Highway from the New England Highway to merge west of the intersection.

Design changes

In response to submissions and following further design development, a number of changes to the REF proposal were identified.

In response to submissions, design changes are proposed to the abattoir access. These changes include:

- Replacing the u-turn facility with a four-leg roundabout at the Golden Highway
- Constructing a new access road within the abattoir property, connecting to the roundabout
- Decommissioning the existing access at the abattoir.

Further design changes are proposed in response to submissions received or due to design progression since display of the REF. These changes comprise:

- Improvements to the Golden Highway and New England Highway intersection including removal of an existing give-way sign and linemarking, provisions for raised traffic islands and improved delineation as well as merge provision for vehicles turning onto the Golden Highway
- Reduced median width between the New England Highway eastbound and westbound travel lanes.
- Amended alignment of the flyover and eastbound entry ramp, reducing property acquisition
- Revised construction compounds areas.

The design changes have been described in Chapter 3 of this submissions report.

Additional assessments

Aboriginal heritage

Areas subject to design changes were located outside of the study area identified in the Cultural Heritage Assessment Report (CHAR) prepared as part of the REF. An additional site survey was carried out for these areas. Representatives from the Local Aboriginal Land Council (LALC) and native title claimant participated in this site survey.

The site survey identified a previously recorded isolated find, a new isolated find and a new artefact scatter. The updated study area has avoided impacts to a site previously identified for impact and reduced impact to a site complex of moderate significance. A total of eight Aboriginal archaeological sites would be impacted by the proposal. Six low archaeological significance sites will have total loss of value and two moderate archaeological significance sites would have partial loss of value from the proposal. The CHAR, which was subject to consultation with registered Aboriginal parties, includes a recommendation for archaeological salvage of areas of the two moderately significant sites impacted by the proposal.

An Aboriginal cultural values assessment was prepared as part of the CHAR. Five knowledge holders who were nominated by the registered Aboriginal parties participated in the cultural values assessment. The knowledge holders did not identify any specific cultural values within the project boundary. However, the knowledge holders all expressed the desire that it is recognised that the project sits within a broader cultural landscape that holds significance and there are a number of key areas surrounding the project footprint.

Biodiversity

An addendum biodiversity assessment report was prepared to assess the additional study area associated with the design changes. This assessment identified that up to 11.88 hectares of central hunter ironbark – spotted gum grey box forest endangered ecological community, listed on the *Biodiversity Conservation Act 2016,* would be impacted by the proposal. An assessment of significance completed for this impact concluded that the proposal would be unlikely to have a significant impact on this endangered ecological community.

9.57 hectares of the 11.88 hectares of central hunter ironbark – spotted gum grey box forest has also been identified as central hunter valley eucalypt forest and woodland critically endangered ecological community (CEEC), listed on *the Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). An assessment of significance completed for this impact concluded that the proposal is likely to have a significant impact on this CEEC. A strategic assessment for the endangered Central Hunter Valley Eucalypt Forest and Woodland complex was carried out under Roads and Maritime's *Environment Protection and Biodiversity Conservation Act 1999 – Strategic Assessment* policy. Impacts to this community would be offset in accordance with the Roads and Maritime Guideline for Biodiversity Offsets and strategic assessment.

The Squirrel Glider has been recorded within the study area. Squirrel Glider is listed as vulnerable under the *Biodiversity Conservation Act 2016.* An assessment of significance completed for potential impacts to the Squirrel Glider concluded that the proposal is unlikely to have a significant impact on this threatened species. Squirrel Glider is listed as a species credit species throughout NSW. As over one hectare of this species habitat is proposed to be impacted by the proposal, offsetting is required. It was determined that 261 species credits would be required to offset the impacts to this species.

Water quality

An additional water quality assessment was undertaken to support the proposal. This more detailed investigation of the construction water quality impacts of the proposal includes consideration of impacts against the NSW Water Quality Objectives for the Hunter River catchment. The assessment concluded that the proposal is unlikely to result in an exceedance of the trigger levels of the key indicators in the water quality objectives.

Traffic, transport and access

An updated assessment of potential traffic impacts associated with the proposal has been carried out to evaluate the proposed changes and confirm alignment with the proposal objectives. The assessment also considered forecast traffic from an approved 24 lot industrial development to the north of the roundabout.

The traffic modelling indicated traffic movements at the roundabout would perform with a Level of Service (LoS) A or B, 10 years after opening. Construction and operational traffic, transport and access of the remainder of the proposal is consistent with the impacts identified in the REF.

Noise and vibration

An amendment to the noise and vibration assessment was prepared to reassess operational road traffic noise impacts of the proposal following design changes. The assessment specifically looked at the noise impacts associated with acceleration and deceleration at the roundabout and changes to operational noise.

The predicted change in maximum noise level impact due to installation of the roundabout is around eight decibels (dB). This is associated with compression breaking events. It is likely that the criteria for potential sleep disturbance impacts would be exceeded but maximum noise levels would be below levels that are likely to significantly affect health and wellbeing.

Landscape character and visual impacts

An updated landscape character and visual impacts assessment was carried out as part of this submissions report. The design changes to the proposal do not result in changes to the potential landscape character and visual impacts outlined in the REF.

Property and land use

An updated property and land use assessment is included within this submissions report. This assessment identified that about 18 hectares of land acquisition is required for the proposal. This is a reduction of 22 hectares from the amount assessed as part of the REF. This reduction applies to one landowner. Land acquisition proposed as part of this proposal would also establish a road corridor for future development of the New England Highway towards Singleton.

No acquisition is proposed as part of the realignment of the abattoir access road. The access road would be constructed within the abattoir property.

Socio-economic

An updated socio-economic assessment was carried out as part of this submissions report. This assessment concluded that the design changes have resulted in reduced impacts to the local business due to the design changes at the abattoir access.

Safeguards and management measures

The additional assessments and proposed design changes have resulted in some changes to the safeguards and management measures outlined in the REF. The following safeguard has been added:

- Provision for an ecologist to be present during the emptying and removal of dams in order to relocate any displaced fauna (B9).

A number of other safeguard and management measures outlined in the REF have been updated to reflect Roads and Maritime's current policies and procedures. The updated safeguard and management measures are included within Table 5-1 of this report.

Contents

Tables

Appendices

1. Introduction and background

1.1 The proposal

Roads and Maritime Services (Roads and Maritime) proposes to upgrade the New England Highway between Belford and the Golden Highway. The upgrade would improve traffic flow, travel times and safety for motorists along a busy section of the New England Highway. The location of the proposal is shown in Figure 1-1.

The key features of the proposal include:

- Widening the New England Highway to provide a divided road with two travel lanes in each direction between Belford and the Golden Highway. This is the last section of the route between Newcastle and the Golden Highway intersection to be upgraded to a four lane divided road
- Replacing the existing right turn movement from the Golden Highway to the New England Highway with a right turn flyover
- Establishing a road corridor for future development of the New England Highway towards Singleton.

A more detailed description of the proposal can be found in the New England Highway upgrade between Belford and the Golden Highway review of environmental factors (REF) prepared by Roads and Maritime in June 2017.

In response to the submissions received, Roads and Maritime has refined the design. These changes include:

- Replacement of the u-turn facility with a roundabout at the Golden Highway
- Improved arrangement for vehicle movements at the Golden Highway and New England Highway intersection
- Reduced median width between the New England Highway eastbound and westbound travel lanes
- Amended alignment of the flyover and eastbound entry ramp
- Revised indicative construction compound areas.

A modified concept design has been developed by Roads and Maritime incorporating the above changes. If approved, the design would be further refined during the detailed design phase. The key features of the proposal are shown in Figure 1-2.

The proposal is subject to assessment under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), with Roads and Maritime being the determining authority.

If the proposal is approved, construction of the project could start in 2019 and is expected to take around two and a half years to complete, weather permitting.

Legend

Proposal boundary

Client
Roads and Maritime Services

Job Title
Belford to Golden Highway

Figure Title
Proposal Boundary

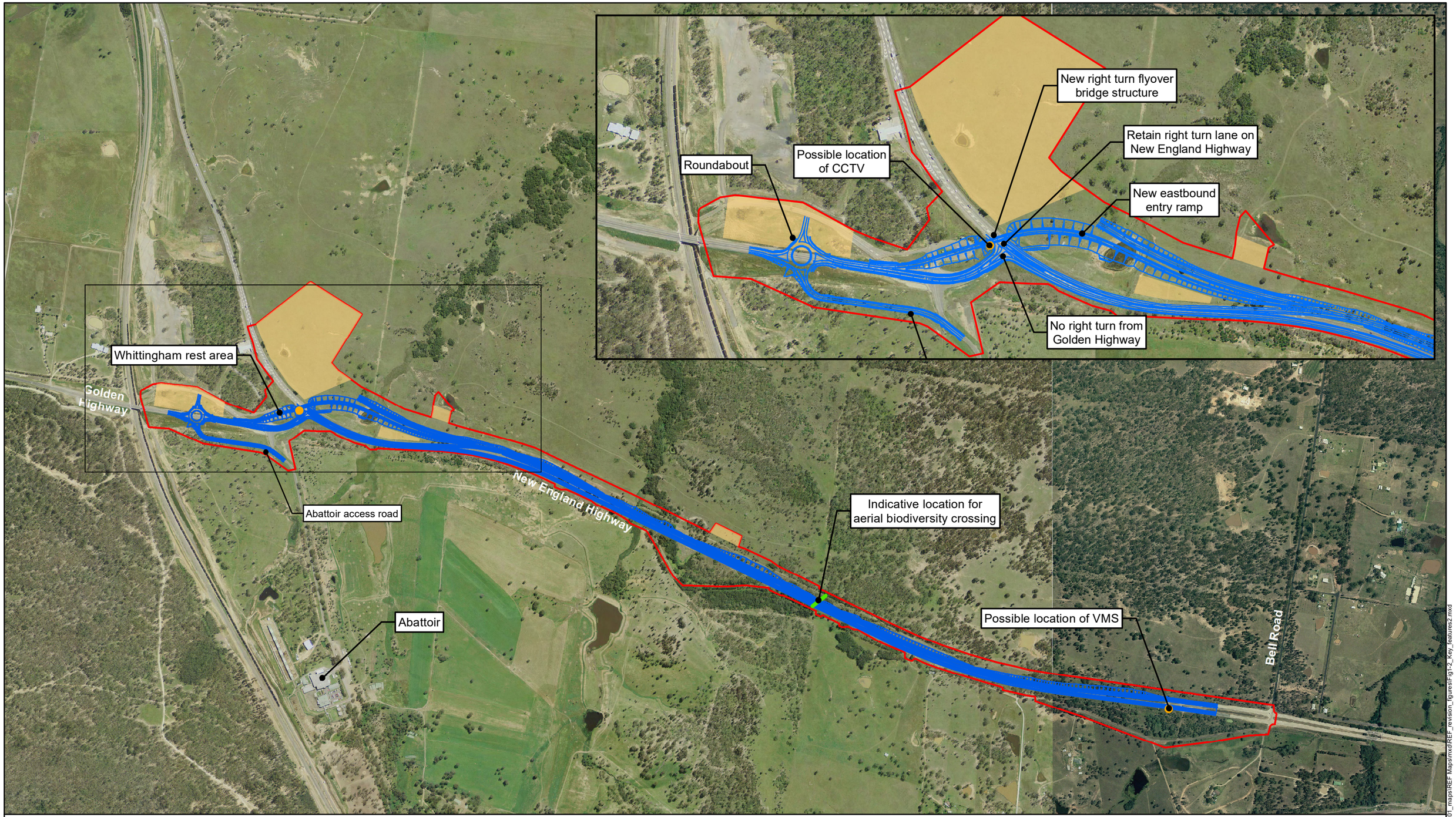
Metres
0 100 200 300 400

D1	26/06/2018	AO	LAS	LH
Issue	Date	By	Chkd	Appd

ARUP
Level 10, 201 Kent Street
PO Box 76 Millers Point
Sydney, NSW 2000
Tel +61 (2)9320 9320 Fax +61 (2)9320 9321
www.arup.com

Scale at A3	Figure Status
1:12,000	**Issue**
Coordinate System	
GDA 1994 MGA Zone 56	
Job No	Figure No
245608-00	**1 - 1**

J:\245000\245608-00 Belford to Golden\Work\Internal\Enviro\GIS\01_maps\REF Maps\mxd\REF_revision_figures\Fig1-1_Proposal_boundary.mxd



Legend

- Proposal boundary
- Indicative biodiversity crossing
- Proposal
- Construction compounds
- Possible CCTV / VMS

Client
Roads and Maritime Services

Job Title
Belford to Golden Highway

Figure Title
Key Features of the Proposal

Metres
0 100 200 300 400

Issue	Date	By	Chkd	Appd
D1	12/06/2018	AO	LAS	LH

ARUP
Level 10, 201 Kent Street
PO Box 76 Millers Point
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Scale at A3	Figure Status
1:12,500	Issue

Coordinate System
GDA 1994 MGA Zone 56

Job No	Figure No
245608-00	1 - 2

J:\245000\245608-00 Belford to Golden\Work\Internal\Enviro\GIS\01_maps\REF Maps\mxd\REF_revision_figures\Fig1-2_Key_features2.mxd

1.2 REF display

Roads and Maritime prepared an REF to assess the potential environmental impacts of the proposal. The REF was publically displayed for 29 days between 30 June 2017 and 28 July 2017 at the Service NSW Singleton Service Centre at 158 John Street, Singleton. The REF was placed on the Roads and Maritime project website and made available for download. The display location and website link were advertised in the Singleton Argus on Wednesday, 28 June 2017 and the Maitland Mercury Friday, 30 June 2017. A copy of the advertisement is provided in Appendix A.

A community update (see Appendix B) outlining the key features of the proposal and details of the public display and how to provide feedback was distributed to around 2,600 properties including residences and businesses in Whittingham, Belford, Lower Belford, Branxton and East Branxton. The newsletter was also made available for download on the Roads and Maritime website, and 800 copies were provided at the REF display.

The project webpage was updated on 30 June 2017 with the latest project information including the community update, the REF, and how to submit feedback. A total of 100 page views were recorded for the June project update and 28 page views were recorded for the REF during the consultation period.

A media release reminding the community to provide feedback on the proposal and providing details of the display dates and locations was issued on Friday, 14 July 2017 (Appendix C).

1.3 Purpose of the report

This submissions report relates to the REF prepared for the New England Highway upgrade between Belford and the Golden Highway (the proposal), and should be read in conjunction with that document. The REF was placed on public display and 32 submissions relating to the proposal and the REF were received by Roads and Maritime.

This submissions report documents the following aspects that have occurred since the display of the REF:

- Issues raised in submissions and the Roads and Maritime responses to each issue (Chapter 2)
- Design refinements made to the proposal by Roads and Maritime (Chapter 3)
- Additional investigations carried out and assessment of environmental impacts resulting from the proposed design changes (Chapter 4)
- New or revised environmental management measures to mitigate impacts (Chapter 5).

2. Response to issues

Roads and Maritime Services received 32 submissions, accepted up until 28 July 2017. Table 2-1 lists the respondents and their allocated submission number. The table also indicates where the issues from each submission have been addressed in this report.

Table 2-1: Respondents

Respondent	Submission No.	Section number where issues are addressed
Community member	1	2.2.1
Community member	2	2.2.1, 2.4
Community member	3	2.2.1, 2.6
Community member	4	2.2.1
Community member	5	2.2.1, 2.9
Community member	6	2.9
Community member	7	2.5
Community member	8	2.2.1, 2.2.3, 2.5
Business	9	2.3.1, 2.3.3
Community member	10	2.3.1, 2.4
Community member	11	2.3.1, 2.3.6
Community member	12	2.2.1, 2.3.1, 2.3.4
Singleton Council	13	2.2.1, 2.7
Community member	14	2.2.1, 2.3.1, 2.3.2
Community member	15	2.5, 2.8.2
Community member	16	2.3.1, 2.3.6
Community member	17	2.3.1
Business	18	2.3.1, 2.3.3, 2.3.4
Business	19	2.3.1, 2.3.3, 2.3.4
Business	20	2.3.5
Business	21	2.2.2, 2.3.1, 2.3.2, 2.3.3, 2.3.5, 2.3.7, 2.7
Business	22	2.2.2, 2.3.1, 2.3.2, 2.3.3, 2.3.4
Community member	23	2.5, 2.8.2
Community member	24	2.2.1, 2.3.1, 2.3.4
Community member	25	2.2.1, 2.3.1, 2.3.4
Community member	26	2.2.1,2.3.1, 2.3.4
Business	27	2.3.1, 2.3.3

Respondent	Submission No.	Section number where issues are addressed
Community member (Group submission comprising 106 signatures)	28	2.3.1, 2.3.4
Community member	29	2.5
Community member	30	2.10.1, 2.10.2
Business	31	2.2.4, 2.3.1, 2.3.3, 2.5, 2.8.1, 2.8.2
Business	32	2.2.1, 2.3.1, 2.3.3

2.1 Overview of issues raised

A total of 32 submissions were received in response to the display of the REF. This included submissions from Singleton Council, seven businesses and two business chambers, and 22 community members. One of the community submissions comprised a letter with 106 signatures.

Each submission has been examined individually to understand the issues being raised. The issues raised in each submission have been extracted and collated, and corresponding responses to the issues have been provided. Where similar issues have been raised in different submissions, only one response has been provided. The issues raised and Roads and Maritime response to these issues forms the basis of this chapter.

Of the 32 submissions:

- 12 (about 38 per cent) stated support for the proposed upgrade
- 20 (about 62 per cent) did not clearly state a position
- 18 (about 56 per cent) raised concerns about safety of the proposed abattoir access and u-turn facility
- Eight (about 25 per cent) were concerned the proposal does not cater for the future use of higher productivity vehicles
- Eight (about 25 per cent) were concerned about travel times and efficiency of the road network.

The basis of the submission from Singleton Council was support for the project and the request for further consultation to be carried out with the abattoir during design development.

2.2 Needs and options

2.2.1 Supportive

Submission number(s)

1, 2, 3, 4, 5, 12, 13, 14, 24, 25, 26, 32

Issue description

Respondents expressed support for the proposed upgrade.

Response

Roads and Maritime thanks the community for their support.

2.2.2 Strategic alignment

Submission number(s)

21, 22

Issue description

Respondents raised concerns that the proposal fails to meet the objectives of key local, state, and national plans and NSW Government initiatives for the following reasons:

- Not providing safe and efficient access / egress from the abattoir
- Not incorporating higher productivity vehicles into the road network
- Constraining growth of the abattoir.

Response

Roads and Maritime values the economic importance of the abattoir in the region. Since display of the REF, access arrangements for vehicles entering and exiting the abattoir have been modified in response to submissions received. A roundabout replaces the previously proposed u-turn arrangement at the Golden Highway, maintaining safe access to the New England Highway eastbound flyover entry ramp for vehicles exiting the abattoir while reducing the need for vehicles to cross and merge with the Golden Highway eastbound traffic lane, and merge with the Golden Highway westbound traffic lane. The roundabout would also allow for right-in access to the abattoir site without the need to cross traffic. This design change has been made in consultation with the abattoir.

Roads and Maritime is progressively upgrading the network to accommodate higher productivity vehicles. The New England Highway upgrade between Belford and the Golden Highway is being designed to cater for the long term vision for both the New England Highway and Golden Highway by catering for Performance-Based Standards (PBS) 2B vehicles (up to 30 metres).

PBS is a national heavy vehicle scheme designed to allow the heavy vehicle industry to explore customised vehicle configurations within a group of parameters to achieve higher productivity. PBS are part of the higher productivity vehicle strategy, in combination with designing for greater loads (bridge and road pavement design).

