Appendix A

Newspaper advertisement

Have your say

New England Highway upgrade between Belford and the Golden Highway

Roads and Maritime Services is planning to upgrade the New England Highway between Belford and the Golden Highway to improve travel times and safety for motorists.

The proposal involves providing two travel lanes in each direction and a flyover for vehicles turning right from the Golden Highway towards Maitland and Newcastle.

An environmental assessment has been carried out to identify potential impacts of the proposal and activities to reduce them.

The concept design and environmental assessment are available to view at **rms.work/B2G** or at the Singleton Service NSW Centre at 158 John Street Singleton, Monday to Friday from 9am to 4.30pm.

We invite you to provide feedback by **25 July 2017**. Feedback will be considered in finalising the proposal.

For more information or to provide feedback please contact Senior Project Development Officer Andrew Thompson on 02 4908 7630 or email Andrew.J.Thompson@rms.nsw.gov.au

Appendix B

Community update newsletter

New England Highway upgrade between Belford and the Golden Highway

Concept design and environmental assessment

June 2017

Roads and Maritime Services is planning to upgrade the New England Highway between Belford and the Golden Highway. The NSW Government has committed $85 million under the Rebuilding NSW Plan for the upgrade to improve traffic flow, travel times and safety for road users.

An environmental assessment has been carried out to identify potential impacts of the proposal and activities to reduce them.

Comments from stakeholders and the community are invited by **Friday, 28 July 2017**. We will consider feedback in finalising the proposal.

Background

The New England Highway is the primary road connecting the Upper Hunter with Maitland and Newcastle. It is also a critical connection between Maitland and Singleton, which are future growth areas for the Hunter.

The Golden Highway connects the New England Highway at Whittingham with Dubbo.

These roads are used by heavy vehicles servicing industries in the Hunter Valley and Central West to access Newcastle.

Around 22,000 vehicles use the New England Highway between Belford and the Golden Highway each day. This section of the highway is currently two lanes westbound and one lane eastbound. It has a history of crashes, particularly near the Golden Highway intersection.

In May 2015 the NSW Government announced the preferred option for the proposed upgrade. The NSW Government has provided $4 million in the 2016–17 financial year to continue planning.

The concept design and environmental assessment are now available for community and stakeholder feedback and can be viewed at **rms.work/B2G**.

The proposal

The proposed upgrade provides the best overall balance between environmental, social and technical considerations.

Key features include:

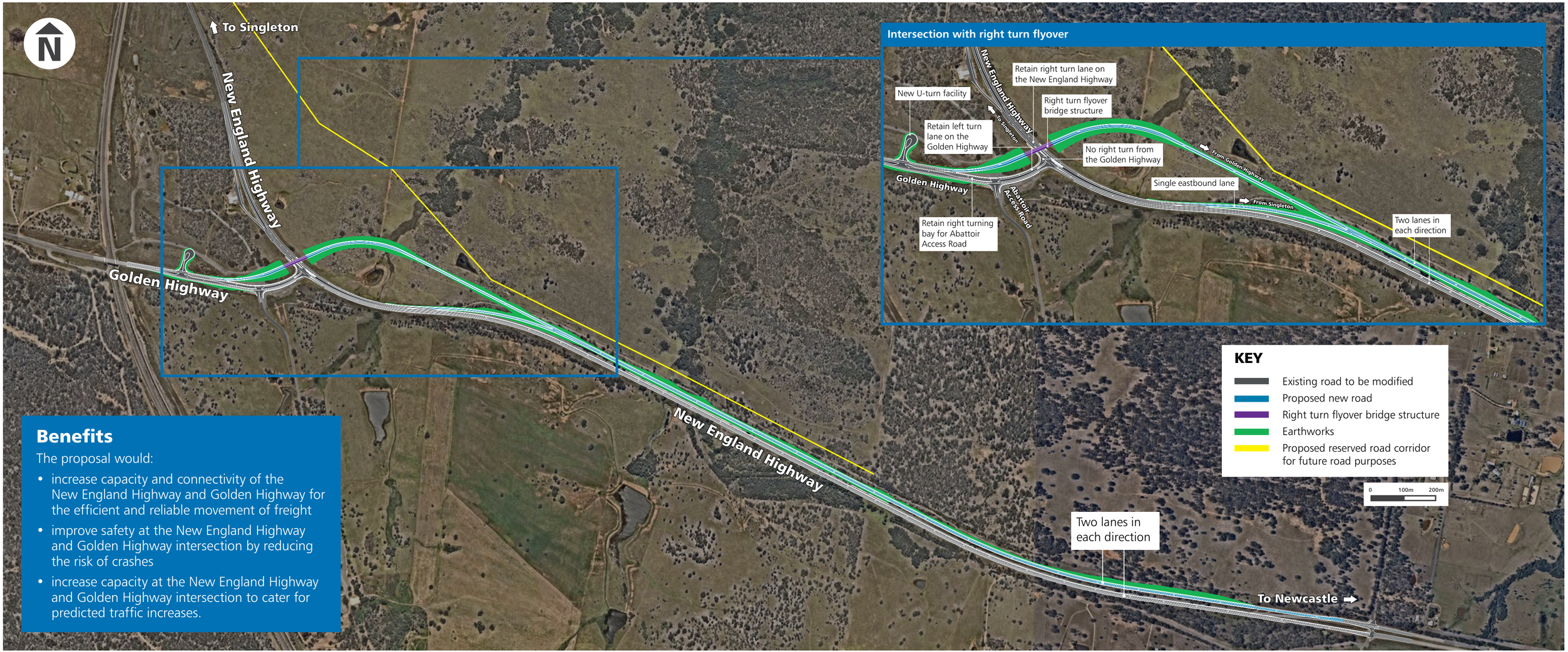
- widening the New England Highway for around 3.2 kilometres to provide a divided road with two travel lanes in each direction between Belford and the Golden Highway
- replacing the existing right turn movement from the Golden Highway to the New England Highway with a right turn flyover
- removing the Whittingham rest area near the New England Highway and Golden Highway intersection.

Improve
travel speeds

Better and more
reliable trips
for locals, long distance traffic and freight

Reduce fatalities
and serious injury

New England Highway upgrade between Belford and the Golden Highway



Benefits

The proposal would:

- increase capacity and connectivity of the New England Highway and Golden Highway for the efficient and reliable movement of freight
- improve safety at the New England Highway and Golden Highway intersection by reducing the risk of crashes
- increase capacity at the New England Highway and Golden Highway intersection to cater for predicted traffic increases.

Environmental assessment

We have carried out an environmental assessment to identify the proposal's potential environmental and social impacts.

The assessment was carried out in consultation with a range of key stakeholders including technical specialists. It also considered feedback received from the community.

The investigations found the proposal is unlikely to have a significant impact on the environment if a range of environmental minimisation and management measures are carried out.

Key considerations for assessment

The following areas of potential impact have been identified in the environmental investigations. The environmental assessment describes these impacts and activities to reduce them.