By designing for PBS, the proposal meets NSW Government initiatives and National plans to incorporate higher productivity vehicles into the road network. The roundabout will be designed for PBS 2B vehicles (up to 30 metres) and provide for safe and efficient access to the abattoir, helping to support local and State strategic and economic plans by recognising the importance of the abattoir in the region.

2.2.3 Tie-in with Singleton Bypass

Submission number(s)

8

Issue description

The respondent requested that the project ties in with the Singleton Bypass to help achieve better outcomes for traffic in the region.

Response

Both the New England Highway upgrade between Belford and the Golden Highway and the Singleton Bypass form part of the *New England Highway Draft Corridor Strategy* (NSW Government, 2016) which sets out the NSW Government's 20 year plan for the management and development of the New England Highway. The two projects will be integrated through implementation of the strategy, which will help achieve consistency in the planning, management and operation of the New England Highway.

2.2.4 Alternative options

Submission number(s)

31

Issue description

An alternative option to the proposal of a grade separated orbital interchange was suggested. This option includes direct access to land on the eastern side of the New England Highway.

Response

The current land use of the property to the east of the New England Highway is agricultural. The land has been rezoned as Heavy Industrial although no approved development applications have been granted. Legal access points are located to the north at New Freugh Lane and from the New England Highway east of the intersection with the Golden Highway. The proposal does not alter the current access arrangements to and from this property.

2.3 Abattoir access and u-turn facility

2.3.1 Safety

Submission number(s)

9, 10, 11, 12, 14, 16, 17, 18, 19, 21, 22, 24, 25, 26, 27, 28, 31, 32

Issue description

Respondents raised concerns about the safety of the abattoir access and proposed u-turn facility. Concerns related to:

- Changes in opportunities to enter the traffic stream due to faster moving traffic
- Travel during peak traffic periods for the employees of the abattoir and movements of freight vehicles (B-double trucks)
- Sight distance due to proximity of proposed u-turn facility to the crest in the road
- Slow acceleration of trucks merging with and crossing fast traffic
- Confusion of drivers using the interchange
- Confusion of drivers using u-turn facility
- Capacity of the u-turn facility to cater for the number of vehicles during peak periods
- Potential for drivers to ignore the u-turn facility and perform illegal u-turns.

Response

Since display of the REF, access arrangements for vehicles entering and exiting the abattoir have been modified in response to the submissions received. A roundabout now replaces the previously proposed u-turn facility at the Golden Highway. The roundabout would provide a consolidated access for lots to the north and south of the Golden Highway. As part of this change, the abattoir access road would be realigned to connect to the roundabout, with the existing access at the abattoir would be decommissioned once the new roundabout and access road is completed. The roundabout would safely manage entry to existing traffic flows on the Golden Highway for vehicles entering from properties to the north and south.

Staff and freight vehicles travelling from the abattoir would have direct access to the roundabout, ensuring safe access to and from the Golden Highway is maintained at all times, including during peak traffic periods. The size and alignment of the roundabout has been designed to provide for safe turning movements by higher productivity vehicles (up to 30 metres).

The roundabout has been located on the crest to provide visibility from a distance that would allow drivers to safely approach the roundabout. Detailed design for the roundabout would be in accordance with the safe sight distance requirements in the Roads and Maritime supplement to the AUSTROADS Guide to Road Design Part 4B: Roundabouts.

The roundabout in place of the u-turn facility would remove the requirements for vehicles exiting the abattoir to cross and merge with the Golden Highway eastbound traffic lane, and merge with the Golden Highway westbound traffic lane. It would provide a safe solution for heavy vehicles from the abattoir to access the Golden Highway and flyover entry ramp.

The roundabout would provide a more traditional access arrangement for the abattoir property. The additional movements associated with the u-turn facility would be removed by the adoption of a roundabout. This arrangement addresses concerns around confusion for drivers exiting the abattoir heading eastbound to access the New England Highway.

The capacity of the roundabout has been assessed via a traffic assessment. This assessment identified that the roundabout would perform with overall good operation under the conditions tested, which included a range of future traffic scenarios (see section 4.4 for further detail).

Removal of the u-turn facility and replacement with a roundabout providing efficient access from the Golden Highway to properties to the north and south would also remove the potential for drivers to perform illegal u-turns to access properties and existing traffic flows.

An independent road safety audit will be carried out in further stages of project development. A road safety audit will review the project design and identify any conflicting elements of the design that may impact on road safety. The final design will take into account the results of the road safety audit and the applicable road design and safety standards.

2.3.2 Alternative options for abattoir access

Submission number(s)

14, 21, 22

Issue description

A number of alternative arrangements for the abattoir access were recommended. These included:

- A new access road and single-span bridge over the Golden Highway for vehicles accessing the abattoir to and from the Golden Highway eastbound. For vehicles travelling westbound on the Golden Highway left in/ left out access was proposed.

- A new access road across and underpass of the Golden Highway for vehicles accessing the abattoir to and from the Golden Highway eastbound. For vehicles travelling westbound on the Golden Highway left in/ left out access was proposed.
- A merge lane onto the right-hand entry of the proposed new flyover for traffic exiting the abattoir.

Response

The arrangement for vehicles exiting the abattoir site heading eastbound towards the New England Highway has been modified in response to submissions received during the REF display period.

The design now incorporates a roundabout on the Golden Highway to enable movements to and from a new abattoir access road and to the properties to the north.

In comparison to the alternative arrangements recommended in the submissions, the roundabout would:
- Remove the need for vehicles to merge with the Golden Highway westbound and eastbound traffic
- Provide a more consolidated access for lots to the north and south of the Golden Highway, including the old Golden Highway alignment
- Provide more direct access for vehicles exiting the abattoir to the Golden Highway and the New England Highway eastbound entry ramp
- Include fewer conflict points between vehicles travelling between the abattoir, Golden Highway, lots to the north of the Golden Highway, and the New England Highway eastbound entry ramp
- Include a smaller footprint of work compared to the underpass option.

Consideration of the safety of movements to and from the abattoir has been further discussed in section 2.3.1.

2.3.3 Higher productivity vehicles

Submission number(s)

9, 18, 19, 21, 22, 27, 31, 32

Issue description

Respondents raised concerns that the proposal doesn't provide for the use of higher productivity vehicles in the future, in particular the u-turn facility, which would restrict the use of higher productivity vehicles accessing the abattoir.

Response

Roads and Maritime is progressively upgrading the network to accommodate higher productivity vehicles. The New England Highway upgrade between Belford and the Golden Highway is being designed to cater for the long term vision for both the New England Highway and Golden Highway by catering for Performance-Based Standards (PBS) 2B vehicles (up to 30 metres).

In response to submissions received, a roundabout replaces the previously proposed u-turn arrangement at the Golden Highway. This roundabout has been designed to current road design standards. The size and alignment of the roundabout has been designed to provide for turning movements by higher productivity vehicles (up to 30 metres).

2.3.4 Travel times and efficiency of network

Submission number(s)

12, 18, 19, 22, 24, 25, 26, 28

Issue description

Respondents raised concerns that the u-turn facility and associated manoeuvres would increase travel times for vehicles exiting the abattoir and accessing the New England Highway, particularly during peak travel times. Concern was also raised that the lack of adequate access into the abattoir by higher productivity vehicles would counter the efficiency gained elsewhere on the network for those vehicles. One respondent believed the proposal would cause a 'choke point' at the abattoir entry point.

Response

As above, the arrangement for vehicles accessing the abattoir site has been modified in response to the submissions received. A roundabout and new access road replaces the previously proposed u-turn facility at the Golden Highway. This roundabout would allow efficient access to and from the abattoir site and has been designed to provide for turning movements by higher productivity vehicles (up to 30 metres).

Traffic modelling has been carried out to assess the performance of the proposal (see section 4.4). The traffic modelling indicated that overall the proposed roundabout would perform with good operation. This included sensitivity testing for the "worst-case" scenario where abattoir traffic was doubled in addition to the forecast traffic growth. The worst impacts were modelled during the AM peak in 2031 where an average delay of 18 seconds is expected for right turn movements from the abattoir onto the Golden Highway.

Overall, the proposal would continue to meet the proposal objectives by reducing congestion and peak period delays at the New England Highway and Golden Highway intersection, and improving travel times in both directions along the New England Highway.

2.3.5 Impact to business

Submission number(s)

20, 21

Issue description

Respondents raised concerns that the proposal would have an impact on the abattoir business. These issues are summarised as follows:

- Concerns the abattoir would face higher journey insurance costs and operational costs due to injury time as a result of staff at the abattoir having to use the proposed u-turn facility when exiting the abattoir and accessing the New England Highway
- Concerns the abattoir would face higher insurance costs for company vehicles as a consequence of accidents if the proposed u-turn facility is implemented
- Concerns the abattoir would be at a commercial disadvantage if higher productivity vehicles are not catered for in the design.

Response

In response to submissions received and in consultation with local stakeholders, a roundabout replaces the previously proposed u-turn arrangement at the Golden Highway. This roundabout has been designed to current road design standards. The roundabout will maintain safe access for all vehicles including those travelling on the Golden Highway, as well as those accessing the abattoir and properties to the north. Consideration of the safety of movements to and from the abattoir has been further discussed in section 2.3.1.

Roads and Maritime is progressively upgrading the network to accommodate higher productivity vehicles. The New England Highway upgrade between Belford and the Golden Highway is being designed to cater for the long term vision for both the New England Highway and Golden Highway by catering for Performance-Based Standards (PBS) 2B vehicles (up to 30 metres). Consideration of higher productivity vehicles in the design of the project has been further discussed in section 2.3.3.

2.3.6 Animal welfare

Submission number(s)

11, 16

Issue description

Respondents raised concerns about animal welfare for livestock trucks using the u-turn facility.

Response

As above, a roundabout replaces the previously proposed u-turn arrangement at the Golden Highway. This roundabout has been designed to current road design standards, which considers vehicle overtopping. The roundabout will maintain safe access for all vehicles, including livestock trucks accessing the abattoir. Consideration of the safety of movements to and from the abattoir has been further discussed in section 2.3.1.

2.3.7 Further information

Submission number(s)

21

Issue description

The following information was requested:

- The findings of the road safety audit for the u-turn facility and abattoir access
- Outputs of the traffic capacity (SIDRA) modelling.

Response

In response to submissions received and in consultation with local stakeholders, a roundabout replaces the previously proposed u-turn arrangement at the Golden Highway. This roundabout has been designed to current road design standards. The roundabout will maintain safe access for all vehicles including those travelling on the Golden Highway, as well as those accessing the abattoir and properties to the north.

Further consultation with business owners around the proposal was carried out in response to submissions received to the REF. Consultation included the proposed roundabout on the Golden Highway and access

arrangements into the abattoir. Roads and Maritime will continue to consult with all surrounding business owners during the detailed design stage.

2.4 Golden Highway intersection

Submission number(s)

2, 10

Issue description

Respondents raised concerns about the turns from the New England Highway onto the Golden Highway. The issues are summarised as follows:

- Conflict between vehicles turning right with vehicles turning left onto the Golden Highway from the New England Highway
- Concerns that there does not appear to be any improvement to the alignment (straightening) of the left turn from the New England Highway onto the Golden Highway
- Confusion of motorists with the current give-way arrangement on the New England Highway for vehicles turning left into the Golden Highway.

Response

Since display of the REF, the intersection of the New England Highway and Golden Highway has been modified in response to the submissions received. These modifications will reduce potential conflict between vehicles and improve the safety at this intersection.

Improvements to the intersection include:

- Removal of the existing give-way sign and linemarking at the New England Highway left turn lane
- Raised traffic islands at the intersection to provide improved delineation for all turning movements, including separation between vehicles
- Provision for vehicles turning onto the Golden Highway to merge west of the intersection.

Design changes proposed at the New England Highway and Golden Highway intersection since display of the REF have been further discussed in section 3.2.

2.5 Unrelated / out of scope

Submission number(s)

7, 8, 15, 23, 29, 31

Issue description

Respondents raised issues outside the boundaries of the proposal's scope. These issues are summarised as follows:

- Concern about the left turn into Bell Road from the New England Highway (eastbound) and request for the left turn lane to be maintained and extended to ensure safety
- Concern about lack of merge lane when turning left out of Bell Road onto the New England Highway (eastbound). Request for left turn acceleration lane out of Bell Road onto the New England Highway (eastbound) to be considered to assist with movement onto the highway during peak traffic
- Request for a right turn acceleration lane to be considered for traffic merging from the centre median onto the New England Highway westbound carriageway from Bell Road, or an interchange at Bell Road for traffic turning right to allow vehicles to safely merge with traffic travelling westbound on the New England Highway

- Concerns that there are different traffic arrangements at every intersection between Bell Road and Standen Drive
- Request for merging lane from Kirkton Road for vehicles turning left to safely merge into the fast moving traffic on the New England Highway (eastbound)
- Request for merging lane from Standen Drive for vehicles turning left to safely merge into the fast moving traffic on the New England Highway (eastbound)
- Request for merging lane in the centre median from Pothana Lane for vehicles turning right to safely merge into the fast moving traffic on the New England Highway (eastbound)
- Request for merging lane in the centre median from Hermitage Road for vehicles turning right to safely merge into the fast moving traffic heading on the New England Highway (eastbound)
- Concerns about lack of merge lane when turning left out of Hermitage Road onto the New England Highway (westbound)
- Request for u-turn bays in the centre median so vehicles can turn left onto the New England Highway (from Bell Road, Kirkton Road and Standen Drive) and have time to safely negotiate across two lanes of traffic to turn around and head westbound, rather than having to cut straight across the eastbound carriageway
- Concerns about lack of central access to land on the eastern side of the New England Highway, as presented in the Singleton Council DCP
- Heavy vehicles between Mount Thorley and Singleton be designated to use the Golden Highway and the New England Highway to avoid Putty Road and Singleton back streets.

Response

The scope of the proposal is for duplication of the New England Highway between Belford and the Golden Highway to provide a divided road with two travel lanes in each direction and provision of a flyover for vehicles turning right from the Golden Highway towards Maitland and Newcastle.

The boundary for the proposal is shown in Figure 1-1 and is between Bell Road west and the Golden Highway.

The left and right turns into Bell Road from the New England Highway are considered to be outside of the scope of the proposal. As noted in section 3.2.4 of the REF, the left turn lane from the New England Highway eastbound onto Bell Road would be retained and following completion of the duplication it would be re-line marked as per the existing arrangement.

The left and right turns from Bell Road onto the New England Highway are considered to be outside of the scope of the proposal. As such, the existing turning movements from Bell Road onto the New England Highway would be maintained by the proposal.

The intersections between Bell Road and Standen Drive fall outside of the bounds of the proposal.

In response to access provisions to land on the eastern side of the New England Highway, this falls outside the scope of this proposal. Roads and Maritime will continue to work with the developer separately in accordance with the Roads and Maritime processes and procedures for land use development.

The designation of heavy vehicle routes between Mount Thorley and Singleton is beyond the scope of this proposal.

2.6 Program

Submission number(s)

3

Issue description

A request was made for information about when the flyover would become operational.

Response

If approved, it is expected that the project could be operational by 2022. This would be subject to project approval, funding availability, construction programming and weather conditions.

2.7 Stakeholder and community consultation

Submission number(s)

13, 21

Issue description

Singleton Council and others requested that further consultation be carried out with the abattoir regarding access and egress impacts on their site.

The abattoir has stated that references made in the REF to consultation carried out with the abattoir does not accurately represent their position on the u-turn facility. It is requested that the REF be updated accordingly, in particular:

- Table 5-5 of the REF does not accurately capture the abattoir's request for the u-turn facility to cater for all types of vehicles
- Table 5-5 of the REF does not respond to concerns raised by the abattoir about speed related issues for the flyover or a grade-separated access to the abattoir
- The abattoir has no record of making a submission about the option of a roundabout at the intersection of the Golden Highway and New England Highway, as detailed in Table 5-5 of the REF
- The REF does not capture submissions made by the abattoir in relation to safety and capacity and sight distance and potential through / turning traffic conflict.

Response

Since display of the REF, Roads and Maritime has carried out further consultation with representatives of the abattoir and other businesses directly impacted by the proposal. Consultation included the proposed roundabout on the Golden Highway, access arrangements into the abattoir and property acquisition. Roads and Maritime will continue to consult with all surrounding business owners during the detailed design and construction stages.

References to consultation made by the abattoir within the REF have been updated below in Table 2-2. The responses to the issues raised during this consultation have been updated following the design changes that have occurred since REF display. These are also included in Table 2-2 .

Table 2-2: Updated summary of stakeholder consultation with the abattoir

Stakeholder	Issue raised	Response
Abattoir	Concern around the right turn into the u-turn facility from the Golden Highway during the 3-4pm peak traffic period and the potential for queuing in the right hand turn lane. Also B-doubles coming out of the u-turn facility being able to get up to speed in time to safely merge with traffic on route to the flyover. Concern about the capacity of the u-turn facility to cater for all vehicle types.	A roundabout is now proposed in place of the u-turn facility at the Golden Highway, removing the previous traffic merge arrangements. The roundabout has been designed to cater for Performance-Based Standards (PBS) 2B vehicles (up to 30m).
Abattoir	Consideration of the approach speed leading up to the flyover ~~whether a roundabout had been investigated at the intersection of the Golden Highway and New England Highway,~~ and the potential for a grade separated entrance to the abattoir, east of the Golden Highway.	The approach speed leading up to the flyover would be 70 km/h. However the proposed roundabout would remove the previous traffic merge arrangements. Access to the abattoir would be via the roundabout.
Abattoir	Concerns about safety, capacity, sight distance and potential through / turning traffic conflict at the u-turn facility.	A roundabout is now proposed in place of a u-turn facility at the Golden Highway. Detailed design for the project would be in accordance with the safe sight distance requirements in the Roads and Maritime supplement to the AUSTROADS Guide to Road Design Part 4B: Roundabouts.

Further notification on the status of the project was provided via a community update in April 2018. This update also noted that the concept design would be refined following the REF display period. The community update was distributed via letter box drop with the same coverage area as the previous notification for the REF display period on 23 April 2018. The project webpage was updated on 26 April 2018 and a post on Facebook was made directing readers to the project webpage on 1 May 2018.

2.8 Land use and property

2.8.1 Property acquisition

Submission number(s)

31

Issue description

The respondent raised concern about the large portion of land to be acquired for the project and the lack of explanation for this.

Response

In response to the submissions received, Roads and Maritime has refined the design. These changes include:

- Replacement of the u-turn facility with a roundabout on the Golden Highway
- Reduced median width between the New England Highway new eastbound and westbound carriageways
- Improved arrangement for vehicle movements at the Golden Highway and New England Highway intersection
- Amended alignment of the flyover and eastbound entry ramp.

These changes have enabled a reduction in property acquisition required for this project. Changes to property acquisition impacts are included in section 4.7.

Since REF display further consultation has been carried out with the respondent regarding property acquisition. The proposed property acquisition provides provision for future upgrade of the New England Highway in this area. This provides the landowner clarity of the impact of future road upgrades enabling the owner to plan for the development of their land.

2.8.2 Property access

Submission number(s)

15, 23, 31

Issue description

Respondents raised concerns related to road safety when accessing properties located on the New England Highway. These concerns include:

- Access to the approved subdivision via the proposed u-turn facility
- No provisions for left turn lane into properties
- Need for B-doubles to use two lanes to turn into properties
- Right turn movements into properties.

Response

In response to submissions received and in consultation with local stakeholders, a roundabout replaces the previously proposed u-turn arrangement at the Golden Highway. The roundabout will maintain safe access for all vehicles including those travelling on the Golden Highway, as well as those accessing the properties to the north. This roundabout will provide the approved subdivision access via a service road using the old Golden Highway alignment.