Property and access

The proposal would result in a loss of agricultural land and permanently change the property access arrangements of one private property.

Ongoing consultation with affected property owners, businesses and the wider community would minimise impacts.

Biodiversity

The proposal would involve removing native vegetation, resulting in less habitat for a range of birds and mammals. This would impact on threatened species and the connectivity of fauna habitat.

An aerial fauna crossing over the New England Highway would be provided to help offset this loss. A biodiversity offset strategy would be developed to reduce potential impacts.

Aboriginal heritage

Aboriginal archaeological sites of moderate significance would be impacted by the proposal.

A methodology for salvaging artefacts from these sites before construction has been developed, in consultation with the local Aboriginal community.

Noise

Noise may be experienced at some properties within 600 metres of the site during construction. Where possible, work would be carried out during standard working hours.

To minimise disruption to traffic and reduce construction timeframes, some work would take place outside of these hours. We would limit noise related work to standard construction hours and minimise noise made by machinery wherever possible.

Visual impacts

The proposal would increase the size and visibility of the highway with the addition of a flyover. A design and landscape strategy has been developed to help reduce this impact.

Proposed construction

There would be some increased travel times along sections of the New England Highway and Golden Highway during construction of the proposal.

A minimum of one lane would be maintained in each direction on the New England Highway during peak travel times.

A reduced speed limit would be implemented for traffic through the construction zone and traffic management would be in place to reduce impacts.

We would notify road users of any changes to traffic throughout the construction of the project.

The completed proposal would reduce delays during peak periods at the New England Highway and the Golden Highway intersection, especially for traffic turning right from the Golden Highway. It would also improve average peak hour travel times on the New England Highway and improve road safety between Belford and the Golden Highway.

Artist impression: Right turn flyover from the Golden Highway to the New England Highway

Artist impression: New England Highway, new divided road heading east towards Maitland

Involving the community and stakeholders

The preferred option for the upgrade was displayed for comment in May 2015.

The feedback received was considered in preparing the environmental assessment and concept design.

We are working with the community and stakeholders during planning to identify issues and minimise potential impacts of the proposed upgrade and construction activities.

Have your say

We invite your feedback on the environmental assessment by **Friday, 28 July 2017.**

02 4908 7630

Andrew.J.Thompson@rms.nsw.gov.au

Andrew Thompson
Senior Project Development Officer
Roads and Maritime Services
Locked Bag 2030
Newcastle NSW 2300

More information is also available at **rms.work/B2G**

Visit a display

You can collect a project update or view the display between 9am and 4.30pm from Monday to Friday until **Friday, 28 July 2017** at the Singleton Service NSW Centre at 158 John Street, Singleton.

The environmental assessment and more information are also available at **rms.work/B2G**.

Next steps

We invite your feedback on the environmental assessment by **Friday, 28 July 2017**.

We will consider the feedback received in finalising the proposal.

The timing of construction is not yet confirmed.

131 450

This document contains important information about road projects in your area. If you require the services of an interpreter, please contact the Translating and Interpreting Service on **131 450** and ask them to call the project team on **1800 631 531**. The interpreter will then assist you with translation.

Save travel time

Intersection improvements

Improving safety

June 2017
RMS 17.303

Transport Roads & Maritime Services

Appendix C

Media Releases

16 February 2018

Next stage of Golden Highway package begins with intersection upgrade

Important safety works are on the way for the Golden Highway, with a crucial intersection upgrade starting from Monday at Cobbora Road, west of Dunedoo.

Deputy Prime Minister and Minister for Infrastructure and Transport Barnaby Joyce said the upgrade would improve safety for all drivers at the major intersection.

“A third of the 1,000 vehicles which use this intersection every day are heavy vehicles, so getting the intersection right by improving visibility for drivers and creating extra room for turning traffic is a good investment in road safety,” Mr Joyce said.

“It is all being done under our jointly funded $47.6 million Golden Highway – Belford to Dubbo improvements project.”

New South Wales Minister for Roads, Maritime and Freight Melinda Pavey said Cobbora Road provided direct access to the Mitchell Highway at Montefiores and the Golden Highway near Elong Elong.

“This is an important upgrade that will improve safety for motorists at this intersection by addressing safety concerns,” Mrs Pavey said.

Federal Member for Parkes Mark Coulton said the works would include widening and strengthening the highway, realigning the intersection to improve lines of sight and providing marked turning opportunities into and out of Cobbora Road.

“Once the work is completed, motorists will be able to enjoy a safer road, improved travel times and the removal of various roadside hazards,” Mr Coulton said.

New South Wales Member for Dubbo Troy Grant said works were planned for Monday 19 February until May 2018, from 7am to 6pm on weekdays and from 8am to 1pm on Saturdays.

“Motorists should plan their trip and allow extra travel time while work is carried out. Traffic control and a reduced speed limit of 40 km/h will be in place during work hours for the safety of workers and motorists,” Mr Grant said.

The Australian Government has committed $23.795 million to the $47.64 million Golden Highway – Belford to Dubbo Improvements project under the Heavy Vehicle Safety and Productivity Program in partnership with the New South Wales Government.

Media Contacts

For Mr Joyce: Kate Barwick 0408 072 809

For Mrs Pavey: Jessica Cole 0437 767 663

For Mr Coulton: Simon Chamberlain 0477 309 999

For Mr Grant: Office 02 6882 3577

14 July 2017

REMINDER TO COMMENT ON PROPOSED NEW ENGLAND HIGHWAY UPGRADE BETWEEN BELFORD AND THE GOLDEN HIGHWAY

Michael Johnsen MP, Member for Upper Hunter is reminding the community to have a say on the proposed upgrade of the New England Highway between Belford and the Golden Highway.

Mr Johnsen said the NSW Government allocated $4 million last financial year with an additional $5 million allocated this year to continue planning for the proposed $85 million upgrade, funded through the Rebuilding NSW Plan.

“The highway is currently two lanes westbound and one lane eastbound at this particular section and unfortunately has a high crash rate near the Golden Highway intersection,” Mr Johnsen said.

“In May 2015 the NSW Government announced a preferred option for the proposed upgrade.

“The proposed upgrade is expected to improve traffic, travel times and safety for around 22,000 vehicles a day by providing two travel lanes in each direction and a flyover for vehicles turning right from the Golden Highway towards Maitland and Newcastle.”

Mr Johnsen said an environmental assessment has been carried out to identify the potential impact of the proposal and activities to reduce them.

“Investigations found the work is not likely to have a significant impact on our local environment with a range of environmental mitigation and management measures put in place,” Mr Johnsen said.

“I am proud to serve in a Government that is delivering significant and ongoing upgrades to our local infrastructure, and the Nationals in Government are committed to ensuring regional and rural motorists enjoy safe, high-quality roads,” Mr Johnsen concluded.

The community and stakeholders are reminded to provide feedback on the proposal before comments close at 2pm on Friday 28 July.

A project update and the proposal can be viewed on weekdays between 9am and 4.30pm until Friday 28 July at the Singleton Service NSW Centre at 158 John Street, Singleton.

The environmental assessment and more information are also available online at www.rms.work/B2G

Media: 02 6543 1065

Wednesday, 14 September 2016

PLANNING PROGRESSES ON NEW ENGLAND HIGHWAY UPGRADE BETWEEN BELFORD AND GOLDEN HIGHWAY

Michael Johnsen MP, Member for Upper Hunter today announced that planning for the New England Highway upgrade between Belford and the Golden Highway is progressing with work on the environmental assessment now being carried out.

Mr Johnsen said the NSW Government has committed $85 million under the Rebuilding NSW Plan for the upgrade to improve traffic flow, travel times and safety for motorists.

“The proposed upgrade would provide two lanes in each direction between Belford and the Golden Highway and a flyover for vehicles turning right from the Golden Highway towards Maitland and Newcastle,” Mr Johnsen said.

“The upgrade would also include a road corridor for future development of the New England Highway toward Singleton.”

Mr Johnsen said Roads and Maritime Services is working on an environmental assessment to improve understanding of any impact the upgrade may have on the project area.

“The assessment includes geotechnical investigations to determine ground conditions at the proposed site as well as investigations and consultation on any potential impact on our local Upper Hunter heritage,” Mr Johnsen said.

“Flora and fauna investigations will also be carried out to minimise any potential impact on our local biodiversity.”

Roads and Maritime will continue to work with stakeholders including nearby land owners and Singleton Council throughout the planning process.

“The environmental assessment and concept design for the proposed upgrade will be displayed for our community’s feedback mid-next year,” Mr Johnsen concluded.

A project update is available at www.rms.nsw.gov.au/

MEDIA: 02 6543 1065

29 July 2016

Motorists are advised of changed traffic conditions on the New England Highway from next week as investigation work is carried out to inform future safety improvements.

Roads and Maritime Services is planning to upgrade the New England Highway between Belford and the Golden Highway to provide two lanes in each direction and a flyover for vehicles turning right from the Golden Highway towards Maitland and Newcastle.

Work is under way to prepare the concept design and environmental assessment for the upgrade which are expected to be displayed for community comment in mid-2017.

Geotechnical investigations will be carried out from Monday 1 August to help prepare the concept design and environment assessment.

Information from these investigations will help plan the future highway upgrade.

Some of the investigations will be carried out next to the highway, with lane and shoulder closures in place for the safety of workers and motorists.

Work will be carried out between 9.30am and 2.30pm from Monday 1 to Wednesday 3 August and between 6am and 6pm on Saturday 6 and Saturday 13 August.

Reduced speed limits and traffic control will be in place during work hours.

Roads and Maritime will continue to liaise with property owners throughout the investigations.

Motorists are thanked for their patience while work is carried out.

For the latest traffic information visit www.livetraffic.com, download the Live Traffic App or call the Transport Management Centre on 132 701.

30 March 2016

Deputy Premier Troy Grant, Minister for Roads Duncan Gay and local members today released the Golden Highway Draft Corridor Strategy which highlights key investment opportunities over the next 20 years to improve this critical freight route.

Mr Grant said the Golden Highway is a key link for freight travelling from the Central West region to the Hunter region and ultimately to the Port of Newcastle.

“Regional communities and industries will be the winners under this strategy. This is a vital route for the agriculture and coal mining industries so we’re investing $170 million into highway upgrades that will improve higher-productivity vehicle access and road safety,” Mr Grant said.

Mr Gay said the Strategy provides a highway blueprint, identifying projects that will deliver immediate benefits and also ensuring the highway is future proofed for years to come.

“Key short term priorities identified in the strategy include; constructing overtaking lanes east of Denman, construction of truck parking bays and upgrading a number of intersections,” Mr Gay said.

”Another key priority for the NSW Government is delivering a grade separated interchange where the Golden Highway intersects with the New England Highway near Belford.”

Member for Upper Hunter Michael Johnsen said release of the strategy marks a major milestone in the NSW Government’s commitment to upgrade the Golden Highway corridor.

“It’s great to be a part of delivering such major works to a key highway for the people of the Upper Hunter,” Mr Johnsen said.

Member for Barwon Kevin Humphries encourages community members to have their say on the draft strategy.

“The NSW Government is getting on with the job of improving NSW roads - progressively every State road will have a corridor strategy to prepare for the future,” Mr Humphries said.

For more information on the strategy including session times, please visit:
http://www.transport.nsw.gov.au/projects-road-network-corridor-planning

17 SEPTEMBER 2015

CONTRACT AWARDED TO PLAN THE NEW ENGLAND HIGHWAY UPGRADE BETWEEN BELFORD AND THE GOLDEN HIGHWAY

Michael Johnsen, Member for Upper Hunter today announced that planning is progressing on the New England Highway upgrade between Belford and the Golden Highway with the design contract awarded to Arup Pty Ltd today.

Mr Johnsen said Arup Pty Ltd will carry out the concept design and environmental assessment, detailed design and tender documentation for the proposed upgrade.

“The NSW Government has allocated $85 million under Rebuilding NSW for the upgrade which aims to improve safety, traffic and travel times for the 22,000 vehicles using this section of the New England and Golden highways daily,” Mr Johnsen said.

“The proposal involves widening the New England Highway to a four lane divided highway between Belford and the Golden Highway which is the final section of the route between Newcastle and the Golden Highway to be upgraded.

“A new flyover is also proposed for motorists travelling to Maitland and Newcastle from the Golden Highway which would improve road safety and increase freight transport efficiency.

“The New England and Golden Highways are used extensively by heavy vehicles accessing the port of Newcastle for coal mining, grain production and other important freight industries, not only for our Upper Hunter Electorate, but also the wider Valley and the Central West,” Mr Johnsen concluded.

Roads and Maritime Services will invite the community to have a say on the concept design and environmental assessment which are scheduled to be displayed late next year.

For more information on the upgrade and other projects in the Hunter region visit www.rms.nsw.gov.au.

MEDIA: 02 6543 1065

1 SEPTEMBER 2015

FEEDBACK REPORT FOR NEW ENGLAND HIGHWAY UPGRADE NOW ONLINE

Michael Johnsen MP, Member for Upper Hunter today highlighted that community members are now invited to view the consultation report responding to feedback received during the display of the preferred option for the New England Highway upgrade between Belford and the Golden Highway.

Mr Johnsen said the NSW Government has allocated $85 million funding for the upgrade under the Rebuilding NSW Plan to improve traffic flow, travel times and safety on the highway for motorists.

“Community feedback was invited in May on the proposal to provide a divided road with two travel lanes in each direction between Belford and the Golden Highway and a flyover for vehicles turning right from the Golden Highway towards Maitland and Newcastle,” Mr Johnsen said.

“The consultation report summarises the 32 formal submissions received during consultation and responds to the issues raised.