As part of the proposal access to properties along the New England Highway will be restricted to left in and left out. This is required to improve safety for all motorists along this section of road and is consistent with highway upgrades throughout NSW. This is consistent with the design as displayed in the REF. Alternative right turn arrangements are available to the east and west of the properties via the proposed roundabout on the Golden Highway and Bell Road.

2.9 Biodiversity

Submission number(s)

5, 6

Issue description

A respondent raised concerns about impacts to biodiversity, particularly:

- The loss of habitat in the road-side corridor

- Connectivity with Belford National Park
- The proposed aerial crossing does not cater for all species or habitat loss.

The respondent also requested further information on proposed biodiversity management measures and offsets.

One respondent offered their property to be used for biodiversity offsetting.

Response

An updated biodiversity assessment in line with the proposed design modifications is provided in section 4.1 of this report. Construction of the proposal would result in clearing of 13.06 hectares of threatened vegetation under the NSW *Biodiversity Conservation Act 2016 (BC Act),* of this 9.66 hectares also meets the definition of threatened vegetation under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).The proposal will remove 13.06 hectares of open forest woodland and 0.90 hectares of aquatic habitat. Eighteen hollow bearing trees are proposed to be removed. The majority of this vegetation is located to the north of the New England Highway and extends to Belford National Park. To mitigate the loss of fauna habitat and to maintain connectivity with the Belford National Park a number of measures have been proposed. These measures include the development of a nest box strategy and installation of an aerial crossing. A flora and fauna management plan would be prepared prior to the commencement of construction to detail how impacts to biodiversity would be minimised and managed.

Squirrel Gliders are listed as Vulnerable under the BC Act. This species has been recorded in two locations within the proposal area. A large area of high quality habitat is available on the northern side of the New England Highway. This habitat provides foraging, breeding and roosting habitat for the species. The proposal will remove some of this habitat. This includes widening which would increase the distance the species would be required to glide to cross the New England Highway. The aerial crossing has been proposed to target Squirrel gliders to facilitate the safe crossing of the road. Squirrel gliders have been targeted due to their known presence within the proposal area, conservation status and potential impacts. For more information see the biodiversity assessment in Appendix D of the REF.

A calculation of the required biodiversity offsets is provided in the updated biodiversity assessment in Appendix D. A Biodiversity Offset Strategy for the project would be developed following approval of the proposal. The Biodiversity Offset Strategy would document how the offsets will be delivered. Landowners of suitable offsets would be contacted during the development of this strategy.

Further consultation was carried out with the respondent to provide additional information on how biodiversity impacts will be managed.

2.10 Aboriginal heritage

2.10.1 Cultural heritage assessment report

Submission number(s)

30

Issue description

The following concerns were raised in relation to the CHAR:

- The Cultural Heritage Assessment Report (CHAR) was not prepared in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* and does not meet the requirements of Clause 80D in the *National Parks and Wildlife Regulation 2009*

- The environment to be impacted upon has not been adequately described in the REF and Roads and Maritime has not discharged it duty under the section 5.5(1) of the *Environmental Planning and Assessment Act 1979*
- The methodology for the stage two site survey was limited to physical investigations and involved splitting into two survey groups for part of the project area
- No mention in the CHAR of anthropological investigation in relation to the cultural significance (intangible cultural heritage) of the area
- Requested that Roads and Maritime Services carry out "an ethnographic assessment of the project area"
- There is no clear process for identification of cultural knowledge held by Aboriginal stakeholders nominated for participation in the cultural values report as per the Burra Charter
- Investigation of intangible heritage values has not been carried out by a qualified anthropologist and the report is overwhelmingly archaeological and historical in nature
- Cultural values summarised by the respondent has not been adequately assessed in the CHAR
- Identified that consultation with native title parties is highly relevant to the assessment process that is referenced in section 3.3.1 of the OEH *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*. No other persons or groups who claim to be cultural knowledge holders have a comparable, or independently assessed position
- Requested that the respondent be engaged to undertake an ethnographic (cultural values) assessment of the project area.

Response

The CHAR was prepared in accordance with the Roads and Maritime *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI). This procedure sets out a consultation process consistent with NSW Office of Environmental and Heritage (OEH) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* and the *National Parks and Wildlife Amendment Regulation 2009.* For the purposes of applying for an Aboriginal Heritage Impact Permit (AHIP), the CHAR meets the requirements of Clause 80D in the *National Parks and Wildlife Regulation 2009*.

The CHAR has been updated in line with the proposed design modifications and is provided in section 4.2 and Appendix E of this report. The CHAR as well as the REF and additional environmental assessments within this Submissions Report has taken into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the proposed activity in accordance with section 5.5(1) of the EP&A Act.

The stage two site survey was completed in accordance with section 2.2 of OEH *Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW 2010.* Impacts to Aboriginal culture (intangible heritage) were considered through an Aboriginal Cultural Values Assessment carried out by Waters Consultancy. The outcomes of the Aboriginal Cultural Values Assessment are summarised in section 6 of the CHAR and the report is attached to the CHAR as Appendix C. The Aboriginal Cultural Values Assessment was conducted in accordance with the PACHCI and the OEH *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*. This included consultation with cultural knowledge holders regarding historical and cultural values within the study area. Cultural knowledge was gathered pursuant to section 3.3.1 of the OEH *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*.

The Burra Charter and Indigenous Cultural Heritage Management Practice Note 2013 emphasises the importance of including in any assessment process "all kinds of connections, whether 'ancestral', 'traditional' or 'historical'." The Burra Charter states, "Advice may need to be sought on who are the relevant knowledge holders". The Aboriginal community may be reasonably understood as the appropriate group for the provision of such advice. This is consistent with the OEH guidelines focus on Aboriginal community decision making. In line with this approach the PACHCI places the determination of who should be engaged with as cultural knowledge holder(s) with the registered Aboriginal parties, not the consultants, and that procedure has been adhered to in this process.

A number of opportunities as detailed in section 2.10.2 were offered to the registered Aboriginal parties to nominate cultural knowledge holders. All nominees were contacted and invited to participate in the cultural values assessment process. Since display of the REF, further consultation has been carried out to gather cultural information. Roads and Maritime will continue to assess any future cultural information provided post REF determination.

There is no approved determination of native title on land affected by the project. There is one registered native title claimant for the project area, who is also a registered Aboriginal party for the project. The native title claimant were invited to participate throughout the consultation process and preparation of the cultural values assessment. Further details are provided within section 2.10.2.

As identified above, Waters Consultancy was engaged to undertake an Aboriginal Cultural Values Assessment. PACHCI and OEH guidelines state that it is only when an approved native title determination exists over the project area that there is the option to consult solely with the native title holder. As there is no determined native title in the project area an independent consultant was engaged. All registered Aboriginal parties were provided the opportunity to nominate knowledge holders to participate in the Aboriginal Cultural Values Assessment.

2.10.2 Aboriginal stakeholder consultation

Submission number(s)

30

Issue description

The respondent raised concerns regarding the consultation process carried out during the preparation of the CHAR. Specifically that there was no consultation or engagement with the native title claimant during Stage 3 of PACHCI.

Response

As there is no approved determination of native title in the project area there is no requirement within the PACHCI or the OEH guidelines for the consideration of native title rights and interests beyond ensuring that any native title claimants, along with a range of other Aboriginal organisations and individuals, are provided with notification of the project in writing. There is one registered native title claimant for the project area, who is represented by a registered Aboriginal party for the project. This registered Aboriginal party were invited to participate throughout the consultation process. The opportunities are detailed in section 4.3.2 of the REF and include:

- Participation by a representative in a site walkover
- Invitation to attend all three Aboriginal Focus Group (AFG) meetings for the proposal
- The opportunity to:
    - Comment on the proposed Aboriginal archaeological and cultural heritage assessment methodologies
    - Nominate cultural knowledge holders
    - Provide information on the Aboriginal cultural values of the area
    - Nominate site officers
    - Comment on the draft CHAR
    - Comment on the updated CHAR following design changes.

The rights of Native Title Claimants to land impacted by the project have been upheld in accordance with the OEH *Aboriginal cultural heritage consultation requirements for proponents 2010.*

3. Changes to the proposal

Since display of the REF, the following design refinements have been made to the proposal:

- Replacement of the u-turn facility with a roundabout at the Golden Highway
- Improved arrangement for vehicle movements at the Golden Highway and New England Highway intersection
- Reduced median width between the New England Highway eastbound and westbound travel lanes
- Amended alignment of flyover and eastbound entry ramp
- Revised construction compound areas.

3.1 Replacement of the u-turn facility with a roundabout at the Golden Highway

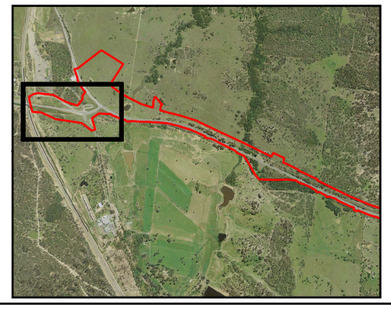
During display of the REF, safe operation of the u-turn facility for access to and from the abattoir and properties to the north of the Golden Highway was raised as a concern. As a result, the concept design has been modified. The proposal now includes a four-leg roundabout approximately 350 metres from the intersection of the Golden Highway and New England Highway, as shown in Figure 3-1. This replaces the u-turn facility assessed as part of the REF.

The roundabout provides a consolidated access for lots to the north and south of the Golden Highway. As part of this change, the abattoir access road has been realigned to connect to the roundabout. Properties to the north will access the roundabout via a service road using the old Golden Highway alignment. The proposed changes would maintain safe access to the eastbound flyover entry ramp for all vehicles and removes the need for vehicles to merge with Golden Highway traffic.

The existing access at the abattoir will be decommissioned once the new roundabout and access road is completed. The new access road will be located within the abattoir property. No additional property acquisition is proposed.

Legend

- Proposal
- Proposal boundary



Client
Roads and Maritime Services

Job Title
Belford to Golden Highway

Figure Title
Roundabout Detail

Metres
0 10 20 30 40 50

Issue	Date	By	Chkd	Appd
D1	26/06/2018	AO	LAS	LH

ARUP
Level 10, 201 Kent Street
PO Box 76 Millers Point
Sydney, NSW 2000
Tel +61 (2)9320 9320 Fax +61 (2)9320 9321
www.arup.com

Scale at A3	Figure Status
1:2,000	Issue

Coordinate System
GDA 1994 MGA Zone 56

Job No	Figure No
245608-00	3 -1

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3.2 Improved arrangement for vehicle movements at the Golden Highway and New England Highway intersection

Since display of the REF, the intersection of the New England Highway and Golden Highway has been modified in response to the submissions received. These modifications will reduce potential conflict between vehicles and improve the safety at this intersection.

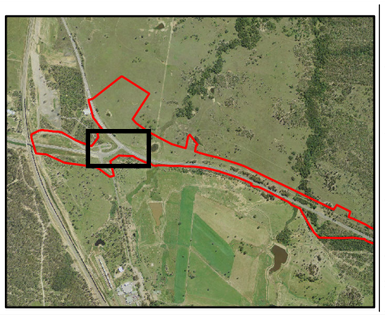
Improvements to the intersection include:

- Removal of the existing give-way sign and linemarking at the New England Highway left turn lane
- Raised traffic islands at the intersection to provide improved delineation for all turning movements, including separation between vehicles
- Provision for vehicles turning onto the Golden Highway to merge west of the intersection.

The proposal for the Golden Highway and New England Highway intersection is shown in Figure 3-2.

Legend

- Proposal
- Proposal boundary
- New England to Golden Highway Merge
- New England to Golden Highway Right Turn
- New England to Golden Highway Left Turn
- Existing Traffic Islands
- Proposed Traffic Islands



Client
Roads and Maritime Services

Job Title
Belford to Golden Highway

Figure Title
New England Highway and Golden Highway intersection

Metres
0 5 10 15 20 25

Issue	Date	By	Chkd	Appd
D1	12/06/2018	AO	LAS	LH

ARUP
Level 10, 201 Kent Street
PO Box 76 Millers Point
Sydney, NSW 2000
Tel +61 (2)9320 9320 Fax +61 (2)9320 9321
www.arup.com

Scale at A3	Figure Status
1:1,000	Issue

Coordinate System
GDA 1994 MGA Zone 56

Job No	Figure No
245608-00	3 -2

J:\245000\245608-00 Belford to Golden\Work\Internal\Enviro\GIS\01_maps\REF Maps\mxd\REF_revision_figures\Fig3-2_Intersection_Draft2.mxd

3.3 Reduced median width between the New England Highway eastbound and westbound travel lanes

Since the display of the REF, Roads and Maritime has reviewed the long term strategic upgrade of the New England Highway. This review identified an opportunity to reduce the footprint of the work. One aspect of this change is to reduce the width of the median from the previously proposed 12 metres to a minimum 8.5 metres.

The reduced median width between the New England Highway eastbound and westbound travel lanes provides the following opportunities:

- Reduced footprint of road infrastructure in several areas on the northern side of the New England Highway
- A reduction in property acquisition
- Reduced impact on utilities in terms of extent of proposed fill above the underground critical gas main that runs along the northern side of the New England Highway, resulting in a reduced length of the gas main needing protection
- Potential for reduced costs due to shortened culverts.

This does not change the proposed capacity for the New England Highway, as two lanes in both the westbound and eastbound direction are retained as part of the design. It is also proposed to install a safety barrier in the median along the length of the New England Highway to Bell Road.

Further detail for sections of the New England Highway changed as part of the proposal is shown in Figure 3-3.

Golden Highway

New England Highway

Bell Road

Metres
0 10 20

Metres
0 10 20

Metres
0 10 20

Metres
0 10 20

Legend

- Proposal
- Median
- Proposal boundary

Client
Roads and Maritime Services

Job Title
Belford to Golden Highway

Figure Title
Median

Metres
0 100 200 300 400

Issue	Date	By	Chkd	Appd
D1	26/06/2018	AO	LAS	LH

ARUP
Level 10, 201 Kent Street
PO Box 76 Millers Point
Sydney, NSW 2000
Tel +61 (2)9320 9320 Fax +61 (2)9320 9321
www.arup.com

Scale at A3	Figure Status
1:12,000	Issue

Coordinate System
GDA 1994 MGA Zone 56

Job No	Figure No
245608-00	3 - 3

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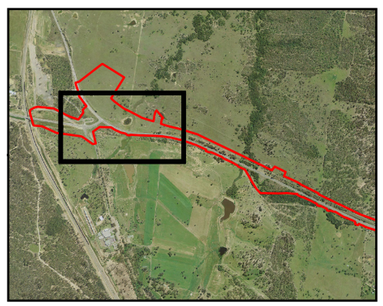
3.4 Amended alignment of flyover and eastbound entry ramp

The flyover for right turn vehicle movements from the Golden Highway onto the New England Highway has been realigned further south compared to the design assessed as part of the REF. As part of the changes, the length of the flyover structure above the New England Highway has been increased, while the width of the flyover structure above the New England Highway has been reduced. The flyover will join eastbound traffic on the New England Highway slightly west compared to the design assessed in the REF. Realignment of the flyover reduces the extent of property acquisition to the north.

The revised design for the flyover is shown in Figure 3-4.

Legend

- Proposal
- Proposal boundary



Client
Roads and Maritime Services

Job Title
Belford to Golden Highway

Figure Title
Flyover Detail

Metres
0 25 50 75 100

Issue	Date	By	Chkd	Appd
D1	12/06/2018	AO	LAS	LH

ARUP
Level 10, 201 Kent Street
PO Box 76 Millers Point
Sydney, NSW 2000
Tel +61 (2)9320 9320 Fax +61 (2)9320 9321
www.arup.com

Scale at A3	Figure Status
1:2,500	Issue

Coordinate System
GDA 1994 MGA Zone 56

Job No	Figure No
245608-00	3 - 4

J:\245000\245608-00 Belford to Golden\Work\Internal\Enviro\GIS\01_maps\REF Maps\mxd\REF_revision_figures\Fig3-4_Flyover2.mxd

3.5 Construction compounds

Due to realignment of the flyover and the opportunity to reduce property acquisition, the potential construction compound locations outlined in the REF has been revised. Figure 3-5 shows the location of the proposed construction compounds and sites.

The main compound site between the proposed flyover and the New England Highway (noted as possible main construction compound 1 on Figure 3-8 of the REF), has been removed from the project due to realignment of the flyover. The loss of this area has been replaced by modifying the compound site to the north of the proposed flyover (noted as possible main construction compound 2 on Figure 3-8 of the REF). This site is identified as Area 2 on Figure 3-5 and has been realigned since the REF to increase the area of the compound site, while minimising impacts to sensitive areas.

The auxiliary construction compound identified adjacent to the Golden Highway, identified as Area 1 on Figure 3-5, remains as set out in the REF. This compound would provide for additional material handling, stockpiling and facilities.

Additional areas (Areas 3, 4 and 5 on Figure 3-5) have also been identified for potential use as construction site and include areas south of the new eastbound entry ramp, south of the dam, and north of the New England Highway towards the middle of the project. All construction sites have been located to avoid impact to Aboriginal heritage sites and native vegetation where practicable.

Areas of compound sites 2, 4 and 5 that fall outside of the acquisition boundary could be leased during construction.

Golden Highway

New England Highway

Bell Road

1

2

3

4

5

Legend

- Proposal boundary
- Construction Compounds
- Proposal

Client
Roads and Maritime Sensitive

Job Title
Belford to Golden Highway

Figure Title
Construction Compounds

Metres
0 100 200 300 400

D1	12/06/2018	AO	LAS	LH
Issue	Date	By	Chkd	Appd

ARUP
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Sydney, NSW 2000
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www.arup.com

Scale at A3	Figure Status
1:12,500	Issue

Coordinate System
GDA 1994 MGA Zone 56

Job No	Figure No
245608-00	3 - 5

J:\245000\245608-00 Belford to Golden\Work\Internal\Enviro\GIS\01_maps\REF Mapsimxd\REF_revision_figures\Fig3-5_Construction compounds2.mxd

4. Environmental assessment

The following sections contain additional environmental assessment carried out for the project since display of the REF. Only additional potential impacts (positive or negative) resulting from the proposal are discussed in the following sections. Impacts considered to be consistent with the REF or regarded as being neutral have not been discussed.

4.1 Biodiversity

An addendum Biodiversity assessment for the proposal was prepared by Environmental Property Services in May 2018. The addendum Biodiversity assessment is summarised below and provided in Appendix D.

4.1.1 Methodology

The methodology for the assessment of biodiversity impacts associated with the proposal remains as set out in the REF (see section 6.6.1). The study area for the assessment has been updated to account for the revised project boundary, the supplementary study area includes land to the south of the Golden Highway and west of the existing New England Highway carriageway which was not assessed previously (see Figure 4-1). Updated database and literature reviews searches were carried out by Environmental Property Services prior to additional surveys on 8 and 9 May 2018. The field survey consisted of:

- Review of aerial photographs to assist in stratifying the supplementary study area into vegetation types
- Updated flora and fauna species lists
- Assessment of Threatened Ecological Communities listed on the *Biodiversity Conservation Act 2016* (supersedes the *Threatened Species Conservation Act 1995*) and/or the *Environment Protection and Biodiversity Conservation Act 1999*
- Random meanders in accordance with Cropper (1993)
- Rapid Data Points (RDP)
- BioBanking / Framework for Biodiversity Assessment (FBA) plots in accordance with the BioBanking Assessment Methodology (Office of Environment and Heritage, 2014)
- Assigning vegetation communities into Plant Community Types (PCT) in accordance with the Office of Environment and Heritage VIS classification database version 2.1
- Establishing the presence / absence of *Eucalyptus glaucina* within the supplementary study area;
- Survey of hollow-bearing tree locations
- Opportunistic diurnal fauna surveys.