“Community feedback has been responded to around safety concerns, suggestions for alternative designs for the upgrade, property access and timing.

“Issues relating to the proposed road corridor for future development of the New England Highway, environmental impacts, the Whittingham rest area and property acquisition were also responded to.

“Roads and Maritime thanks the community for their feedback and will now carry out the concept design and environmental assessment taking the feedback into consideration.

“The community will be invited to provide further feedback when the concept design and environmental assessment are displayed in late next year,” Michael Johnsen said.

The consultation report is now available on the Roads and Maritime website at www.rms.nsw.gov.au.

22 July, 2015

SAFETY IMPROVEMENT WORK STARTS ON NEW ENGLAND HIGHWAY NORTH OF BELFORD

Michael Johnsen MP, Member for Upper Hunter is pleased to announce that Roads and Maritime Services will start work on safety improvements on the New England Highway north of Belford next month after a recent road safety review of this section of the highway.

Mr. Johnsen said the safety review identified improvements to the southbound merge lane on the New England Highway south of the Golden Highway intersection.

“Since late 2013, one fatal crash two injury crashes have occurred near the north and southbound merges to the highway,” Mr. Johnsen said.

“Roads and Maritime will carry out safety improvements to relocate the merge north of the crest on the New England Highway to improve visibility and reduce traffic congestion which occurs during busy times as motorists form one lane.

“A reduced 80km/h speed limit will be installed along with queue warning signage to improve safety at the new merge location and to manage potential congestion.

“Line marking improvements will also be carried out to provide a wider median and increased clearance between opposing traffic near the merge.

“Roads and Maritime will provide the community with an update on the start of work in the coming weeks,” Mr. Johnsen said.

Mr. Johnsen said planning is progressing well on the proposal to upgrade the New England Highway and Golden Highway intersection which involves providing a new flyover and a four lane divided highway between Belford and the Golden Highway.

“Community feedback is currently being reviewed to finalise the concept design and environmental assessment.

“More information about the major upgrade will be available for community consultation in late 2016,” Mr. Johnsen said.

2 September 2014

22 July, 2015

SAFETY IMPROVEMENT WORK STARTS ON NEW ENGLAND HIGHWAY NORTH OF BELFORD

Michael Johnsen MP, Member for Upper Hunter is pleased to announce that Roads and Maritime Services will start work on safety improvements on the New England Highway north of Belford next month after a recent road safety review of this section of the highway.

Mr. Johnsen said the safety review identified improvements to the southbound merge lane on the New England Highway south of the Golden Highway intersection.

“Since late 2013, one fatal crash two injury crashes have occurred near the north and southbound merges to the highway,” Mr. Johnsen said.

“Roads and Maritime will carry out safety improvements to relocate the merge north of the crest on the New England Highway to improve visibility and reduce traffic congestion which occurs during busy times as motorists form one lane.

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“Roads and Maritime will provide the community with an update on the start of work in the coming weeks,” Mr. Johnsen said.

Mr. Johnsen said planning is progressing well on the proposal to upgrade the New England Highway and Golden Highway intersection which involves providing a new flyover and a four lane divided highway between Belford and the Golden Highway.

“Community feedback is currently being reviewed to finalise the concept design and environmental assessment.

“More information about the major upgrade will be available for community consultation in late 2016,” Mr. Johnsen said.

13 December 2013

Safety and traffic improvements were completed this week on the New England Highway between Belford and the Golden Highway.

“Work on the project started on 5 August and took about 4 months to complete,” said XXX

“The work involved widening the highway and changing the layout of the lanes to increase road safety and improve traffic flow beyond the western end of the Hunter Expressway when it opens to traffic.

“Motorists now have access to two westbound lanes and a single eastbound lane along this three kilometre section of the New England Highway.

“The right turn lane from the Golden Highway onto the New England Highway has been retained and the existing left turn lane onto the Golden Highway has been extended.

“The NSW Government provided $5 million to improve road conditions along this three kilometre section of the New England Highway.

“Roads and Maritime Services thanks motorists and residents for their patience while the work was carried out,” XXX said.

For more information on road projects visit www.rms.nsw.gov.au

Appendix D

Addendum Biodiversity assessment

5 June 2018

Leah Howell
Senior Consultant
Environment and Resources
Arup
Level 10, 201 Kent Street
Sydney NSW 2000

Via email: Leah.Howell@arup.com

Dear Leah,

RE: Belford to Golden Highway Additional Assessment - Biodiversity

1 INTRODUCTION

Roads and Maritime Services (Roads and Maritime) proposes to upgrade the New England Highway between Belford and the Golden Highway. A Review of Environmental Factors (REF) was prepared by Roads and Maritime in June 2017 to document the likely impacts of the project on the environment and detail protective measures to be implemented. To support the REF, a Biodiversity Assessment Report (BAR) was prepared by EPS in November 2016 in order to assess the potential impacts to biodiversity and provide recommended mitigation and management measures.

The REF was placed on public display between 30 June 2017 and 28 July 2017, and as a result of submissions received, Roads and Maritime has prepared a modified concept design. The modified concept design, along with constructability review, has resulted in an increased footprint for the project. The amended project boundary has the potential to alter the biodiversity impacts assessed in the REF. An additional assessment is therefore required to determine and assess any impacts as a result of the modified concept design.

1.1 Aims and Objectives

The purpose of this report is to consider the biodiversity impacts as a result of the modified concept design and update the assessment of total likely impacts from the project on biodiversity within the amended project boundary. Impacts from the project have been assessed under the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and other related biodiversity legislation such as the *Threatened*

Species Conservation Act 1995 (TSC Act), *Biodiversity Conservation Act 2016* (BC Act) and *Fisheries Management Act 1994* (FM Act).

The purpose of this review and additional assessment is as follows:

- Describe the existing biodiversity and existing environment within the modified construction footprint;
- Identify and update any additional impacts to threatened biodiversity under the BC Act / TSC Act, FM Act and/or EPBC Act;
- Update vegetation mapping and condition;
- Update clearing calculations;
- Update fauna habitat loss;
- Identify and update any altered hollow-bearing tree loss;
- Provide any additional mitigation measures to reduce the impacts as a result of the additional impact area as a result of the project upon biodiversity wherever possible; and
- Update likely biodiversity offsets requirements in accordance with the FBA methodology.

1.1 Definitions

The following definitions have been referred to within this additional assessment;

- **The project** - the upgrade of the New England Highway between Belford and the Golden Highway
- **Additional study area** - additional area surveyed as part of this additional assessment
- **The construction and clearing boundary** - includes the direct impact area for the project inclusive of the updated design changes
- **Project study area** - includes both the study area that was assessed for the BAR submitted with the 2017 REF and the additional study area;

1.2 Personnel

The field survey, BioBanking calculations and reporting completed for this additional assessment were conducted by a qualified biodiversity team. The personnel and their qualifications and roles are provided in Table 1-1.