Seven BioBanking plots were conducted for areas of land not previously assessed, as shown in Figure 4-1.

Golden Highway

GHB2

GHB1

GHB3

New England Highway

GH4

GH7

GH6

GH5

Bell Road

Legend

- Bio Banking assessment plots
- Supplementary study area
- Proposal boundary
- Proposal

Client
Roads and Maritime Services

Job Title
Belford to Golden Highway

Figure Title
Supplementary Study Area for Biodiversity

Metres
0 100 200 300 400

D1	12/06/2018	AO	LAS	LH
Issue	Date	By	Chkd	Appd

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Scale at A3: **1:12,000**
Figure Status: **Issue**
Coordinate System: **GDA 1994 MGA Zone 56**
Job No: **245608-00**
Figure No: **4 - 1**

J:\245000\245608-00 Belford to Golden\Work\Internal\Envir\GIS\01_maps\REF Maps\mxd\REF_revision_figures\Fig4-1_Supplementray study area2.mxd

4.1.2 Description of existing environment

Vegetation

In addition to the existing vegetation described in the REF (section 6.1.2), additional areas of native and non-native vegetation communities were identified within the supplementary study area for the proposal. No new Plant Community Types (PCT) were identified, the additional areas of native and non-native vegetation are the same types as those outlined in the REF. Mapping of the vegetation communities is included in Appendix D.

Flora

A total of 108 flora species were recorded in the supplementary study area. Of these species, 30 new species were recorded that were not previously recorded as part of the existing environment outlined in the REF.

No threatened flora species were recorded in the supplementary study area and therefore it remains that no threatened flora species would be affected by the proposal.

No additional priority weeds were recorded in the supplementary study area, however, noxious and invasive weeds have been identified in the study area as discussed in the REF.

Fauna

A total of 31 species were recorded in the supplementary study area, six of which had not been previously recorded as part of the existing environment outlined in the REF. These included:

- Cow
- Rabbit
- Noisy Friarbird
- Grey butcherbird
- Blue-faced Honeyeater
- Red-belied Black Snake.

No new threatened species were identified in the supplementary study area. However, two previously identified threatened species (Speckled Warbler and Grey-crowned Babbler) present in the study area were also present in the supplementary study area.

Migratory species

No additional records of migratory species were identified through the updated database searches or field surveys of the supplementary study area.

Hollow-bearing trees

No additional hollow-bearing trees were identified in the supplementary study area, therefore there remains 40 hollow-bearing trees with a total of 151 hollows recorded across the study area.

Fauna Habitat

No additional fauna habitats were recorded in the supplementary study area. Two previously identified fauna habitats (open forest/woodland and grassland) as part of the REF were also recorded in the supplementary study area.

A summary of each fauna habitat identified is outlined in the REF (see section 6.1.2).

Biodiversity Considerations

The biodiversity considerations remain as set out in the REF. In addition to these, two additional threatened fauna species were identified by the Office of Environment and Heritage (OEH) database as being recorded within 10km of the supplementary study area, these include Flame Robin and Dusky Woodswallow. The Federal Protected Matters database search identified one additional threatened fauna species, the Greater Glider, as being recorded or having potential habitat in the supplementary study area.

The updated OEH database search identified two threatened flora species and the Federal Protected Matters Database Search identified 13 threatened flora species that were recorded and/or have potential habitat within a 10km radius of the supplementary study area.

4.1.3 Potential impacts

Construction and operation

Vegetation Loss

The proposal results in vegetation loss of about 43.09 hectares across the study area (including 29.13 hectares of cleared land). This includes areas containing vegetation communities listed under the BC Act and EPBC Act. It should be noted that the vegetation communities identified under the EPBC Act are the same vegetation as that identified under the BC Act, however the BC Act includes additional criteria to that set out for the EPBC Act and therefore additional areas of vegetation removal are identified as being affected under the BC Act. Table 4-1 outlines the revised impacts to vegetation as part of the proposal.

Table 4-1: Impacts to vegetation

Vegetation Community	Act	Act status	REF area impacted (ha)	Revised impacted area (ha)
Spotted Gum – Narrow-leaved Ironbark – Red Ironbark Shrub – Grass Open Forest of the Central Hunter and Lower Hunter	BC Act	Endangered Central Hunter Ironbark – Spotted Gum Grey Box Forest	10.40	11.88
	EPBC Act	Critically Endangered Central Hunter Valley Eucalypt Forest and Woodland – Class A	3.94	3.98
		Critically Endangered Central Hunter Valley Eucalypt Forest and Woodland – Class B	3.27	3.29
		Critically Endangered Central Hunter Valley Eucalypt Forest and Woodland – Class C	0.99	2.30

Vegetation Community	Act	Act status	REF area impacted (ha)	Revised impacted area (ha)
Swamp Oak Weeping Grass Grassy Riparian Forest of the Hunter Valley	BC Act	Endangered Swamp Oak Floodplain forest	0.83	1.18
	EPBC Act	Endangered Coastal Swamp Oak (Casuarina glauca) Forest - Good Quality Category C	0.00	0.09
Farm dams and cleared riparian	N/A	N/A	0.30	0.90
Cleared land (Exotic)	N/A	N/A	16.20	29.13
Total Vegetation[1]			27.73	43.09
Total BC Act Threatened Ecological Community			11.23	13.06
Total EPBC Act Threatened Ecological Community			8.20	9.66

1. Calculated by considering vegetation designated under the BC Act plus the farm dams and cleared riparian and the cleared land (exotic) – vegetation discussed under the EPBC Act is the same vegetation as that discussed under the BC Act.

Note: N/A indicates that these vegetation types are not covered by the BC Act or EPBC Acts.

Impacts to Critically Endangered Central Hunter Valley Eucalypt Forest/Woodland (EPBC Act)

The Central Hunter Valley Eucalypt Forest and Woodland community is listed as critically endangered under the EPBC Act because of a decline in extent, a restricted distribution, being highly fragmented, and a reduction in community integrity.

The proposal would reduce the extent of this community by 9.57 hectares. This is an increase in the area assessed within the REF. An additional patch within the supplementary study area meets Condition Class C for this EPBC Threatened Ecological Community (TEC).

The impact assessment carried out for this community (see Appendix D) determined that the proposal would result in a significant impact upon this community which is consistent with the assessment completed for the REF.

The conservation advice for this community states that the minimum threshold for a patch to be the subject of a referral under the EPBC Act is moderate or higher condition. Some of the patches identified within the proposal area are in a moderate to high condition. As assessment of significance under the EPBC Act concluded that the proposal is likely to have a significant impact on this community and therefore biodiversity offsets are required (see Appendix D). As such, a strategic assessment for this community has been carried out under Roads and Maritime's *Environment Protection and Biodiversity Conservation Act 1999 – Strategic Assessment* policy. This was also the case for the design assessed as part of the REF.

Impacts to Coastal Swamp Oak (*Casuarina glauca*) Forest (EPBC Act)

A patch of the Swamp Oak Weeping grass grassy riparian forest of the Hunter Valley meets the criteria set out in the EPBC Act. The project would remove a small area (0.09 hectares) of this vegetation community.

An updated impact assessment was carried out for this community (see Appendix D) which concluded that the project would be unlikely to result in a significant impact due to the small size of removal. Therefore, a strategic assessment for this community was not required.

Impacts to Central Hunter Spotted Gum Ironbark Forest (BC Act)

The Central Hunter Spotted Gum Ironbark Forest is listed as endangered under the BC Act. This community within the study area has been modified due to previous land uses and is already fragmented. The proposal would remove 11.88 hectares of this community, which equates to 0.07 per cent removal in the locality and 0.08 per cent of the extent of this community in the Central Hunter. This is an increase in the area included within the REF.

It is considered that the removal of a comparatively minor area of this community and is not likely to place the local occurrence of this community at risk of extinction.

The impact assessment carried out for this community (see Appendix D) determined that the proposal is unlikely to have a significant impact upon this community.

Impacts to Swamp Oak Floodplain Forest (BC Act)

The Swamp Oak Floodplain Forest is listed as endangered under the BC Act. The proposal results in the removal of 1.18 hectares. This is an increase in the area included within the REF.

The impact assessment carried out for this community (see Appendix D) determined that the proposal is unlikely to have a significant impact upon this community.

Fauna habitat loss

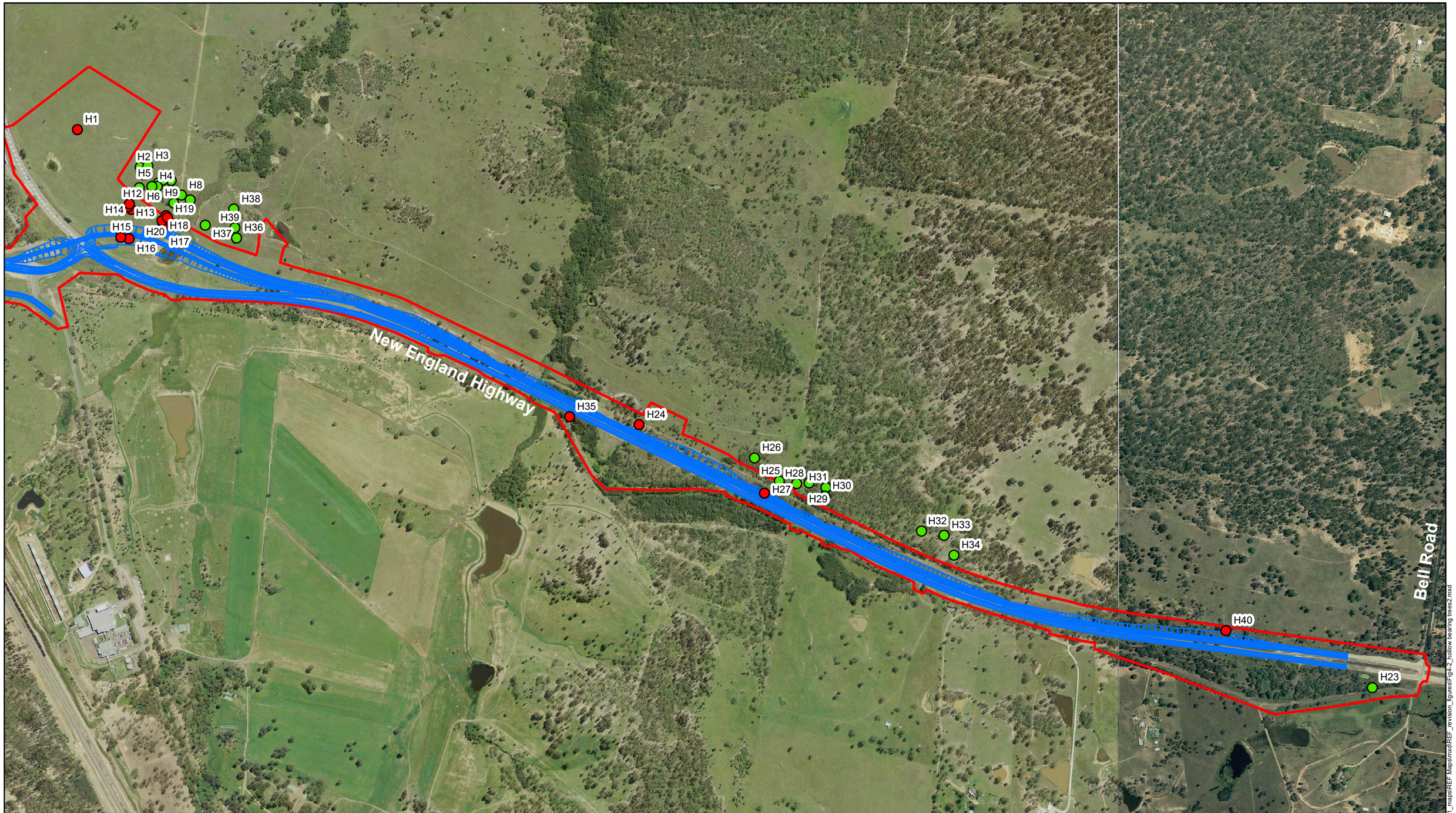
The proposal would result in 43.09 hectares of fauna habitat loss across all habitats. Table 4-2 shows the breakdown for each habitat.

Table 4-2: Fauna habitat loss

Fauna habitat	Corresponding vegetation community	REF area of removal (ha)	Proposed area of removal (ha)
Open forest woodland	Spotted Gum – narrow-leaved ironbark – red ironbark shrub – grass open forest of the central hunter and lower hunter Swamp Oak Weeping grass grassy riparian forest of the hunter valley	11.23	13.06
Aquatic	Farm dams and cleared riparian	0.30	0.90
Grassland	Cleared Land	16.20	29.13

Removal of hollow-bearing trees

The proposal results in the loss of 18 hollow-bearing trees, which is the same amount as assessed in the REF. However, the distribution of these trees has changed slightly. Those trees likely to require removal as part of the proposal are shown in Figure 4-2.



Legend

- Remove
- Retain
- Proposal
- Proposal boundary

Client
Roads and Maritime Services

Job Title
Belford to Golden Highway

Figure Title
Hollow-Bearing Trees to be Removed

Metres
0 100 200 300 400

Issue	Date	By	Chkd	Appd
D1	12/06/2018	AO	LAS	LH

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Scale at A3	Figure Status
1:9,000	Issue

Coordinate System
GDA 1994 MGA Zone 56

Job No	Figure No
245608-00	4 - 2

J:\245000\245608-00 Belford to Golden\Work\Internal\Environ\GIS\01_maps\REF Maps\mxd\REF_revision_figures\Fig4-2_hollow bearing trees2.mxd

Impact to threatened species

Potential impacts on six threatened species recorded in the study area remain as set out in the REF. It is considered that none of the species would be significantly impacted by the proposal. The full assessment can be found in Appendix D.

Habitat fragmentation and barrier effects

The project would remove 43.09 hectares of vegetation, including vegetation along the existing New England Highway road verges. The vegetation to the north of the New England Highway contains much larger areas of vegetation and while these patches are fragmented to a certain degree, overall they are well connected over an expansive area.

It is expected that the proposal could affect connectivity for the Squirrel Glider narrowing the gap between habitats for this species. Squirrel Gliders have a maximum gliding distance of approximately 70 metres. The current distance between the remnant vegetation areas either side of the New England Highway is approximately 15 to 30 metres. The proposal would increase the distance from one side of the highway to the other to a conservative maximum distance of about 65 to 70 metres. This has reduced slightly from the design assessed as part of the REF due to the reduced width of the median. This slight reduction in width is considered consistent with the impacts assessed as part of the REF.

Other impacts

No changes to the potential impact from fauna injury and mortality, spreading of weeds, noise impacts to fauna of impacts to key threatening processes are anticipated as a result of the proposal. These remain as set out in the REF.

Conclusion on significance of impacts

The proposal is not likely to significantly impact threatened species, populations or ecological communities or their habitats, within the meaning of the *Threatened Species Conservation Act 1995* or *Fisheries Management Act 1994* and therefore a Species Impact Statement is not required. While the *Threatened Species Conservation Act 1995* has been repealed as of August 2017, as the environmental assessment for this project began prior to this and is likely to be determined before February 2019, consideration of the *Threatened Species Conservation Act 1995* has still been taken into account.

The proposal is likely to significantly impact threatened species, populations, ecological communities or migratory species, within the meaning of the EPBC Act. As such, a strategic assessment for the endangered Central Hunter Valley Eucalypt Forest sand Woodland complex was carried out under Roads and Maritime's *Environment Protection and Biodiversity Conservation Act 1999 – Strategic Assessment* policy. The procedures for the strategic assessment are built-into the Roads and Maritime REF process, which includes assessing the significance of impacts on Commonwealth listed biodiversity matters in accordance with the Department of Environment and Energy's *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance* and documenting the steps taken to avoid, minimise and mitigate impacts. The strategic assessment concluded that biodiversity offsets would be required to minimise the impact associated with removal of part so of this community.

Biodiversity Offsets

Roads and Maritime requires the consideration of biodiversity offsets when remnant vegetation is to be impacted. Given the proposal would impact upon areas of Commonwealth and State-listed threatened ecological communities, biodiversity offsets would be required via a Biodiversity Offset Strategy.

In accordance with the *Roads and Maritime Guideline for Biodiversity Offsets* (2011), offsets are only required for the 11.88 hectares of Spotted Gum – Narrow-leaved Ironbark – Red Ironbark Shrub – Grass Open Forest of the Central Hunter and Lower Hunter to be removed, as this community is listed as an endangered ecological community under the TSC Act, as well as the BC Act and EPBC Act and more than one hectare of this community is to be cleared. Offsetting this vegetation would also compensate for the impacts to threatened species habitat for the ecosystem credit species recorded or considered likely to occur within the study area.

Other native vegetation to be removed includes 1.18 hectares of Swamp Oak Floodplain Forest, which is listed as an endangered ecological community under the TSC Act, BC Act and EPBC Act. However, the small amount to be removed does not meet the thresholds for requiring offsets.

A preliminary calculation to determine the required ecosystem credits to offset the likely impacts of the proposal has been completed. The full report can be found in Appendix D. The calculation was carried out using the linear assessment option of the Major Project module FBA methodology, as although this proposal is not a Major Project, the linear assessment option was considered to best suit the proposal design. Data collected from the BioBanking plots was used in the calculation.

A preliminary credit requirement of 560 credits of Spotted Gum – Narrow-leaved Ironbark – Red Ironbark Shrub – Grass Open Forest of the Central Hunter and Lower Hunter (HU815) is required to offset the impacts of the proposal. These credits include the biodiversity offsets (451 credits) required as part of the strategic assessment carried out for 9.57 hectares of this community which is declared as critically endangered under the EPBC Act.

The Squirrel Glider was recorded as part of the field surveys in January 2016 within the study area. This species was previously categorised as an ecosystem species in the Hunter Catchment Management Authority (CMA) and therefore wasn't required to be calculated as part of the previous FBA calculations. However, subsequently the Squirrel Glider has been reclassified by OEH as a species credit species. As over one hectare of clearing of this species habitat is proposed to be impacted it has therefore been included as part of the assessment of the proposal. It was determined that 261 species credits would be required to offset the impacts to this species.

A Biodiversity Offset Strategy would be prepared in later stages of the proposal, which would outline the methodology for finalising biodiversity offsets for the proposal, including refining credit requirements if the proposal design is altered enough to change the impacts of the proposal. Such offsets would provide suitable compensation for the biodiversity impacts of the proposal.

4.1.4 Revised safeguards and management measures

In addition to the safeguards and management measures outlined in the REF (which remain applicable to the proposal), an additional mitigation measure is required to provide abatement for the proposal. Two dams in the north west of the study area may need to be removed to accommodate the proposal. These dams are unlikely to comprise important habitat for any threatened flora or fauna, however it is considered appropriate that their removal are supervised by an ecologist to relocate any displaced fauna. This additional measure is shown in Table 4-3.

Table 4-3: Additional management measures for biodiversity

Impact	Environmental safeguard	Responsibility	Timing	Reference
Fauna loss due to dam removal	Ecologist to be present during the emptying and removal of dams in order to relocate any displaced fauna such as turtles, frogs etc.	Project manager and site manager	During construction	Additional safeguard

4.2 Aboriginal heritage

4.2.1 Methodology

Assessment of Aboriginal heritage impacts associated with the proposal followed the same methodology as set out in the REF. This included following the Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) to ensure that the views of the Aboriginal community were properly considered and respected in the assessment process.

The study area for the assessment was updated to account for the revised project boundary (see Figure 1-1). An additional archaeological survey, carried out in accordance with the PACHCI, was carried out in April 2018 in the area south of the Golden Highway now included in the study area. The survey was carried out with representatives from the Wanaruah Local Aboriginal Land Council (LALC) and Native Title claimant, the Plains Clans of the Wonnarua People (PCWP).

Impacts to cultural values associated with the additional study area were assessed using information previously gathered for the locality during preparation of the Aboriginal Cultural Values Assessment Report (June 2017). This included consultation with the Aboriginal cultural knowledge holders nominated for the project.

The Cultural Heritage Assessment Report (CHAR) prepared for the project in June 2017 has been updated to include assessment of the additional study area (see Appendix E).

4.2.2 Description of existing environment

A detailed description of the existing environment in the context of Aboriginal heritage can be found in section 6.2.2 of the REF.

The additional survey encountered previously recorded isolated find (NEHIF01), a new isolated find (GHIF1), and a new scatter site (GHAFT1). The updated study area has avoided impacts to site USR39. The area of impacts to site WP 6 (Bulga) has also been reduced. The Aboriginal archaeological sites present in the revised study area are listed in

Table 4-4.

Table 4-4: Aboriginal archaeological sites within the study area

Site name	Registered name	AHIMS identification	Site type
WP 6 (Bulga)	WP 6 (Bulga)	37-6-0818	Artefact
	USR 33	37-6-1594	Artefact
	USR 35	37-6-1596	Artefact
NEH IF 01	NEF IF 01	37-6-3875	Artefact
NEH AFT 2	NEH AFT 2	37-6-3691	Artefact
NEH IF 03	NEH IF 03	37-6-3720	Artefact
USR 10	USR 10	37-6-1567	Artefact
USR 09	USR 09	37-6-1580	Artefact

Site name	Registered name	AHIMS identification	Site type
GH AFT 1	GH AFT 1	37-6-3874	Artefact
GH IF 1	GH IF 1	37-6-3873	Artefact

The local area has cultural heritage value (social value) to the local Aboriginal community. However, regarding the Aboriginal sites identified within the project area, no specific cultural or social values expressed by these sites have been identified to date.

4.2.3 Potential impacts

Construction

The design refinements have resulted in some changes to the potential impacts to Aboriginal heritage outlined in the REF. The changes would result in impact to all sites listed in

Table 4-4. The revised degree of impacts at each site is listed in Table 4-5.

Table 4-5: Revised degree of impact to Aboriginal archaeological sites

Site name	Registered name	AHIMS identification	Significance	Degree of impacts
WP 6 (Bulga)	WP 6 (Bulga)	37-6-0818	Moderate	Partial loss of value
	USR 33	37-6-1594		
	USR 35	37-6-1596		
NEH IF 01	NEF IF 01	37-6-3875	Low	Total loss of value
NEH AFT 2	NEH AFT 2	37-6-3691	Low	Total loss of value
NEH IF 03	NEH IF 03	37-6-3720	Low	Total loss of value
USR 10	USR 10	37-6-1567	Low	Total loss of value
USR 19	USR 19	37-6-1580	Low	Total loss of value
GH AFT 1	GH AFT 1	37-6-3874	Moderate	Partial loss of value
GH IF 1	GH IF 1	37-6-3873	Low	Total loss of value

The scientific value of archaeological sites is linked to the physical information the sites contain. The proposal would result in a loss of scientific value attributed to the identified sites within the project boundary. Therefore, keeping with the recommendations in the REF, a pre-construction salvage program has been proposed to help increase the understanding of the potential resource, strengthen interpretations and improve ongoing and future management of Aboriginal heritage in the surrounding area.

An Aboriginal Heritage Impact Permit (AHIP) will be required for impacts to the identified sites/objects before the start of construction activities. Management strategies for mitigating harm to the sites are outlined in below in Table 4-6.

Table 4-6: Management strategies for impacted Aboriginal sites

Site name	Registered name	AHIMS identification	Management Strategy
WP 6 (Bulga)	WP 6 (Bulga)	37-6-0818	• Given the moderate significance of the site and degree of proposed impact, salvage excavation of a representative sample of the site is required before impact • An AHIP is required for the impacted portion of the site • Management measures to be implemented to ensure the non-impacted portion of site is avoided by construction activities could include protective fencing, identification in the CEMP, toolbox talks, etc.
	USR 33	37-6-1594	
	USR 35	37-6-1596	
NEH IF 01	NEF IF 01	37-6-3875	• Archaeological salvage not required • An AHIP is required for the impacted portion of the site.
NEH AFT 2	NEH AFT 2	37-6-3691	• Archaeological salvage not required • An AHIP is required for the impacted portion of the site.
NEH IF 03	NEH IF 03	37-6-3720	• Archaeological salvage not required • An AHIP is required for the impacted portion of the site.
USR 10	USR 10	37-6-1567	• Archaeological salvage not required • An AHIP is required for the impacted portion of the site.
USR 19	USR 19	37-6-1580	• Archaeological salvage not required • An AHIP is required for the impacted portion of the site.
GH AFT 1	GH AFT 1	37-6-3874	• Given the moderate significance of the site and degree of proposed impact, salvage excavation of a representative sample of the site is required before impact • An AHIP is required for the impacted portion of the site • Management measures to be implemented to ensure the non-impacted portion of site is avoided by construction activities could include protective fencing, identification in the CEMP, toolbox talks, etc.
GH IF 1	GH IF 1	37-6-3873	• Archaeological salvage not required • An AHIP is required for the impacted portion of the site.

The cultural values assessment prepared as part of the CHAR is consistent for the proposal.

4.2.4 Revised safeguards and management measures

No additional safeguards or management measures to those outlined in the REF are required. A summary of the measures for Aboriginal heritage is provided in Table 5-1.

4.3 Water quality and hydrology

4.3.1 Methodology

The methodology for assessing water quality, hydrology and flooding remains as set out in the REF (see section 6.4.1). This report also includes an assessment against the Hunter River Water Quality and River Flow Objectives (WQO's). The WQO's are split into four aspects:

- Aquatic ecosystems - Maintaining or improving the ecological condition of waterbodies and their riparian zones over the long term
- Visual amenity - Aesthetic qualities of water. Indicators include visual clarity, surface films and nuisance organisms (such as algae and fungus)
- Primary and secondary contact recreation - Maintaining or improving water quality for activities such as swimming where there is a high probability for swallowing. Secondary contact recreation relates to activities such as boating and wading where there is a low probability of water being swallowed.
- Water supply - Protecting water quality to maximise the production of healthy livestock. Protecting the quality of waters applied to crops and pasture. Protecting water quality for domestic use in homesteads, including drinking, cooking and bathing

Section 4.3.2 describes the existing environment relating to water sources and water courses in the proposal area. For those WQO's relevant to the existing and proposed future environment, a high-level assessment of the modified proposal against the WQO's was carried out. Justification has been provided where no assessment of a specific aspect of the WQO's was carried out.

4.3.2 Description of existing environment

Overview

The water sources and watercourses in the proposal area remain as set out in the REF (see section 6.4.2) and include:

- Two unnamed creek lines to the east of the service station. These have been classified to likely be Stream Order 2 (Strahler, 1952) and Class 4 for fish habitat (DPI fish Policy, 2013). Based on observations made during a biodiversity field survey these creek lines are likely ephemeral with permanent pools
- Three minor drainage lines
- Three farm dams
- Minor water storage areas in the private properties in the proposal area.

The identified watercourses have been categorised under the WQOs as uncontrolled streams. Uncontrolled streams and waterbodies are those that are not in estuaries or in the other categories. Their flow patterns may have been altered in some way through land-use change and extraction. Many of these streams flow into the regulated river sections, such as the Hunter River.

Water quality

Water quality in the creek / drainage lines and farm dams is considered to directly correlate to adjacent land uses which include farming, rail, road, a service station and an abattoir. No monitoring has been carried out

for the project to determine the water quality of these water courses, however a Stage 1 preliminary site investigation to assess potential contamination in the area found a low risk of contamination for all receivers. During the biodiversity field surveys in January – February 2016, the aquatic ecology assessment observed the water quality of the unnamed creek lines to be poor, as the water colour was brown and turbid indicating high amounts of suspended sediment, which is likely representative of pooled water in an ephemeral watercourse. However, the remaining pools provide some potential habitat for a range of amphibians and waterbirds.

The abattoir is upstream of the proposal area and potential run off from this facility could reach the watercourses which cross the proposal area. The abattoir operates under an Environmental Protection Licence (EPL No. 11279), required as part of the *Protection of the Environment Operations Act 1997* (POEO Act). Soil and effluent quality monitoring is required for the treatment ponds and storage dams on the premises under the EPL, however no monitoring is required at the site boundary to assess potential runoff. However, the licence includes an operating condition that effluent application to the land must not result in surface run off. Therefore, run off from the abattoir should not be contributing substantially to the water courses which cross the proposal area. Aerial photography suggests that algae is present in the treatment ponds/storage dams located at the abattoir.

Downstream of the proposal area, the water courses continue to run through rural areas, including agricultural land with livestock, and join the Hunter River around three km north of the proposal area. It should be noted there are no NSW water quality monitoring gauges close to the site to establish local water quality of the Hunter River downstream. The closest gauging station upstream of the proposal boundary is on a nearby watercourse of Black Creek (210089, near Rothbury) over six km away and the closest downstream gauging station the Hunter River at Greta (210064) over 12 km away.

The watercourses being assessed are shallow pool and ephemeral drainage lines. There are no known primary or secondary contact taking place within the proposal area. The watercourses are also not considered to be useful as a water supply for irrigation, homestead, drinking water or for aquatic foods. Water to be sourced for these purposes is more likely to be sourced from groundwater or in higher order streams in closer proximity to the Hunter River. There are nearby land uses in the region that will use the overland flow adjacent to the creek lines as damns for livestock upstream and downstream of this section of the highway.

Hydrology and flooding

The existing transverse drainage system and stormwater management system in the proposal area comprises a number of pipes, culverts and headwalls under the New England Highway carriageway between Belford and the Golden Highway. Heavy rainfall in the proposal area is expected to result in overland flow which is managed by the existing transverse drainage system.

While the proposal area does not fall within the Flood Planning Areas mapped within the Singleton LEP, there is evidence of consistent and prolonged inundation with the prevalence of various rush and swamp vegetation species within the drainage lines and flats, particularly around the culverts. Flood modelling carried out for the proposal also indicates that two of the existing culverts currently overtop on the New England Highway, one in the 20 year average recurrence interval event and one in the 10 year annual recurrence interval event.

4.3.3 Potential impacts

Construction

Water quality

Construction of the proposal has the potential to impact on water quality due to erosion and sediment runoff. Proposed earthworks would primarily include excavation, piling and vegetation clearing. During

earthworks the topsoil would be stripped back and soil material exposed, creating the potential for erosion, runoff and sedimentation particularly during heavy rainfall events. Erosion from stockpiles of excavated spoil, fill and other erodible materials could also result in sediment runoff. Another potential source of water pollution includes accidental spills or leakage of fuels, oils or other potentially harmful substances, which could result in localised contamination of soils and pollution of downstream waterways.

Construction sediment basins may be used to minimise the potential for runoff to the downstream environment. Construction sediment basins will be design and managed in accordance with Landcom's Managing Urban Stormwater: Soils and Construction series. Construction basin discharge limits at each licensed discharge point as follows:

- Total suspended solids (TSS) – Less than 50mg/l
- pH - 6.5-8.5
- No visible oil or grease.

Generally, the proposed construction sediment basin discharges consist of water generated by rainfall run-off over soil exposed during road construction activities, and typically treated to meet the nominated discharge criteria. Where construction sediment basin discharge TSS limits are exceeded, the basin is treated with a flocculent or coagulant to reduce the amount of suspended solids in the basin prior to discharging. Roads and Maritime specifies the use of gypsum for the flocculation of basins and does not permit the use of alternative flocculants without the completion of ecotoxicity, site-specific testing of the nominated product, and consultation with the EPA. Use of any alternative flocculants or coagulants is required to comply with standard Environment Protection Licence (EPL) conditions relating to their use. The need and design for construction sediment basins will be determined during detailed design.

As discussed above, there is the potential for watercourses which cross the proposal to flow downstream into regulated sections of the Hunter River. Table 4-7 includes a description of the potential impact associated with proposed construction sediment basin discharge limits and a discussion on the expected likelihood of the impact.

Table 4-7: Assessment of potential impacts against the Hunter River water quality objectives

Key indicator	Trigger levels	Discussion	Potential impacts from proposal
Aquatic ecosystems			
Total Phosphorus	25µg/L	Excessive phosphorus could lead to stimulation of the growth of nuisance plants which could dominate and change the dynamics of the aquatic ecosystem (eg eutrophication, algae and macrophytes). Eutrophication occurs when excessive plant growth deprives the water column of oxygen thereby killing other forms of aquatic biota. The growth of algae is also stimulated by excessive nutrients and may result in a build up of toxins in the water column. The availability of inorganic phosphorus from soil is strongly controlled by pH. Maximum phosphate availability occurs in the pH range of 6.0-7.0. Geotechnical investigations carried out for the modified proposal in July 2016 found the soils in the area to have a pH range of between 7.4 and 8.6.	The majority of total phosphorus is available in the organic matter in topsoil. The project will disturb the topsoil during topsoil stripping as well as during clearing and grubbing. For the majority of the construction program subsoils, which contain minimal organic matter, will be exposed. Topsoil will be stockpiled for future use on the proposal. These stockpiles will be protected through erosion and sediment controls such as temporary cover crop which will minimise the potential for run off containing elevated total phosphorus levels. The use of potential sediment basins during the construction phase is expected to reduce total phosphorus levels through retention, settlement, flocculation and removal of deposited sediments. As a result, the proposal and potential operation of construction sediment basins are unlikely to generate phosphorous which might contribute towards this trigger level downstream.

Key indicator	Trigger levels	Discussion	Potential impacts from proposal
Total nitrogen	350µg/L	Excessive nitrogen can also create Eutrophication within waterways and lead to algal blooms. High levels of algae can lead to an anoxic event and can therefore lead to death for many aquatic organisms. Different forms of nitrogen (ie ammonia) present can affect the toxicity of the environment. Most nitrogen in surface soils is immobilised, bound as organic nitrogen associated with humus. A small proportion is steadily turned into inorganic (mineralised) forms such as nitrate compounds through nitrification that can be released to groundwater or soil water. Direct addition of fertiliser can increase the levels of nitrate in a soil.	The majority of total nitrogen is available in the organic matter in topsoil. The project will disturb the topsoil during topsoil stripping as well as during clearing and grubbing. For the majority of the construction program subsoils, which contain minimal organic matter, will be exposed. Topsoil will be stockpiled for future use on the proposal. These stockpiles will be protected through erosion and sediment controls such as temporary cover crop which will minimise the potential for run off containing elevated total nitrogen levels. The use of potential sediment basins during the construction phase is expected to reduce total nitrogen levels through retention, settlement, flocculation and removal of deposited sediments. As a result, the proposal and potential operation of construction sediment basins are unlikely to generate nitrogen which might contribute towards this trigger level downstream.

Key indicator	Trigger levels	Discussion	Potential impacts from proposal
Chlorophyll-a	5µg/L	Elevated concentrations of Chlorophyll are caused by urban runoff and runoff of nutrients from the use of fertilisers such as nitrogen and phosphorus. Elevated chlorophyll can lead to an increase in algae biomass which degrades water quality, by consuming oxygen and creating a toxic environment for aquatic organisms and is some situation humans.	The construction of the proposal and operation of construction sediment basins are unlikely to generate Chlorophyll-a which might contribute towards this trigger level downstream.
Turbidity	6-50 NTU	Turbidity is caused by particles suspended or dissolved in the water that scatter light making it appear murky. High turbidity can harm fish and other aquatic life by reducing food supply, blocking light for growth of aquatic vegetation, affecting gill function and degrading spawning beds.	Construction sediment basins have discharge limits for TSS of less than 50mg/l. This is consistent with the trigger levels. As a result there is expected to be minimal impact on this indicator.
Salinity	125-200µS/cm	Salinity can affect water quality and the ecological health of streams. Increased salinity allows for greater penetration of sunlight in rivers, with the potential to lead to harmful algae blooms. Increased salinity can also be harmful for freshwater fish and impact upon their ability to osmoregulate internal functions.	The REF identified that surface salt scalding was present within the proposal area. Surface salt scalding is an indicator of dryland salinity. The proposal has the potential to expose areas of dryland salinity. Runoff from exposed areas may carry elevated salinity levels. The implementation of erosion and sediment controls and minimising disturbed areas will reduce the potential for run off containing elevated salinity levels.
Dissolve oxygen	85-110%	Dissolved oxygen refers to the volume of oxygen contained in water. This is important for water quality and aquatic ecology health. The level of dissolve oxygen determines the carrying capacity for the number and types of organisms living in the body of water. Salinity, temperature and pressure can affect the concentration of oxygen in the water.	The construction of the proposal and operation of construction sediment basins are unlikely to change the dissolved oxygen characteristics of the existing downstream water courses.

Key indicator	Trigger levels	Discussion	Potential impacts from proposal
pH	6.5 – 8.5	If aquatic pH levels are too acidic or alkaline this can affect the organisms living in the water. pH levels outside of the WQOs are likely to affect aquatic ecology by reducing hatching and survival rates. The pH levels of the soils in the area, tested during the geotechnical investigation, found levels between 7.4 and 8.6. Tested groundwater shows levels between 6.3 and 7.0.	The discharge limits of the construction sediment basins are consistent with the WQOs for the protection of aquatic ecosystems. Existing pH information available for soils and groundwater also shows that existing pH levels are likely to be within the WQOs pH trigger level. Therefore, no impact to pH levels would be anticipated due to the construction of the proposal or operation of a construction sediment basin.
Temperature	More than 80% temperature increase or a 20% temperature decrease	A large increase of decrease in temperature of the water has the potential to affect species composition, diversity and abundance.	The operation of construction sediment basins are not anticipated to alter the water temperature from the local waterways as the depth is relatively shallow. This is consistent with the surrounding environment.
Chemical contaminants or toxicants	Various Anzecc trigger levels for toxicants	As water testing has not been undertaken, existing chemical contaminants and toxicants have not been identified. Therefore, specific trigger levels cannot be provided here. Chemical contaminants and toxicants have the potential to affect water quality and biodiversity health.	The proposal has the potential to result in chemical contamination from spills. These spills are likely to be oil and fuel spills from plant and machinery. Spills may also occur from uncontrolled concrete washout activities. These spills are generally small quantities and are cleaned up as part of routine construction activities. The discharge limits of construction sediment basins require that no visible oil or grease be released.

Key indicator	Trigger levels	Discussion	Potential impacts from proposal
			The construction of the proposal and operation of construction sediment basins are not anticipated to contribute to changes in chemical contaminants or toxicants of the existing water courses.
Biological assessment indicators	Management goals for ecosystem protection	Collection of the above triggers to ensure good ecological health within the watercourse and to protect against any future deterioration of water quality.	The implementation of erosion and sediment control and discharge limits for the construction sediment basins would contribute towards maintaining the existing ecological health and diversity of the water courses that cross the proposal area.
Visual amenity			
Visual clarity and colour	Natural visual clarity should not be reduced by more than 20% Natural hue of the water should not be changed by more than 10 points on the Munsell scale The natural reflectance of the water should not be changed by more than 50%	Sediment can lead to reduced visual clarity and colour of the watercourse. The existing clarity and reflectance of the watercourse are understood as a result of previous field investigations, which have shown the visual clarity of the watercourses are currently poor.	Watercourses within the proposal are not on public land but have the potential to affect visual amenity downstream when flowing into the Hunter River. Previous field investigations suggest that the existing streams are in poor condition. The riparian zones are limited and narrow due to historic clearing and pools/creeks are brown in colour. This indicator is largely assessed above in relation to turbidity and TSS.
Surface film and debris	Oils and petrochemicals should not be noticeable as a visible film on the water, nor should they be detectable by odour	While these trigger levels are important for visual amenity, they also contribute to the quality of the watercourses. Previous field investigations did not identify any debris, litter or visible film. In addition, no odour was detected,	The proposed construction sediment basin discharge limits are consistent with this indicator.