Table 1-1: Personnel

Personnel	Qualifications	Position	Role
Toby Lambert	BEnvSc Accredited BioBanking Assessor No. 0034 Accredited BAM Assessor	Director – Ecology and Principal Ecologist	Project Manager BioBanking Calculations and Credit Review Technical Review Reporting
Deborah Landenberger	BSc (Hons) Accredited BioBanking Assessor No. 0158	Senior Ecologist	BioBanking Field Surveys BioBanking Calculations Field Surveys Reporting
Alan Midgley	BEnvMgt & Sc (Hons) PhD Accredited BAM Assessor	Ecologist / Bush Regenerator	Field Surveys Reporting

All personnel are licensed to conducted field surveys in accordance with a *National Parks and Wildlife Act 1974* (NP&W Act) Section 132 (c) Scientific Licence (SL100772) and the Department of Industries Animal Research Authority.

2 METHODS

A two-day field survey was conducted on the 8th and 9th May 2018 by Debbie Landenberger (Senior Botanist) and Alan Midgley (Ecologist).

Updated database and literature review searches were conducted prior to the survey and included the following:

- OEH Atlas Database of threatened ecological communities listed on the *Biodiversity Conservation Act 2016* (BC Act);
- Protected Matters Search of the ecological communities listed on the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- PlantNet Spatial Search
- Review of Weeds of National Significance (WONS);
- Review of NSW Department of Primary Industry Weed Wise Database for Singleton LGA
- Threatened Species, Populations, and Ecological Communities of NSW - http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx; and
- OEH Vegetation Information System: Classification database (2012).

The field survey consisted of the following methodologies:

- Review of aerial photographs to assist in stratifying the additional 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 (RDPs);
- BioBanking / FBA plots in accordance with the BioBanking Assessment Methodology (Office of Environment and Heritage, 2014);
- Assigning vegetation communities into Plant Community Types (PCTs) in accordance with the Office of Environment and Heritage VIS classification database version 2.1;
- Establishing the presence / absence of *Eucalyptus glaucina* within the additional study area;
- Survey of hollow-bearing tree locations; and
- Opportunistic diurnal fauna surveys.

2.1 Vegetation Zone Delineation and Plots

The additional study area was initially inspected via vehicle to provide a preliminary assessment of the vegetation and the potential number of vegetation zones and their condition. After an extensive site walk over, the vegetation was mapped with each community assigned to PCTs in accordance with VIS Classification database (2015). The condition of the vegetation within the additional study area was assigned into condition classes in accordance with the BioBanking Assessment Methodology (Office of Environment and Heritage 2014). Seven BioBanking / FBA plots were conducted in accordance with the BioBanking Assessment Methodology (2014). Sections of native vegetation have been mapped outside of the additional study area to assist in patch definition and assessment to determine if the patch meets the EPBC criteria for a Threatened Ecological Community (TEC). These patches were observed from the edge of the additional study area and also considered from a desktop perspective. The locations of the plots are shown in Table 2-1 and in the next section in the summary Figure 3-1.

Table 2-1: Survey Locations

Date	Flora survey type	Orientation of plot (degrees)	Eastings GDA56	Northings GDA56
Entire Survey Period	Random meanders and vegetation mapping	Entire project area	-	-
08/05/2018	BioBanking Plot 1	93°	334366	6386880
08/05/2018	BioBanking Plot 2	77°	333948	6386881
08/05/2018	BioBanking Plot 3	90°	334656	6386808
09/05/2018	BioBanking Plot 4	274°	335446	6386578
09/05/2018	BioBanking Plot 5	267°	336366	6386125
09/05/2018	BioBanking Plot 6	295°	336280	6386161
09/05/2018	BioBanking Plot 7	294°	336024	6386295

2.2 Weather Conditions

Weather conditions recorded at the Singleton weather station on the 8th and 9th May 2018 during the survey period consisted of a maximum temperature of 26.6°C and a minimum temperature of 6.0°C. Rainfall did not occur during this period with only light northwesterly winds up to 9km/h occurring.

Table 2-2: Weather Conditions

Date	Temperature (C0)	Wind Direction	Wind Speed Km/hr	Rain (mm)
08/05/2018	6.0-25°C	NW	6	No Rain
09/05/2018	7.5-26.6°C	NW	9	No Rain

**Weather conditions recorded by the Bureau of Meteorology at the Singleton Weather Station.

2.3 Fauna Survey Effort

The fauna habitat present within the additional study area is generally degraded and habitat data was collected to determine the range of fauna that may utilise the area for roosting, breeding and/or foraging. The following fauna surveys were conducted throughout the additional study area:

1. Opportunistic fauna observations;
2. Presence of burrows, whitewash, owl pellets, nests/drays and chewed *Casuarina* cones (which may indicate the presence of species such as Glossy Black Cockatoo);
3. Floristic structure of the canopy, mid stratum and ground layer;
4. Depth and composition of leaf litter;
5. Presence of rocks and rock shelves;
6. Presence of fallen timber; and
7. Aquatic habitat such as depressions, farm dams and riparian vegetation.

2.4 Limitations

Field surveys are conducted over a small period of time, and not all species can be detected. These include mobile fauna species, migratory birds and fauna that utilise the resources on a seasonal basis. Flora species that are difficult to detect include cryptic, annuals and species present in the seed bank. Therefore, the results in this report are a result of the time when the field surveys were completed.

The surveys were conducted during the flowering periods for the threatened flora species that have habitat within the additional study area. The exceptions were *Eucalyptus glaucina* and *Grevillea parviflora* subsp. *parviflora.* These two species are easily identified outside of their flowering period. *Eucalyptus camaldulensis*, *Acacia pendula* and *Cymbidium canaliculatum* were surveyed outside of their flowering period however these species are easily detected outside of the flowering period on vegetative features alone. Generally, the survey of the additional study area was considered to be adequate to identify any likely important biodiversity values.