Key indicator	Trigger levels	Discussion	Potential impacts from proposal
	Waters should be free from floating debris and litter		
Nuisance organisms	Macrophytes, phytoplankton scums, filamentous algal mats, blue-green algae, sewage fungus and leeches should not be present in unsightly amounts	Nuisance organisms, such as algae, would reduce the visual amenity of a watercourse. Previous field investigations identified algae as being present and therefore this would be contributing to a reduction in visual amenity of the ephemeral watercourses and permanent pools.	The impacts of proposed construction sediment basin discharge limits on nutrients are outlined above and are unlikely to result in exceedance of these indicator trigger values.
Primary and secondary recreation			
Faecal coliforms	Primary – Less than 150 faecal coliforms per 100ml Secondary - Less than 1000 faecal coliforms per 100ml	The presence of faecal coliforms in water, originating from direct discharge of animal waste, agricultural and storm runoff and even human sewage, can lead to an elevated risk of waterborne gastroenteritis.	There are no known primary or secondary recreational uses at the watercourses which cross the proposal. Two unnamed creek lines in the flow into the Hunter River, approximately three kilometres downstream of the proposal. As a result, consideration of these WQO's has been undertaken for potential uses downstream. As discussed above the discharge limits for pH from the sediment basins are within the pH levels set in the WQOs for primary and secondary recreation uses. The discharge criteria for sediment basins also maintains visual amenity of the water. Other indicators are also assessed above.
Enterococci	Primary – Less than 35 enterococci per 100ml Secondary - Less than 230 enterococci per 100ml	Enterococci is bacteria which have the potential to cause clinical infections such as urinary tract infections, diverticulitis and meningitis.	
Protozoans	Bodies of water should be free from pathogenic free-living protozoans	Protozoans are bacteria which can cause disease. Protozoans will not be present where water temperature is greater than 24°C.	
Algae and blue-green algae	Less than 15,000 cells per ml	Algae is also stimulated by excessive nutrients and may result in a build-up of toxins in the water column.	
Chemical contaminants	Various Anzecc trigger levels for toxic substances	Chemical contaminants and toxicants have the potential to affect water quality and biodiversity health.	

Key indicator	Trigger levels	Discussion	Potential impacts from proposal
Nuisance organisms/ visual clarity/ surface films	Same as for visual amenity	Same as for visual amenity	The proposal is unlikely to contain elevated levels of faecal coliforms, enterococci, protozoans, chemical contaminants or algae to contribute to the trigger levels of these key indicators. The proposal is unlikely contribute to the trigger levels for primary and secondary recreation uses.
pH	5.0 – 9.0	The pH trigger level for primary and secondary water recreation is broad as this would not significantly affect health.	
Temperature	15°C – 35°C for prolonged exposure	Water temperature can affect the bodies core temperature either through cold water shock or prolonged exposure.	
Livestock			
Algae & blue-green algae	An increasing risk to livestock health is likely when cell counts of microcystins exceed 11 500 cells/mL and/or concentrations of microcystins exceed 2.3 µg/L expressed as microcystin-LR toxicity equivalents.	Higher levels of algae in livestock drinking water can release neurotoxins into the animals and cause sickness and lead to death.	As identified in section 4.3.2, the existing water quality in the proposal area is considered to be low. Algae is also present in the surrounding area. Indicators associated with these environmental values are assessed above. The proposal including operation of construction sediment basins is unlikely to directly contribute to the receiving environment that will substantially impact on the downstream receiving environment.
Salinity (electrical conductivity)	Recommended concentrations of total dissolved solids in drinking water for livestock are given in table 4.3.1 (ANZECC 2000 Guidelines).	High levels of salt within the drinking water can cause toxic effects in cattle over time. Higher levels of salt build up in the animals system and can upset the animal's water balance that allows bodily functions to operate correctly.	
Hermotolerant coliforms (faecal coliforms)	Drinking water for livestock should contain less than 100 thermotolerant coliforms per 100 mL (median value).	High levels and exposure to faecal coliforms can lead to disease in cattle these include botulism.	

Key indicator	Trigger levels	Discussion	Potential impacts from proposal
Chemical contaminants	Refer to Table 4.3.2 (ANZECC 2000 Guidelines) for heavy metals and metalloids in livestock drinking water. Refer to Australian Drinking Water Guidelines (NHMRC and NRMMC 2004) for information regarding pesticides and other organic contaminants, using criteria for raw drinking water.	Water can contain elements and compounds which, at elevated concentrations, can cause toxic effects or residue issues. Heavy metals, such as arsenic, lead, mercury, selenium, zinc and the fluorides, and pesticides are of particular concern. While high concentrations of some heavy metals can be found in groundwater, sources of these metals and pesticides are generally run-off, seepage or spillage from arable land and industrial or sewerage waste. If there is a high contamination risk or where productivity losses are suspected, a detailed water analysis should be conducted (DPIRD, 2018)	

Potential impacts from the proposal on the Hunter River and associated watercourses would be managed using safeguard measures identified in the REF and replicated in this report, including the Erosion and Sediment Control Plan as well as the Spill Management Plan.

The construction phase of the proposal is likely to require the removal of two farm dams in the north-west of the proposal area. The emptying and removal of these dams would be carried out in such a way to prevent any potential impacts on water quality in the watercourses.

As such, the impact of the proposal on water quality would be **minor** during construction.

Hydrology and flooding

Construction of the proposal is not expected to impact the capacity of the current transverse drainage and stormwater management system within the proposal area.

The existing overland flow paths, may be temporarily impacted by construction works, primarily at the northern flyover embankment. This overland flow currently runs across the project area into two unnamed creek lines that cross the project. Earthworks have to potential to alter flow paths resulting in the ponding of water onsite. This impact is anticipated to be minor, short term and localised to the project area.

Drainage works may require temporary diversions. These diversions will concentrate water travelling under the New England Highway to a smaller flow path. This has the potential to hold water upstream. This is anticipated to be minor and short term.

As such, the impact of the proposal on hydrology and flooding would be **minor** during construction.

Operation

Water quality

Risks to water quality during operation include untreated stormwater runoff, spills which could result in fuels, oils or other harmful substances entering the drainage system and potentially the natural environment. As the proposal relates to widening of the road corridor it is anticipated that any impacts regarding the operation of the proposal would be similar to the existing environment.

As such, the impact of the proposal on water quality is expected to be **negligible** during operation.

Hydrology and flooding

The proposal would increase the impervious surface area, and the new eastbound carriageway of the New England Highway would cross over the existing creek and drainage lines. The existing pipes and culverts would be extended under the new eastbound carriageway to provide the necessary continuity of drainage flows. Two dams in the north west of the proposal area may need to be removed as part of the proposal. Where these are removed, it is not considered that this would substantially affect surface water and flooding in the area, as these dams are not used for water retention purposes.

Currently all existing drainage structures do not overtop in up to and including one in 100 year flood events, except for two culverts, one which overtops during one in 20 year flood events and the other which overtops during one in 10 year flood events.

Flood modelling carried out for the concept design assessed as part of the REF shows that the culvert that currently overtops during one in 20 year flood events would no longer overtop the road in flood events up to and including one in 100 year event. This is due to replacing the existing inlet headwall with an inlet sump and providing some regrading of the upstream area. The culvert that currently overtops during one in 10 year flood events would overtop the road during one in 20 year flood events. This is due to a transverse drainage solution, providing an additional culvert next to the existing culvert, implemented as part of the proposal. The proposal is not considered to change the outcome of the flood modelling assessment. Some

localised afflux may occur immediately upstream of the transverse drainage structures as a result of the proposal, consistent with flood modelling carried out for the design assessed in the REF. This is a result of increased hardstand areas due to the new road, creation of road embankments and re-direction of existing flow paths. This would be further evaluated during detailed design to minimise impacts where practicable.

As such, the proposal is expected to have a negligible impact on hydrology during operation.

4.3.4 Revised safeguards and management measures

No additional safeguards or management measures to those outlined in the REF are required. A summary of the measures for traffic and access is provided in Table 5-1.

4.4 Traffic, transport and access

The REF presented an operational traffic assessment for the proposal in terms of network performance and level of service (see Section 6.6 of the REF). The traffic assessment in the REF was based on modelling performed at an early stage of the project which was carried out to help determine an acceptable design solution for the New England Highway and Golden Highway intersection. As the concept design evolved, additional modelling was carried out to assess the performance of key access points, including egress from the abattoir and the u-turn facility at the Golden Highway.

Since the REF, the design has been further refined with an opportunity to provide a consolidated access for lots to the north and south of the Golden Highway (see Section 3.1) and improved arrangements for vehicle movements at the Golden Highway and New England Highway intersection (see Section 3.2).

An assessment of potential traffic impacts associated with the proposal has been carried out to evaluate the proposed changes and confirm alignment with the proposal objectives (see Section 2.3.1 of the REF).

4.4.1 Methodology

The methodology adopted for the proposal differs slightly to the methodology applied for the assessment in the REF as follows:

- The proposal has been evaluated in terms of future traffic performance for the years 2021 (nominated opening year), 2031 and 2041. The future years of 2019, 2029 and 2039 were previously assessed in the REF. These have been modified to the proposed opening year and future years based on the estimated construction and opening dates
- SIDRA Intersection (a traffic modelling software) has been used in lieu of Paramics (modelling software used for the REF) to extract the predicted delays for each movement as it was deemed to provide more realistic delay numbers for this project
- Forecast traffic from the approved 24 lot industrial development to the north of the roundabout has been included in the assessment using the predicted traffic volumes and trip origin and destinations provided in *Whittingham Industrial Sub Division, Western Precinct, Golden Highway, Whittingham, NSW: Traffic and Access Report* (Better Transport Futures, August 2010). This is additional traffic volumes to those previously included in the REF
- The hour of 5.30am–6.30am was selected as the AM traffic peak as this represents the hour with the highest traffic volumes on the New England Highway. The assessment presented in the REF considered 6.30am–7.30am as the AM peak which has lower traffic volumes on the New England Highway, resulting in lower delays for vehicles turning left and right from the Golden Highway.

Separate modelling has been carried out to assess performance of the proposed roundabout on the Golden Highway. The proposed configuration has been tested for the future years 2021 and 2031. The assessment focused on performance in the morning and evening peak traffic periods of 5.30am–6.30am and 4.00pm–5.00pm. The hour of 4.00pm–5.00pm was selected as the PM traffic peak as this hour exhibited higher traffic volumes due to the inclusion of the 24 lot industrial development. This differs from the assessment of the u-turn facility in the REF which assessed a PM peak of 3.00pm–4.00pm.

4.4.2 Description of existing environment

The existing traffic and transport environment remains as set out in the REF (see section 6.6.2).

4.4.3 Potential impacts

Construction

Construction of the proposal is not considered to result in substantial changes to the construction traffic requirements and impacts outlined in the REF (see section 6.6.3). Proposed site accesses are also likely to remain primarily as set out in the REF.

Operation

Traffic performance

Traffic performance for the proposal has been evaluated and reported in the same manner as the REF. Traffic volumes (vehicles / hour) have also been included for each movement.

Traffic performance in morning (AM) and evening (PM) peak traffic hours is shown in Table 4-8 and Table 4-9.

Table 4-8: Traffic performance in the AM peak

Movement	2021			2031			2041		
	Volume (vehicles / hour)	Delay (seconds)	LoS	Volume (vehicles / hour)	Delay (seconds)	LoS	Volume (vehicles / hour)	Delay (seconds)	LoS
Right-turn from the Golden Highway onto the New England Highway	76	No delays due to free flow movement via the flyover		89	No delays due to free flow movement via the flyover		100	No delays due to free flow movement via the flyover	
Left-turn from the Golden Highway onto the New England Highway	15	25	B	17	58	E	18	372	F
Right-turn from the New England Highway onto the Golden Highway	30	19	B	35	35	C	39	150	F
Eastbound traffic on the New England Highway	223	0	A	264	0	A	302	0	A
Westbound traffic on the New England Highway	1,120	0	A	1,317	0	A	1,513	0	A
Left-turn from the New England Highway onto the Golden Highway	903	8	A	1,055	9	A	1,203	9	A

Table 4-9: Traffic performance in the PM peak

Movement	2021			2031			2041		
	Volume (vehicles / hour)	Delay (seconds)	LoS	Volume (vehicles / hour)	Delay (seconds)	LoS	Volume (vehicles / hour)	Delay (seconds)	LoS
Right-turn from the Golden Highway onto the New England Highway	569	No delays due to free flow movement via the flyover		656	No delays due to free flow movement via the flyover		707	No delays due to free flow movement via the flyover	
Left-turn from the Golden Highway onto the New England Highway	51	10	A	55	11	A	43	13	A
Right-turn from the New England Highway onto the Golden Highway	22	10	A	24	11	A	11	11	A
Eastbound traffic on the New England Highway	1,039	0	A	1,220	0	A	1,666	1	A
Westbound traffic on the New England Highway	492	0	A	577	0	A	692	0	A
Left-turn from the New England Highway onto the Golden Highway	138	8	A	154	8	A	176	8	A

The traffic model predicts travel time savings for vehicles travelling eastbound on the Golden Highway onto the flyover to the New England Highway and travelling south past Bell Road are around 1.0 minute in the AM peak and 5.0 minutes in the PM peak on opening in 2021, compared to the no build arrangement in 2021.

Roads and Maritime modelling guidelines recommend that the overall intersection performance is defined by the worst movement for unsignalised intersections. The modelling indicates good performance for the PM peak, with an overall Level of Service A through to 2041. Most vehicles in the AM peak are expected to experience a Level of Service A through to 2041. However, the performance of the left turn from the Golden Highway to the New England Highway and the right turn from the New England Highway to the Golden Highway will worsen to a Level of Service F between 2031 and 2041, defining the overall intersection performance and indicating a potential need to upgrade or improve the intersection in that horizon.

It is noted that a small number of vehicles, 18 and 39 respectively, are impacted by these delays. Further to this, the modelling has used a 2% traffic growth rate which is considered conservative. Should this growth not be sustained in the long term then the delays to these movements would reduce significantly.

Long term strategic planning for the New England Highway includes provision for duplication to four lanes which would result in review of the operation of the intersection. Roads and Maritime will continue to monitor the operation of this intersection for both performance and safety.

As identified previously, in response to submissions received, an alternative access arrangement has been developed for lots to the north and south of the Golden Highway.

Modelling has been carried out to assess the performance of the proposed roundabout on the Golden Highway and any potential impact on traffic flow. Along with the traffic volumes used for the assessment in Table 4-8and Table 4-9

above, an additional “worst-case” scenario was also tested where traffic from the abattoir was doubled (i.e. in addition to the forecast traffic growth).

The traffic modelling indicated that the proposed roundabout would perform with an overall LoS A (‘good operation’). This included sensitivity testing for the “worst-case” scenario where abattoir traffic was doubled in addition to the forecast traffic growth. An average delay of 18 seconds (LoS B) is expected for right turn movements from the abattoir onto the Golden Highway during the AM peak in 2031 in the scenario where traffic from the abattoir was doubled. However all other access points would operate with a LoS A during the peak periods modelled.

In summary, the proposal provides the opportunity to improve access to the New England Highway and Golden Highway for properties to the north and south of the Golden Highway. The proposal continues to meet the proposal objectives by reducing congestion and peak period delays at the New England Highway and Golden Highway intersection, and improving travel times in both directions along the New England Highway. Overall, the proposal would have a **positive** impact on traffic and network performance during operation***.***

Property access

The inclusion of a roundabout in the proposal alters access to properties within the vicinity. These include the abattoir, an approved 24 lot development and undeveloped land. The design changes would provide all turning movements into and out of the abattoir.

No further changes to property access are proposed as part of the proposal.

The proposal would continue to have a **minor adverse** impact on property access during operation. However the design changes improve property access to and from the Golden Highway from that assessed in the REF.

4.4.4 Revised safeguards and management measures

No additional safeguards or management measures to those outlined in the REF are required. A summary of the measures for traffic and access is provided in Table 5-1.

4.5 Noise and vibration

A review of noise impacts was carried out for the proposal. The technical note is provided in Appendix F and summarised below.

4.5.1 Methodology

The methodology and criteria for the assessment of noise impacts associated with the proposal remains as set out in the REF (see sections 6.7.1 and 6.7.3). No additional noise monitoring has been carried out as the baseline noise monitoring surveys carried out for the REF in December 2015 remain relevant.

The updated noise assessment has drawn upon outputs from the revised traffic modelling and therefore now also considers traffic associated with the proposed 24 lot industrial development to the north of the Golden Highway and provides an assessment for the future years of 2021 and 2031. The modelling has considered changes to the design alignment.

In addition, the noise assessment of the proposal has included an analysis of maximum noise levels associated with compression braking, acceleration and deceleration as heavy vehicles approach the roundabout and the intersection. This was carried out to determine any sleep disturbance impacts to nearby residences as a result of the proposed roundabout.

Maximum noise events are assessed against the provisions of Practice Note (iii) of the Environmental Noise Management Manual (ENMM). An assessment of the 'emergence' of the A-weighted maximum noise level above the 1-hour equivalent traffic noise level is used as a screening criterion for the assessment of potential sleep disturbance as follows:

$$L_{Amax} \geq L_{Aeq\ (1hour)} + 15\ dB(A)$$

The following is also noted in the ENMM:

- Maximum internal noise levels below 50–55 dB(A) are unlikely to cause awakening reactions
- One or two noise events per night with maximum internal noise levels of 65–70 dB(A) are not likely to significantly affect health and wellbeing.

It is noted in the ENMM, that this maximum noise assessment should be used as a tool to help prioritise and rank mitigation strategies, but should not be applied as a decisive criterion.

4.5.2 Description of existing environment

The existing noise environment remains as set out in the REF (see section 6.7.2) and is characterised by road traffic noise, rail movements, rural industry and animal noise. The sensitive receivers near to the project remain as set out in Figure 6-9 of the REF.

4.5.3 Potential impacts

Construction

No changes are anticipated to the potential noise and vibration impacts associated with the construction phase of the proposal (see Appendix F). Potential impacts remain as set out in the REF (see section 6.7.4).

Operation

Predicted operational noise levels at nearby sensitive receivers have been recalculated based on the proposal and revised traffic modelling, as shown in Table 4-10. The noise levels are compared against a 'no build' scenario.

Two sensitive receivers (R5 and R7) are predicted to exceed the operational noise criteria. However, the relative increase in noise levels between the build and no-build scenarios is less than 2dB(A). Therefore, no receivers qualify for consideration of additional noise mitigation following the criteria set out in the Roads and Maritime Services Noise Mitigation Guideline. This is consistent with the outcomes of the assessment of the design presented in the REF.

Table 4-10: Predicted road traffic noise levels at sensitive receivers for the opening and design year

Receiver ID	Opening year, dB(A)				Design year, dB(A)				NCG criteria, dB(A)		Are the Noise Mitigation Guideline criteria exceeded?		Change in noise level, dB(A)			
	'No Build'		'Build'		'No Build'		'Build'						Opening year		Design year	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
R3	55.1	51.5	55.0	51.5	55.7	51.8	55.6	52.1	60	55	NO	NO	-0.1	0.0	-0.1	0.3
R4	55.6	51.9	55.6	52.0	56.1	52.2	56.2	52.6	60	55	NO	NO	0.0	0.1	0.1	0.4
R5	59.9	56.3	59.9	56.4	60.5	56.6	60.6	57.0	60	55	NO	NO	0.0	0.1	0.1	0.4
R6	57.4	53.6	57.7	53.9	57.9	53.8	58.3	54.5	60	55	NO	NO	0.3	0.3	0.4	0.7
R7	59.4	55.8	59.3	55.6	59.9	56.1	60.0	56.2	60	55	NO	NO	-0.1	-0.2	0.1	0.1

An analysis was carried out using worst case sound power levels for trucks accelerating, decelerating and engaging compression brakes in order to compare the potential change in maximum noise level impacts at the nearest affected noise sensitive receiver. The maximum noise events predictions for R1 and R2 are shown in Table 4-11.

Table 4-11: Maximum noise level event predictions

Scenario	Distance to nearest affected residential receiver (m)	Event	Sound power level dB(A)	Predicted sound pressure level dB(A)
R1				
On approach to intersection	615	Compression braking	125	61
		Acceleration	119	55
		Deceleration	109	46
On approach to roundabout	265	Compression braking	125	69
		Acceleration	119	63
		Deceleration	109	53
R2				
On approach to intersection	420	Compression braking	125	65
		Acceleration	119	59
		Deceleration	109	49
On approach to roundabout	160	Compression braking	125	73
		Acceleration	119	67
		Deceleration	109	57

The predicted change in maximum noise level impact due to installation of the roundabout is around 8 dB. The equivalent noise levels within residential receiver locations are expected to be at least 10 dB below the external noise levels quoted in Table 4-10. For compression braking events on approach to the proposed roundabout, the maximum noise level is likely to be in exceedance of potential criteria for awakening events at both receivers, but below levels that are likely to significantly affect health and wellbeing. For acceleration events, internal noise levels have the potential to marginally exceed awakening criteria by up to 2 dB at R2, while noise levels at R1 are within the criteria . Deceleration events are expected to result in noise levels being below awakening criteria for both receivers.

4.5.4 Revised safeguards and management measures

No additional safeguards or management measures to those outlined in the REF are required. A summary of the measures for noise and vibration is provided in Table 5-1.

4.6 Landscape character and visual impacts

A review of landscape character and visual impacts was carried out for the proposal. The technical note is provided in Appendix G and summarised below.

4.6.1 Methodology

The methodology for assessing potential impacts to landscape character and visual amenity included reviewing the key design changes associated with the proposal and assessing the changes against the Landscape Character Zones (LCZ) and viewpoints identified in the Landscape Character, Visual Impact Assessment and Urban Design Study prepared for the REF (see Appendix J of the REF). Impacts were evaluated using the Roads and Maritime Landscape Character and Visual Impact Grading Matrix (2013). The design changes were also assessed against the urban design principles and objectives developed for the proposal (see section 2.3.2 of the REF).

4.6.2 Description of existing environment

The existing landscape character and visual amenity environment remains as set out in the REF (see section 6.9.2). The additional areas now included in project boundary are considered to be consistent with the previously identified rural character of the area.

4.6.3 Potential impacts

Construction

Landscape character and visual amenity impacts during the construction phase of the proposal remains as set out in the REF where low-moderate and moderate adverse impacts were identified.

Operation

Landscape character

Potential landscape character impacts associated with the proposal are set out in Table 4-12. The changes to the proposal do not result in changes to the potential impacts outlined in the REF.

Table 4-12: Landscape impacts during operation

Landscape Character Zone (LCZ)	Sensitivity	Permanent landscape changes	Magnitude of change	Impact
LCZ1 – wooded edge	Low	• New flyover and roundabout (replacing the u-turn facility) • Consistent with the removal of the Whittingham rest area, introduction of additional road infrastructure, earthworks and flyover • Vegetation removal	Moderate	Low-moderate adverse
LCZ2 – floodplain	Moderate	• The introduction of the flyover on embankment would contrast with the low lying floodplain landscape • Reduced impact on agricultural land due to changes to flyover • Additional vegetation clearance due to the introduction of the abattoir access	Moderate	Moderate adverse
LCZ3 – Spotted gum forest	Moderate	• Landscape changes are consistent with the concept design	Low	Low-moderate adverse

Visual amenity

Potential visual impacts associated with the proposal are set out in Table 4-13. The changes to the proposal do not result in changes to the potential impacts outlined in the REF.

Table 4-13: Visual impacts during operation

Viewpoint	Sensitivity	Permanent visual elements	Magnitude of change	Impact
Viewpoint 1 – United Petroleum service station	Low	• Impacts consistent with the concept design	Moderate	Low-moderate adverse
Viewpoint 2 – Abattoir	Low	• The addition of a roundabout instead of u-turn facility is not anticipated to the alter the visual amenity • Realignment of access road results in enlarged footprint of road infrastructure • Additional vegetation clearance due to the introduction of the abattoir access	Moderate	Low-moderate adverse
Viewpoint 3 – Road user of the existing	Low	• Impacts consistent with the concept design	High	Moderate adverse

Viewpoint	Sensitivity	Permanent visual elements	Magnitude of change	Impact
Golden Highway				
Viewpoint 4 – residential property 3193 New England Highway	Moderate	• Impacts consistent with the concept design	Low	Low-moderate adverse
Viewpoint 5 – road users of the existing New England Highway	Low	• Impacts consistent with the concept design	High	Moderate adverse

Urban design principles and strategy

The urban design strategy included within the REF (section 2.3.2) outlined four objectives with supporting design principles. The objectives included;

- Fit within the landform
- Design an experience in movement
- Respond to natural vegetation patterns
- Achieve integrated and minimal maintenance design.

This urban design strategy was informed by the New England Highway Urban Design Framework (October 2016) and led to the preparation of a concept design to illustrate an overall approach that would be further discussed and developed during the detailed design stage.

The urban design key considerations have been applied to the proposal and would result in landscape character and visual impacts consistent with those assessed in the REF. The following urban design considerations have been identified for the proposal:

- The introduction of a safety barrier has the potential to add additional road furniture within a rural context. The final location and extent of the barrier would be confirmed during the detailed design stage and will consider the urban design objective 'Design an experience in movement,' ensuring framed views out from the road corridor for motorists
- The landscape design will consider opportunities to grass or vegetate the roundabout to reduce the scale and appearance of road corridor
- Additional revegetation works would occur to rehabilitate areas of additional disturbed ground to the south of the abattoir access road.

4.6.4 Revised safeguards and management measures

No additional safeguards or management measures to those outlined in the REF are required. A summary of the measures for landscape character and visual amenity is provided in Table 5-1.

4.7 Property and land use

4.7.1 Methodology

The methodology for the assessment of property and land use impacts associated with the proposal remains as set out in the REF (section 6.10).

4.7.2 Description of existing environment

The existing environment remains as set out in the REF (see section 6.10.2). Designated land use zones are shown in Figure 4-1 of the REF.

4.7.3 Potential impacts

Construction

The potential location of compound sites during the construction phase have changed from those considered in the REF. The revised locations are shown in Figure 3-5.

The two smaller plots of lands, identified as potential construction sites on the north-eastern side of the New England Highway may be leased during construction, as these areas are not currently owned by Roads and Maritime. These areas of land would be rehabilitated to their existing state and returned to the owners following construction.

The proposal includes realignment of the access road for the abattoir to join the Golden Highway at the proposed roundabout. The access road would be constructed as part of the project on land owned by the abattoir. Roads and Maritime does not propose to acquire this land and following construction maintenance of the access road would remain the responsibility of the landowner. Construction would be carried out in consultation with the abattoir.

As set out in the REF, the proposal may have an impact on utilities in the area. No impacts on infrastructure and utilities are anticipated outside of the proposal area.

The proposal is expected to have a **minor adverse** impact on land uses during construction.

Operation

The property acquisition boundary for the project has been reviewed for the proposal. Realignment of the flyover has resulted in a reduced area for acquisition. Figure 4-3 shows the revised property acquisition boundary.

Legend

- Proposal
- Cadastre
- Proposal boundary
- Land Acquisition Area
- Construction Compounds

Client
Roads and Maritime Services

Job Title
Belford to Golden Highway

Figure Title
Property acquisition area

Metres
0 100 200 300 400

Issue	Date	By	Chkd	Appd
D1	26/06/2018	AO	LAS	LH

ARUP
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Scale at A3	Figure Status
1:12,000	Issue

Coordinate System
GDA 1994 MGA Zone 56

Job No	Figure No
245608-00	4 - 3

J:\245000\245608-00 Belford to Golden\Work\Internal\Design\GIS\ArcMap\DesktopMaps\mxd\Fig4-3_Property Acquisition Boundary3.mxd

As outlined in the REF, land acquired by Roads and Maritime would be rezoned to SP2 – Infrastructure under the Singleton LEP. The proposal would result in a reduction of around 18 hectares of land zoned IN3 – Heavy Industrial as part of the Whittingham Industrial Area. However, this has been reduced from the 40 hectares of land to be acquired under the previous design. While the area of land to be acquired has been reduced, the acquisition of land continues to affect the same three properties as identified in the REF. In line with the impact discussed in the REF, while this acquisition would slightly impact the potential magnitude of development, the proposal would not alter the opportunity for an industrial estate to be developed at this location. The proposal would still contribute to improved accessibility to this precinct.

4.7.4 Revised safeguards and management measures

No additional safeguards or management measures to those outlined in the REF are required. A summary of the measures for property and land use is provided in Table 5-1.

4.8 Socio-economic

4.8.1 Methodology

The methodology for the assessment of socio-economic impacts associated with the proposal remains as set out in the REF (see section 6.12.1). The methodology for assessing socio-economic impacts associated with the proposal included reviewing the key design changes and assessing the changes against the values assessed in the REF.

The assessment has also considered the other additional environment assessments carried out for this Submissions Report, including traffic and access (section 4.4), Aboriginal heritage (section 4.2), property and land use (section 4.7) and amenity associated with noise and vibration, landscape and visual, and biodiversity (sections 4.5, 4.6, and 4.1 respectively).

4.8.2 Description of existing environment

The existing environment remains as set out in the REF (see section 6.12).

4.8.3 Potential impacts

Construction

Socio-economic impacts during the construction phase of the proposal remains as set out in the REF.

Construction of the realigned abattoir access road would occur on land owned by the abattoir. Construction of the road is unlikely to impact the daily business operations of the abattoir as the existing access road would remain in operation until the realigned access road and the proposed roundabout on the Golden Highway is fully built and in operation. It is unlikely that the construction work would affect the amenity of workers, as the on-site buildings and facilities are about 500 metres south of the proposed access road.

Operation

The socio-economic impacts associated with the operational phase of the proposal remains primarily as set out in the REF. It is considered that the revised access arrangements at the abattoir have resulted in reduced impacts for this local business. The proposal is not considered to result in any changes for other aspects assessed such as infrastructure and services, travel behavior or amenity.

A summary of the potential socio-economic impacts during operation is shown in Table 4-14.

Table 4-14: Summary of socio-economic impacts during operation

Impact	Stakeholder impacted	Nature of impact based on proposal	Comment
Acquisition of 18 hectares of land from an Industrial Area	Private land owners	Moderate adverse impact	The proposal provides a more beneficial outcome compared with the design assessed as part of the REF due to a reduction in land acquisition
Altered access / egress arrangements	Abattoir and some private properties	Minor adverse impact	Revised access provisions for abattoir and approved 24 lot development provide a more beneficial outcome for these properties.
Improved road safety	Local and regional users of the New England Highway and Golden Highway	Positive impact	The inclusion of the roundabout results in further road safety improvements for vehicles accessing the Golden Highway.
Reduced congestion and improved travel times	Local and regional users of the Golden Highway	Positive impact	No change
Changes to visual amenity	Local residences	Moderate adverse impact	No change
Improved cycling infrastructure	Local and regional cyclists	Positive impact	No change
Removal of the Whittingham Light Vehicle Rest Area	Local and regional users of the New England Highway and Golden Highway	Moderate adverse impact	No change

4.8.4 Revised safeguards and management measures

No additional safeguards or management measures to those outlined in the REF are required. A summary of the measures for socio-economic aspects is provided in Table 5-1.

5. Environmental management

The REF for the New England Highway upgrade between Belford and the Golden Highway identified the framework for environmental management, including safeguards and management measures that would be adopted to avoid or reduce environmental impacts (Chapter 7 of the REF).

After consideration of the issues raised in the public submissions and changes to the proposal, the safeguard and management measures have been revised. Additional safeguard measures have been identified for biodiversity but for all other topics assessed safeguard and management measures remain as set out in the REF.

Should the proposal proceed, environmental management will be guided by the framework and measures outlined below.

5.1 Environmental management plans (or system)

A number of safeguards and management measures have been identified in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these management measures would be incorporated into the detailed design and applied during the construction and operation of the proposal.

A Project Environmental Management Plan (PEMP) and a CEMP will be prepared to describe safeguards and management measures identified. The PEMP and CEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The PEMP and CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by environment staff, prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The PEMP and CEMP would be developed in accordance with the specifications set out in the QA Specification G36 – Environmental Protection (Management System), QA Specification G38 – Soil and Water Management (Soil and Water Plan), QA Specification G40 – Clearing and Grubbing and QA Specification G10 - Traffic Management.

5.2 Summary of safeguards and management measures

The REF for the New England Highway upgrade between Belford and the Golden Highway identified a range of environmental outcomes and management measures that would be required to avoid or reduce the environmental impacts.

After consideration of the issues raised in the public submissions, the environmental management measures for the project (refer to Chapter 7 of the REF) have been revised. Should the project proceed, the environmental management measures in Table 5-1 will guide the subsequent phases of the New England Highway upgrade between Belford and the Golden Highway development. Additional and/or modified environmental safeguards and management measures to those presented in the REF have been underlined and deleted measures, or parts of measures, have been struck out.

Table 5-1: Summary of environmental safeguards and management measures

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing	Reference
G1	General - minimise environmental impacts during construction	A CEMP is to be prepared and submitted for review and endorsement of the Roads and Maritime Environment Manager prior to commencement of any work. As a minimum, the CEMP should address the following: • Any requirements associated with statutory approvals • Details of how the project will implement the identified safeguards outlined in the REF • Issue-specific environmental management plans • Roles and responsibilities • Communication requirements • Induction and training requirements • Procedures for monitoring and evaluating environmental performance, and for corrective action • Reporting requirements and record-keeping • Procedures for emergency and incident management • Procedures for audit and review. The endorsed CEMP is to be implemented during the pre-construction and construction stages of the project.	Project manager / Site Manager	Pre-construction and construction	
G2	General - notification	All businesses, residential properties and other key stakeholders likely to be affected by the activity are to be notified at least five days prior to the commencement of any work.	Project manager / Site Manager	Pre-construction and construction	
G3	General – environmental awareness	Environmental awareness training must be provided, by the contractor, to all field personnel and subcontractors. This should include up-front site induction and regular "toolbox" style briefings. Site-specific training to be provided includes: • Aboriginal heritage sensitivity • Threatened species habitat.	Site Manager	Pre-construction and construction	
G4	General – ancillary facilities	Prior to establishment and use of any additional ancillary facilities such as compound sites and/or stockpile sites, consultation is to be undertaken with the Roads and Maritime	Site Manager	Pre-construction and construction	

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing	Reference
		Environment Officer, Hunter region to determine if any further environmental impact assessment is required.			
B1	General biodiversity impacts	A Flora and Fauna Management Plan (FFMP) is to be prepared and implemented as part of the CEMP. The FFMP should include, but not be limited to: • Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas • Pre-clearing survey requirements • Procedures for unexpected threatened species finds and fauna handling • Procedures addressing relevant matters specified in the Policy and guidelines for fish habitat conservation and management (DPI Fisheries, 2013) • Protocols to manage weeds and pathogens.	Project Manager and Site Manager	Pre-construction	
B2	Vegetation Clearing	Protocols for the clearing of vegetation, such as a pre-clearing check, are to be developed and implemented in accordance with the Roads and Maritime Biodiversity Guidelines.	Project Manager and Site Manager	Pre-construction and construction	Roads and Maritime Biodiversity Guidelines (Guide 4: Clearing of vegetation and removal of bushrock)
B3	Unexpected threatened species	An unexpected finds procedure is to be implemented in the event that a threatened species or ecological community that has not been identified and assessed by the REF is unexpectedly encountered during the construction process.	Site Manager	Pre-construction and construction	
B4	Hollow-bearing tree removal	A nest box strategy is to be developed and implemented in accordance with the Roads and Maritime Services Biodiversity Guidelines 2011 – Guide 8 (nest boxes).	Project Manager and Site Manager	Pre-construction and construction	Roads and Maritime Services Biodiversity Guidelines 2011 – Guide 8 (nest boxes)
B5	Wildlife Connectivity	An aerial crossing to retain fauna connectivity is to be installed in the vicinity of the Squirrel Gliders recorded. (An indicative	Project Manager and Site Manager	Pre-construction and construction	

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing	Reference
		location has been provided in Figure 1-3 of the REF, however the final location, design and type of aerial crossing is to be determined during detailed design).			
B6	Spread of pathogens	Protocols for preventing the introduction and/or spread of disease causing agents such as bacteria and fungi are to be developed and implemented in accordance with the Roads and Maritime Biodiversity Guidelines – Guide 7 (Pathogen Management).	Project Manager and Site Manager	Pre-construction and Construction	Roads and Maritime Biodiversity Guidelines – Guide 7 (Pathogen Management).
B7	Spread of Noxious Weeds	Declared noxious weeds are to be managed according to requirements under the *Noxious Weeds Act 1993* and the Roads and Maritime Biodiversity Guidelines – Guide 6 (Weed Management).	Site Manager	Pre-construction and Construction	Roads and Maritime Biodiversity Guidelines – Guide 6 (Weed Management)
B8	Biodiversity offsets	A Biodiversity Offset Strategy is to be developed and implemented in accordance with Roads and Maritimes Guidelines for Biodiversity Offsets.	Project Manager	Pre-construction or Construction	
B9	Dam emptying and removal	Ecologist to be present during the emptying and removal of dams in order to relocate any displaced fauna such as turtles, frogs etc.	Project manager and site manager	During construction	
AH1	Impacts to known Aboriginal heritage sites	~~An AHMP is to be prepared in accordance with the *Procedure for Aboriginal cultural heritage consultation and investigation (Roads and Maritime, 2011)* and implemented as part of the CEMP. The AHMP should provide specific guidance on measures and controls to be implemented for managing impacts on Aboriginal heritage and culture. The AHMP should be prepared in consultation with all relevant Aboriginal groups.~~ An Aboriginal Heritage Management Plan (AHMP) is to be prepared to provide specific management and control measures to prevent unauthorised impacts to Aboriginal heritage. The AHMP is to be prepared in accordance with the AHIP for the project and the Cultural Heritage Assessment	Project Manager/ Site Manager	Pre-construction and construction	Roads and Maritime Procedure for Aboriginal cultural heritage consultation and investigation