3 EXISTING ENVIRONMENT

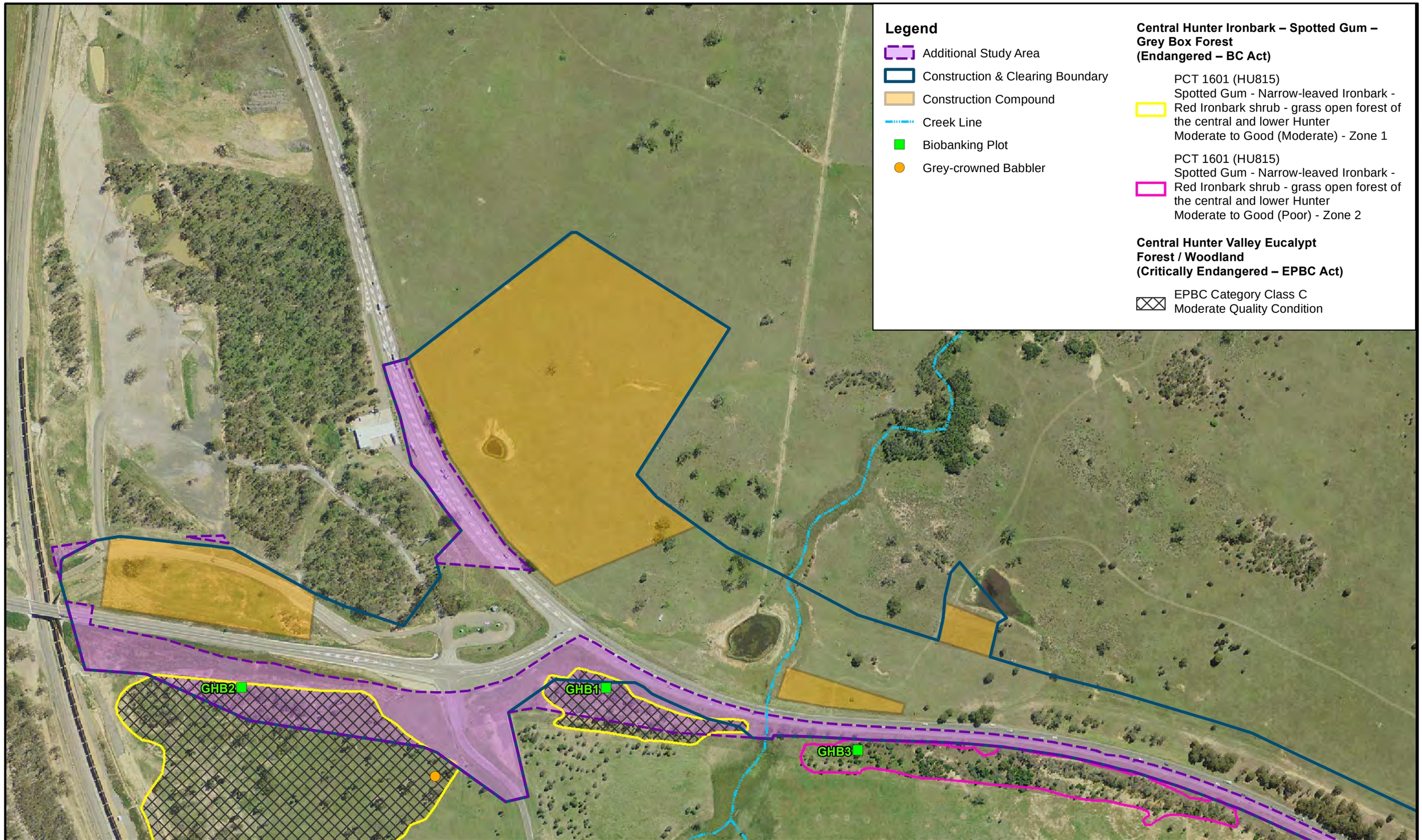
3.1 Plant Community Types

No new PCTs were identified within the additional study area (refer to Figure 3-1 and Table 3-1), however all of the areas of the previously recorded PCTs areas have been increased within the additional study area. Refer to the detailed descriptions of the PCTs in Sections 3.2 and 3.3 for explanation of the zones, which essentially categorise the condition of each PCT.

Table 3-1: PCTs, Zones and Plots in additional study area

PCT Type	Area (ha)	Condition Zones	Condition	Number of plots required by BBAM	BioBanking Plots Completed	Potential Threatened Ecological Community BC Act	Potential Threatened Ecological Community EPBC Act
Spotted Gum – Narrow-leaved Ironbark – Red Ironbark shrub – grass open forest of the central hunter and lower hunter	1.8	1	Moderate to Good - Moderate - High	1	2	Endangered Central Hunter Ironbark – Spotted Gum Grey Box Forest	Critically Endangered Central Hunter Valley eucalypt Forest and Woodland
Spotted Gum – Narrow-leaved Ironbark – Red Ironbark shrub – grass open forest of the central hunter and lower hunter. (In part)	0.12	2	Moderate to Good - Moderate - Poor	1	3	Endangered Central Hunter Ironbark – Spotted Gum Grey Box Forest	Does not meet EPBC Act criteria
Swamp Oak Swamp Fringing Estuaries Sydney Basin and South East Corner Bioregions – PCT 1234	0.19	3	Moderate to Good - Moderate	1	1	Endangered Swamp Oak Floodplain Forest	Does not meet EPBC Act criteria

PCT Type	Area (ha)	Condition Zones	Condition	Number of plots required by BBAM	BioBanking Plots Completed	Potential Threatened Ecological Community BC Act	Potential Threatened Ecological Community EPBC Act
Swamp Oak Swamp Fringing Estuaries Sydney Basin and South East Corner Bioregions – PCT 1234	0.09	4	Moderate to Good - High	1	1	Endangered Swamp Oak Floodplain Forest	Endangered Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland (Coastal Swamp Oak Forest)
Cleared Land (including roads)	6.30		Low	None	None	None	None



Author:	S. Wilkin
Reviewer:	T. Lambert
A3 Scale:	1:4,000
Job Ref:	11232

N

0 50 100 200 Metres

Map Projection: GDA 1994 MGA Zone 56

Figure 3-1A

Additional Study Area Plant Community Types, Biobanking Plot Locations and Threatened Fauna