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing	Reference
		Report (CHAR), which was prepared in consultation with the Registered Aboriginal Parties for the project.			
AH2	Impacts to known Aboriginal heritage sites	An AHIP for the project area would be obtained prior to construction and any salvage would be undertaken in accordance with the proposed salvage methodology and any conditions of approval (if granted).	Project Manager/ Site Manager	Pre-construction and construction	
AH3	Possible impacts to known Aboriginal heritage sites	Archaeological sites in close proximity to construction works should be fenced off prior to the commencement of construction to ensure that they are not inadvertently affected as a result of construction work. Fencing should be maintained throughout the duration of works.	Site Manager	Pre-construction and construction	
AH4	Possible disturbance to unknown Aboriginal heritage sites	The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) is to be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. Work should only re-commence once the requirements of that Procedure have been satisfied.	Site Manager	Construction	Roads and Maritime, Standard Management Procedure – Unexpected heritage items
SG1	Soil impacts	A Soil Management Plan (SMP) is to be prepared in accordance with *QA Specification G38* and implemented as part of the CEMP. The SMP should identify all reasonably foreseeable risks relating to subsurface impacts and pollution associated with construction of the proposal, and describe how these risks would be managed and minimised. This should include arrangements for managing pollution risks associated with spillage or soil contamination on the site and adjoining areas, and monitoring during and post-construction.	Project Manager / Site Manager	Pre-construction and construction	*QA Specification G38*
SG2	Spoil and stockpile management	A Spoil and Fill Management Plan (SFMP) is to be prepared and implemented as part of the CEMP. The SFMP should identify the locations of spoil and fill stockpiles, sources of imported fill, and methods to re-use or dispose of excess or unsuitable spoil material including estimated volumes and disposal sites.	Project Manager / Site Manager	Pre-construction and construction	

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing	Reference
SG3	Groundwater impacts	In addition to the implementation of general erosion, sediment and water quality control safeguards, sediment basins, stockpiles, washdowns, batch plants, refuelling and chemical storage sites would be lined and/or bunded if they are located within 50 metres of a shallow groundwater source.	Site Manager	Construction	
SG4	Groundwater interaction	Any groundwater intercepted during construction works, such as around the flyover, is to be treated, disposed or reused appropriately. Any dewatering activities will be undertaken in accordance with the *RTA Technical Guideline: Environmental management of construction site dewatering* in a manner that prevents pollution of waters. ~~Prior to any dewatering activities being carried out, an approval must first be obtained in accordance with Section 92 of the WM Act and dewatering is to be carried out in accordance with the requirements of the Environment Protection Licence. Management measures to minimise potential adverse impacts are to be implemented in accordance with the RTA *Technical Guideline: Environmental management of construction site dewatering*.~~ ~~These may include, but not necessarily be limited to:~~ • ~~Options to collect and store groundwater to enable recharge of the water table (such as via grassed lined channels)~~ • ~~Where recharge is not appropriate or feasible, discharging groundwater to the surface water drainage system following~~ • ~~Appropriate treatment to ensure discharged water is of sufficient quality.to ensure discharged water is of sufficient quality.~~	Site Manager	Construction	
SG5	Management of topsoil	Topsoil would be stockpiled in cleared or disturbed areas and managed in accordance with the RTA *Stockpile Site Management Guideline* until it is removed from the construction site for reuse of disposal at and ~~disposed of~~ an appropriately licensed facility.	Site Manager	Construction	

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing	Reference
SG6	Soil stabilisation	The rehabilitation of disturbed areas would be carried out progressively as construction stages are completed, and in accordance with: • Landcom's Managing Urban Stormwater: Soils and Construction series • RTA Landscape Guideline • Roads and Maritime *Guideline for Batter Stabilisation Using Vegetation.*	Site Manager	Construction	Roads and Maritime Guideline for Batter Stabilisation Using Vegetation.
SG7	Construction of batter during excavation	Batters would be designed and constructed to minimise risk or exposure, instability and erosion, and to support long-term, on-going best practice management, in accordance with the Roads and Maritime *Guideline for Batter Stabilisation Using Vegetation*.	Site Manager	Construction	Roads and Maritime Guideline for Batter Stabilisation Using Vegetation.
SG8	Saline soils	A pre-construction preliminary salinity field investigation is to be considered with locations, profile descriptions, soil tests and laboratory analyses planned with reference to the Department of Land and Water Conservation (2002) – Site Investigations for Urban Salinity (DLWC, 2002).	Project Manager	Pre-construction	
W1	Water quality impacts during construction	A site specific Erosion and Sediment Control Plan (ESCP) is to be prepared and included in the CEMP. The ESCP should identify detailed measures and controls to be applied to minimise erosion and sediment control risks including, but not necessarily limited to runoff, diversion and drainage points, sediment basins and sumps, scour protection, stabilising disturbed areas as soon as possible, and dam checks. The ESCP should also include arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather.	Project Manager / Site Manager	Pre-construction and construction	
W2	Minimise risks to water quality during	Consistent with any specific requirements of the approved ESCP and the SMP, control measures should be implemented to minimise risks associated with erosion and	Site Manager	Construction	

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing	Reference
	construction	sedimentation and entry of materials into the creek / drainage lines. This may include, but not necessarily be limited to: • Sediment management devices, such as sediment fencing, straw bales or sand bags • Installation of measures at work entry and exit points to minimise movement of material onto adjoining roads, such as rumble grids or wheel wash bays • Appropriate location and storage of construction materials, fuels and chemicals, including bunding where appropriate.			
C1	Contaminant exposure during construction	If contaminated areas are encountered during construction, appropriate control measures would be implemented to manage the immediate risks of contamination, such as the diversion of surface runoff, capture of any contaminated runoff or temporary capping. All other work that may impact on the contaminated area would cease until the nature of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Environment Manager and/or NSW Environment Protection Agency (EPA).	Site Manager	Construction	
C2	Emergency spills	~~A site specific emergency spill plan would be developed and implemented, and include spill management measures in accordance with the Roads and Maritime *Code of Practice for Water Management* and relevant EPA guidelines. The plan would address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Roads and Maritime and EPA Officers).~~ A Spill Management Plan will be prepared and implemented as part of the CEMP to minimise the risk of pollution arising from spillage or contamination on the site and adjoining areas. The Spill Management Plan will address, but not necessarily be limited to: management of chemicals and potentially polluting materials; any bunding requirements; maintenance of plant and equipment; and emergency management, including	Project Manager / Site Manager	Pre-construction and construction	Roads and Maritime Code of Practice for Water Management

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing	Reference
		notification, response and clean-up procedures.			
T1	Disruptions to traffic and transport	A Traffic Management Plan (TMP) is to be prepared and implemented as part of the project CEMP. The TMP should be prepared in accordance with the Roads and Maritime *Traffic control at worksites manual* (Version 4), Australian Standard 1742.3 Manual of uniform traffic control devices, and instruction from the Transport Management Centre. The TMP should include, but not be limited to: • Confirmation of haulage routes and site access points • Site specific traffic control measures (including signage) to manage and regulate traffic movements • Measures to maintain access to properties • Requirements and methods to inform the local community of impacts on the local road network • A response plan for any construction traffic related incidents.	Project Manager and Site Manager	Pre-construction	Roads and Maritime Traffic control at worksites manual (Version 4),
T2	Changed transport and access conditions	Road users, local residents, and local businesses are to be informed in advance of changed conditions, including any likely disruptions to access.	Project Manager and consultation team	Pre-construction and construction	
T3	Changed transport and access conditions	Consultation is to be carried out with Hunter Valley Buses should the existing Singleton Heights to Stockland Green Hills via Maitland (route 180) bus stops within the project area need to be temporarily relocated. Appropriate temporary stop locations should be agreed and implemented for the defined period.	Project Manager	Pre-construction and construction	
T4	Disruptions to traffic and transport	Real-time information is to be made available through temporary Variable Message Signs (VMS), the Live Traffic and 131 500 websites, and the media.	Project Manager/ Site Manager	Construction	
T5	Disruptions to traffic and	Construction staging and materials are to be managed to minimise the number of haulage and delivery vehicles	Site Manager	Construction	

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing	Reference
	transport	required on site.			
T6	Disruptions to traffic and transport	The designated site access points and haulage routes are to be used.	Site Manager	Construction	
T7	Transport conditions	Affected areas are to be restored to a condition equivalent to that which existed prior to the commencement of the work.	Site Manager	Post-construction	
NV1	Construction noise and vibration	A Noise and Vibration Management Plan (NVMP) is to be prepared and implemented as part of the CEMP. The NVMP should generally follow the approach in Interim Construction Noise Guideline (ICNG) and identify: • All potential significant noise and vibration generating activities • Measures to be implemented during construction to minimise noise and vibration impacts • A monitoring program to assess performance against relevant noise and vibration criteria • Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures • Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria. The CEMP should be regularly updated to account for changes in noise and vibration management strategies.	Project Manager/ Site Manager	Pre-construction and construction	
NV2	Construction noise	All sensitive receivers likely to be affected by construction noise are to be notified at least 7 days prior to commencement of any works associated with the activity that may have an adverse impact. The notification will include details of: the project, the construction period and construction hours, contact information for project management staff, complaint and incident reporting, and how to obtain further information.	Site Manager	Pre-construction and construction	

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing	Reference
NV3	Construction noise	The majority of works are to be carried out during standard working hours (i.e. 7am – 6pm Monday to Friday, 8am –1pm Saturdays). Any work that is performed outside normal work hours or on a Sunday or public holiday is to minimise noise impacts in accordance with Roads and Maritime's *Environmental Noise Management Manual Practice Note 7 – Roadworks Outside of Normal Working Hours* and the ICNG.	Site Manager	Construction	Roads and Maritime's Environmental Noise Management Manual Practice Note 7 – Roadworks Outside of Normal Working Hours
NV4	Construction noise	Construction personnel are to be made familiar with the potential for noise and vibration impacts upon local residents and encouraged to take all practical and reasonable measures to minimise noise during the course of their activities.	Site Manager	Construction	
NV5	Construction noise	Where practical, the location of construction compounds and the layout and positioning of noise-producing plant and activities at each work site is to be optimised to minimise noise emission levels.	Site Manager	Construction	
NV6	Construction noise	Where practical, equipment should be selected to minimise noise emissions. Equipment should be fitted with appropriate noise control equipment and be in good working order.	Site Manager	Construction	
NV7	Construction noise	Where possible, non-"beeper" reversing movement alarms should be used such as broadband (non-tonal) alarms or ambient noise-sensing alarms. Work sites should also be designed to reduce the need for reversing, potentially minimising the use of reversing beepers.	Site Manager	Construction	
NV8	Construction noise	Vehicles, plant and equipment are to be regularly inspected and maintained to avoid increased noise levels from rattling hatches, loose fittings etc.	Site Manager	Construction	
NV9	Construction noise	All vehicles, plant and equipment are to be shut off when not in use.	Site Manager	Construction	

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing	Reference
NV10	Construction vibration	Where required, attended vibration measurements are to be undertaken at the commencement of vibration generating activities to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage.	Site Manager	Construction	
NV11	Construction vibration	Where required, the following should be considered to minimise the noise and vibration impacts of blasting: • Choosing the appropriate blast charge configurations • Ensuring appropriate blast-hole preparation • Optimising blast design, location, orientation and spacing • Selecting appropriate blast times, and • Utilising knowledge of prevailing meteorological conditions. AS 2187.2 Explosives-Storage, transport and use, Part 2: Use of Explosives provides more detailed advice on ground vibration and airblast overpressure impact minimisation options.	Site Manager	Construction	
LV1	Visual impacts during construction	Project work sites, including construction areas and supporting facilities (such as storage compounds and offices) must be managed to minimise visual impacts, including appropriate storage of equipment, parking, stockpile screening and arrangements for the storage and removal of rubbish and waste materials.	Site Manager	Construction	
LV2	Temporary lighting	Temporary site lighting must be installed and operated in accordance with *AS4282:1997 Control of the Obtrusive Effect of Outdoor Lighting*.	Site Manager	Construction	
LV3	Landscape design strategy	The landscape design strategy for the proposal should be reviewed during the final detailed project design and implemented as part of the CEMP.	Project Manager and Site Manager	Detailed design and construction	
LU1	Property	All property acquisition is to be carried out in accordance with	Project manager	Pre-construction	Roads and Maritime,

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing	Reference
	acquisition	the *Land Acquisition Information Guide* (Roads and Maritime, 2012) and the *Land Acquisition (Just Terms Compensation) Act 1991*.			Land Acquisition Information Guide
LU2	Temporary leasing	The temporary leasing of any land is to be managed and setup at the earliest stage possible in the project and all land owners consulted with in accordance with the standard consultation measures.	Project Manager	Pre-construction	
LU3	Utility work	Prior to the commencement of utility work, consultation is to be carried out with the identified persons and organisations that may be adversely affected by service disruptions to determine any special requirements or alternative service arrangements.	Project Manager	Pre-construction	
AQ1	Air quality impacts during construction	An Air Quality Management Plan (AQMP) is to be prepared and implemented as part of the CEMP. The AQMP should identify: • Potential sources of air pollution (such as dust, vehicles transporting waste, plant and equipment) during construction • Air quality management objectives consistent with any relevant published EPA and/or OEH guidelines • Mitigation and suppression measures to be implemented, such as spraying or covering exposed surfaces, provision of vehicle clean down areas, covering of loads, street cleaning, use of dust screens, maintenance of plant in accordance with manufacturer's instructions • Methods to manage work during strong winds or other adverse weather conditions • A progressive rehabilitation strategy for exposed surfaces • A monitoring program to assess compliance with the identified objectives, and developed in accordance with any relevant published EPA and/or OEH guidelines • Community notification and complaint handling procedures.	Project Manager and Site Manager	Pre-construction and construction	

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing	Reference
AQ2	Air quality impacts during construction	All personnel working on-site are to receive training to ensure awareness of requirements of the AQMP. Site-specific training is to be given to personnel working in the vicinity of sensitive receivers.	Site Manager	Pre-construction	
AQ3	Air quality impacts during construction	Consistent with the approved AQMP, mitigation and suppression measures are to be implemented to protect local air quality.	Site Manager	Construction	
SE1	General community	A Communication Plan (CP) is to be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum): • Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions • A complaints handling procedure The CP will be prepared in accordance with the *Community Involvement and Communications Resource Manual* (RTA, 2008).	Project Manager and Site Manager	Pre-construction and construction	
SE2	Property impacts	Consultation is to be carried out with the abattoir to identify appropriate management strategies to avoid or minimise impacts on access and operations. These details are to be included in the TMP.	Project Manager	Pre-construction	
SE3	Impacts to bus services	Operation of public and school bus services are to be maintained during construction of the proposal. Appropriate arrangements are to be made with the local school bus provider to ensure safe pick up and drop off points are maintained/ established throughout the construction period. These details are to be included in the project TMP.	Project Manager and Site Manager	Pre-construction and construction	
SE4	Emergency services	Access for emergency service vehicles, including police, ambulance, fire and rescue and the rural fire brigade is to be provided at all times during construction. Any special arrangement for emergency vehicles should be	Project Manager and Site Manager	Pre-construction and construction	

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing	Reference
		communicated with the relevant agency and detailed in the project TMP.			
WR1	Construction waste	A Waste Management Plan (WMP) is to be prepared and implemented as part of the CEMP. The WMP should provide specific guidance on measures and controls to be implemented to support minimising the amount of waste produced and appropriately handle and dispose of unavoidable waste. It would also address the importation of waste to the site for use in undertaking the project. The WMP would give effect to any management measures contained in any waste assessment carried out for the project and include, but not necessarily be limited to: • measures to avoid and minimise waste associated with the project • classification of wastes generated by the project and management options (re-use, recycle, stockpile, disposal) • classification of wastes received from off-site for use in the project and management options • identifying any statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal • monitoring, record keeping and reporting, including any documentation management obligations arising from resource recovery exemptions. The WMP would be prepared taking into account the Roads and Maritime *Environmental Procedure – Management of Wastes on Roads and Maritime Services Land* and relevant Roads and Maritime Waste Fact Sheets.	Project Manager / Site Manager	Pre-construction and construction	
WR2	Construction waste	Waste would be classified in accordance with the methods and specifications of the NSW EPA Waste Classification Guidelines 2014.	Site Manager	Construction	
WR3	Construction	Any trees to be removed are to be reused as millable timber	Site Manager	Construction	

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing	Reference
	green waste	wherever practicable. Other vegetated material from native species shall be mulched and re-use on-site for landscaping or rehabilitation purposes if consistent with the approved FFMP for the project. Weed species, or vegetation not considered appropriate for re-use on-site, would be removed and disposed of to an appropriately licenced facility.			
CU1	Cumulative impacts	Cumulative impacts would be incorporated into the traffic management plan and the noise management plan.	Project Manager	Pre-construction and construction	
CU2	Cumulative impacts	Management measures within the CEMP would be reviewed in response to any complaints received.	Project Manager / Site Manager	Construction	

5.3 Licensing and approvals

Should the proposal proceed, the licenses and approvals as outlined in Table 5-2 may be required prior to the commencement of construction.

Table 5-2: Summary of licensing and approval required

Instrument	Requirement	Timing
Water Management Act 2000	Water supply work approval in accordance with section 92 of the WM Act if groundwater needs to be extracted for dewatering purposes during construction	Prior to the commencement of the work
Water Management Act 2000	A licence may be required under the WM Act for use of water from the dam if the intended amount of water to be withdrawn is outside the amount within Roads and Maritime's harvestable right	Prior to the commencement of the work
National Parks and Wildlife Act 1974	Under the NPW Act, an AHIP is required prior to the harm of any Aboriginal objects	Prior to the commencement of the work
Protection of the Environment Operations Act 1997	An EPL would be required under the POEO Act for the extraction of more than 30,000 tonnes of material in a year	Prior to the commencement of the work

6. References

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Office of Environment and Heritage (OEH) 2010, *Aboriginal cultural heritage consultation requirements for proponents*, April 2010

Office of Environment and Heritage (OEH) 2011, *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*, April 2011

Roads and Maritime Services 2017, *New England Highway upgrade between Belford and the Golden Highway Review of Environmental Factors,* June 2017

Roads and Maritime Services 2011, *Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI)*, November 2011

Terms and acronyms used in this report

Acronym	Description
AFG	Aboriginal Focus Group
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
AHMP	Aboriginal Heritage Management Plan
AQMP	Air Quality Management Plan
BC Act	Biodiversity Conservation Act 2016
CEMP	Construction Management Plan
CHAR	Cultural Heritage Assessment Report
CMA	Catchment Management Authority
CP	Communication Plan
DLWC	Department of Land and Water Conservation
DPI	Department of Primary Industries
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	NSW Environment Protection Agency
EEC	Endangered Ecological Communities
ENMM	Environmental Noise Management Manual
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
EPL	Environment Protection Licence
ESCP	Erosion and Sediment Control Plan
FBA	Framework for Biodiversity Assessment
FFMP	Flora and Fauna Management Plan

Acronym	Description
ha	Hectares
ICNG	Interim Construction Noise Guideline
LALC	Local Aboriginal Land Council
LCZ	Landscape Character Zones
LEP	Local Environmental Plan
LoS	Level of Service
NPW	National Parks and Wildlife Act 1974
NVMP	Noise and Vibration Management Plan
OEH	Office of Environmental and Heritage
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PBS	Performance-Based Standards
PCT	Plant Community Types
PCWP	Plains Clans of the Wonnarua People
PEMP	Project Environmental Management Plan
POEO Act	Protection of the Environment Operations Act 1997
RDP	Rapid Data Points
Roads and Maritime	Roads and Maritime Services
RTA	Roads and Traffic Authority (previous name of Roads and Maritime Services)
SFMP	Spoil and Fill Management Plan
SMP	Soil Management Plan
TEC	Threatened Ecological Community
TSC Act	Threatened Species Conservation Act 1995 (repelled by Biodiversity

Acronym	Description
	Conservation Act 2016)
TMP	Traffic Management Plan
WM Act	Water Management Act
WMP	Waste Management Plan 2000
VMS	Variable Message Signs

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13 22 13

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