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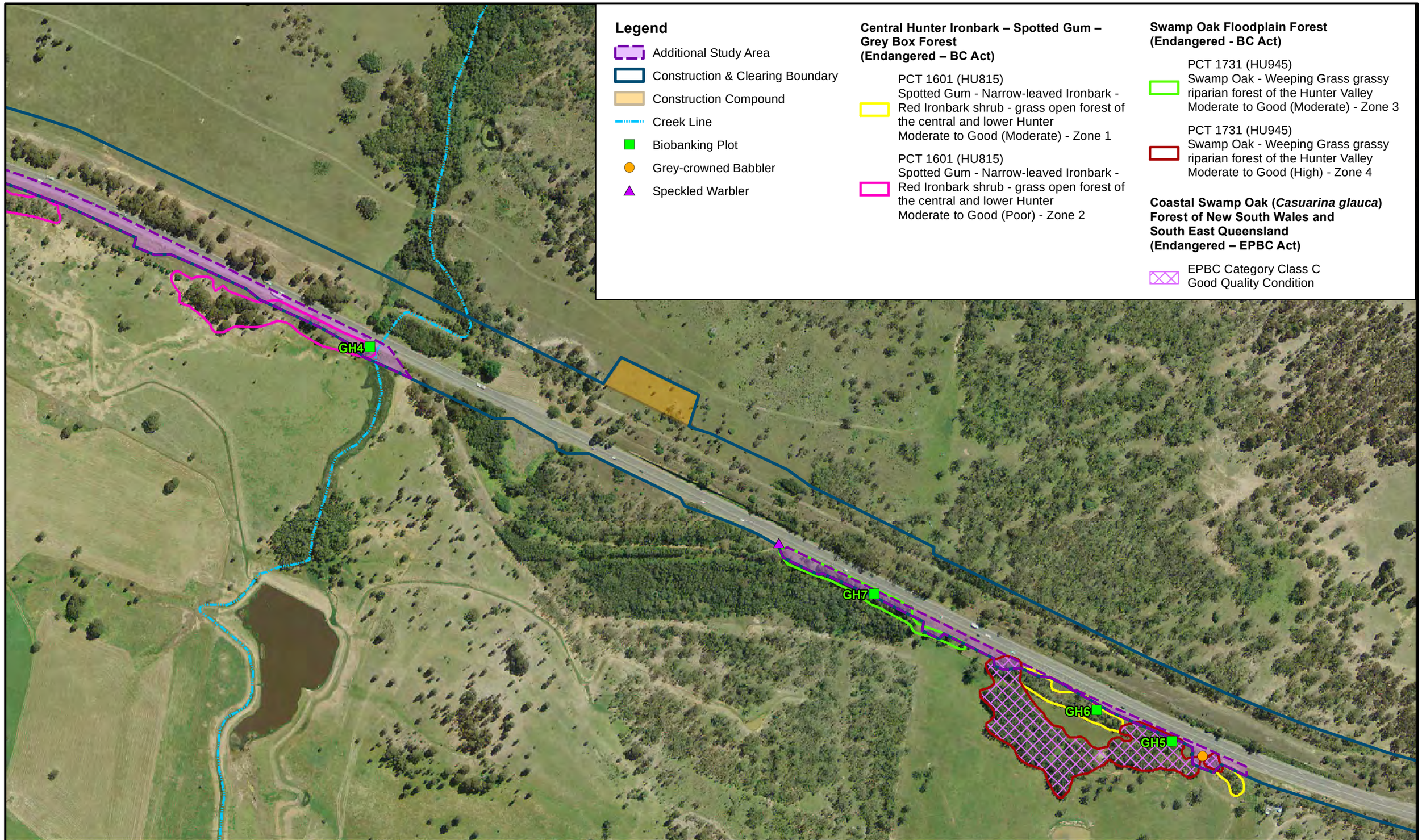

Author:	S. Wilkin
Reviewer:	T. Lambert
A3 Scale:	1:4,000
Job Ref:	11232

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Map Projection: GDA 1994 MGA Zone 56

Figure 3-1B

Additional Study Area Plant Community Types, Biobanking Plot Locations and Threatened Fauna

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Legend

- Additional Study Area
- Construction & Clearing Boundary
- Biobanking Plot
- Grey-crowned Babbler

Central Hunter Ironbark – Spotted Gum – Grey Box Forest (Endangered – BC Act)

- PCT 1601 (HU815) Spotted Gum - Narrow-leaved Ironbark - Red Ironbark shrub - grass open forest of the central and lower Hunter Moderate to Good (Moderate) - Zone 1

Swamp Oak Floodplain Forest (Endangered - BC Act)

- PCT 1731 (HU945) Swamp Oak - Weeping Grass grassy riparian forest of the Hunter Valley Moderate to Good (Moderate) - Zone 3
- PCT 1731 (HU945) Swamp Oak - Weeping Grass grassy riparian forest of the Hunter Valley Moderate to Good (High) - Zone 4

Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland (Endangered – EPBC Act)

- EPBC Category Class C Good Quality Condition

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Reviewer:	T. Lambert
A3 Scale:	1:4,000
Job Ref:	11232

N

0 50 100 200 Metres

Map Projection: GDA 1994 MGA Zone 56

Figure 3-1C

Additional Study Area Plant Community Types, Biobanking Plot Locations and Threatened Fauna

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3.2 Spotted Gum Narrow-leaved Ironbark – Red Ironbark Shrub – Grass Open Forest of the Central Hunter and Lower Hunter PCT 1601

The vegetation description provided within the BAR submitted as part of the REF adequately describes the vegetation recorded within the additional study area. Therefore, no further description is required.

This PCT occurred in five patches within the additional study area (Figure 3-1). Two types of vegetation conditions were recorded and are described below.

3.2.1 Vegetation Zones and Condition

The condition of the patches of this PCT match the previous two conditions identified in the original REF and have been allocated into the moderate to good (moderate) and moderate to good (poor) conditions.

Vegetation Zone 1

This vegetation zone has been classified into moderate to good (moderate) condition as these plots recorded generally higher condition levels and have a representative structure of PCT 1601 (Table 3-2). All of these plots had a high species richness, high grass cover percentage and generally low exotic species cover. Plot 6 had a higher percentage of exotic cover, however this plot contained a shrub layer dominated by native species. Condition modification for this zone has occurred from cattle grazing and previous clearing for the original construction of the New England Highway.

Vegetation Zone 2

This vegetation zone has been classified into moderate to good (poor) condition as all the benchmark attributes were below benchmark levels with the exception of plots 1 and 4 (Table 3-2). No hollow-bearing trees were recorded within any of the plots. The native mid-storey was generally absent which was likely to be a result of grazing and previous clearing for the original construction of the New England Highway.

Table 3-2: Comparison of Spotted Gum – Narrow-leaved Ironbark – red ironbark shrub – grass open forest of the central and lower hunter against the benchmarks for PCT 1601

Benchmark Attribute	Benchmark	Plot 1 Zone 1	Plot 2 Zone 1	Plot 3 Zone 2	Plot 4 Zone 2	Plot 6 Zone 1
Plant Species Diversity	38	21	15	16	13	24
Native Over Storey % Cover	15-40	17.5	11	2	21	14.5
Native Mid Story % Cover	4-40	0.1	0	0	0	8.5
Native Ground Grasses	30-60	14	56	2	0	22
Native Ground Shrubs	3-15	0	2	0	0	0
Native Ground Other	10-25	6	0	2	0	10
Exotic Species %	N/A	20	4	36	98	50
Number of Trees with Hollows	1.2	0	0	0	0	0
Over Storey Regeneration	N/A	1	1	1	1	1
Length of Fallen Timber	10	3	3	3	2	7
OEH Condition	**N/A**	**Moderate to Good (moderate)**	**Moderate to Good (moderate)**	**Moderate to Good (poor)**	**Moderate to Good (poor)**	**Moderate to Good (moderate)**

Note: red number is below benchmark.

Plate 3-1: Zone 1 Spotted Gum - Narrow-leaved Ironbark – Red Ironbark shrub – grass open forest – moderate to good (moderate)

Plate 3-2: Zone 2 Spotted Gum - Narrow-leaved Ironbark – Red Ironbark shrub – grass open forest – moderate to good (poor)

3.3 Swamp Oak Weeping Grass Grassy Riparian Forest of the Hunter Valley PCT 1731

The vegetation description provided within the BAR submitted as part of the REF adequately describes the vegetation recorded within the additional study area. Therefore, no further description is required.

This PCT occurred in two patches within the additional study area (Figure 3-1). Two types of vegetation conditions were recorded and are described below.

3.3.1 Vegetation Zones and Condition

This PCT occurs in two conditions, being moderate to good (high) and moderate to good (moderate). All of the patches within the additional study area were generally below benchmarks due to modification from road edge weed infestations and cattle grazing.

Vegetation Zone 3

This vegetation zone has been classified into moderate to good (moderate) condition as the majority of attributes were below benchmark levels. The groundlayer consisted of high density cover of the exotic grass species *Panicum maximum*. This species was common along the road verge of the New England Highway.

Vegetation Zone 4

This vegetation zone has been classified into moderate to good (high) condition as this patch was recorded with higher attributes of all the benchmark levels with the exception of species diversity, mid-storey and hollow bearing trees. Few exotic species were recorded and the PCT has a vegetative structure representative of PCT 1731. Minor condition modifications for this vegetation zone has occurred from road verge weed infestations. The original REF did not record a high condition for this PCT.

Table 3-3: Comparison of Swamp oak Weeping Grass Grassy Riparian Forest of the Hunter Valley benchmark for PCT 1731 in the additional study area

Benchmark Attribute	Benchmark	Plot 5 Zone 4	7 Zone 3
Plant Species Diversity	24	17	6
Native Over Storey % Cover	15-70	23	27
Native Mid Story % Cover	10-60	6	7
Native Ground Grasses	5-50	8	0
Native Ground Shrubs	5-30	6	0
Native Ground Other	5-40	21	8
Exotic Species %	N/A	30	90
Number of Trees with Hollows	0.2	0	0
Over Storey Regeneration	N/A	1	1
Length of Fallen Timber	5	11	2
OEH Condition	**N/A**	**Moderate to good - High**	**Moderate to good - Moderate**

Note: red number is below benchmark.

Plate 3-3: Zone 3 Swamp oak Weeping Grass Grassy Riparian Forest of the Hunter Valley benchmark moderate to good (moderate) condition

Plate 3-4: Zone 4 Swamp oak Weeping Grass Grassy Riparian Forest of the Hunter Valley benchmark moderate to good (high) condition

Plate 3-5: Cleared Land

3.4 Cleared Land

This non-native vegetation community consisted of cleared paddocks, and mown road verges (Plate 3.3). The dominant understorey species were exotic grasses, herbs and shrubs. These included *Olea europaea* subsp. *cuspidata**, *Cenchrus clandestinus**, *Panicum maximum*, Chloris gayana**, *Verbena rigida*, Conyza bonaerensis*, Plantago lanceolata*, Bidens pilosa** and *Sida rhombifolia**.

3.5 Revised REF vegetation communities

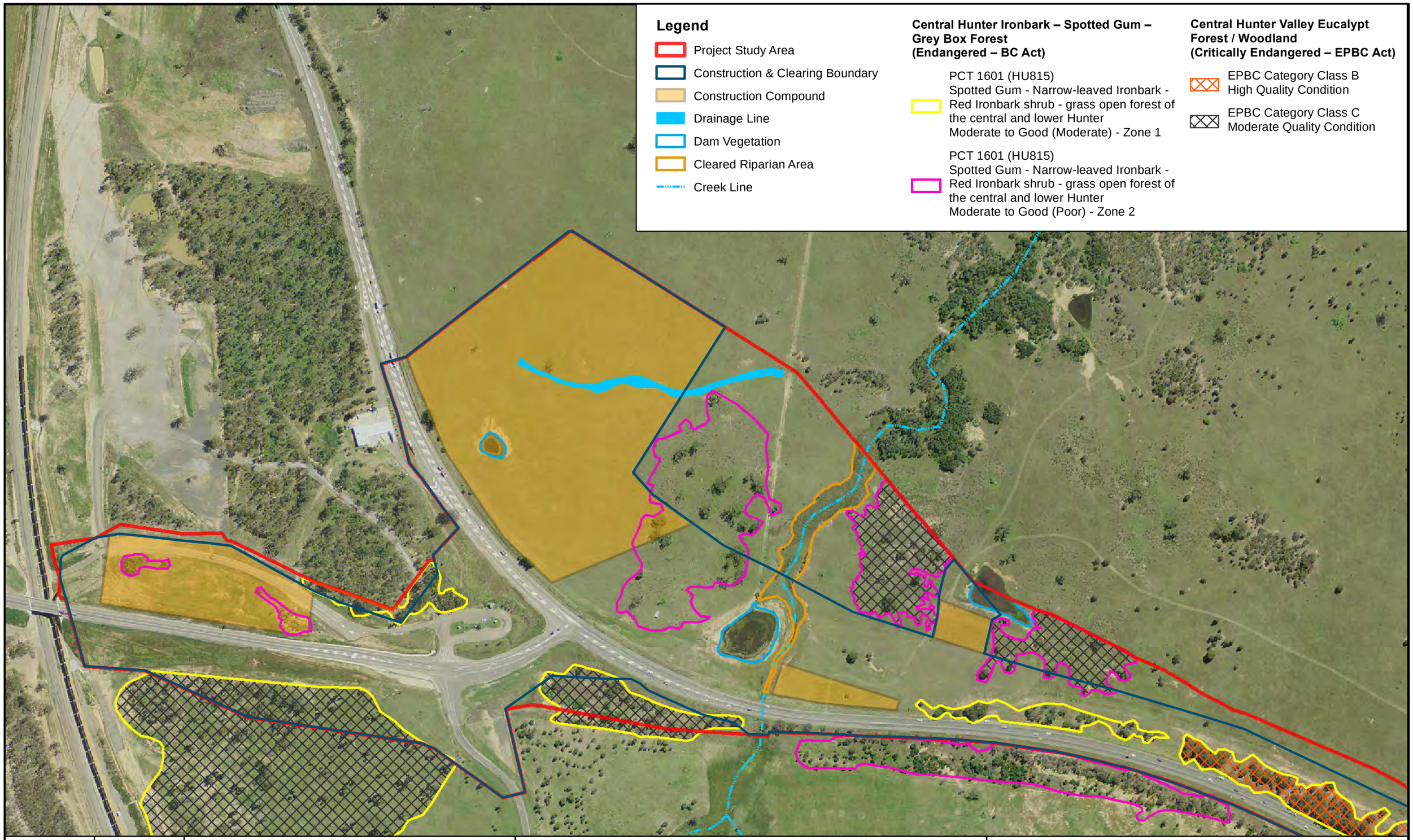
Figure 3-2 shows the combined PCTs and condition within the project study area, inclusive of the additional study area. A new condition for the Swamp Oak Weeping Grass Grassy Riparian Forest of high condition was recorded. The high condition meets the criteria for good quality category C condition of Coastal Swamp Oak (*Casuarina glauca*) Forest listed as endangered on the EPBC Act. No new PCTs were recorded.

3.6 Flora Species Recorded

A total of 108 flora species were recorded within the additional study area. Of these recorded species, 30 new species were recorded that were not previously observed in the BAR. These species are denoted by red text in Appendix 4.

No threatened flora species were recorded within the additional study area.

No additional priority weeds listed under the *Biosecurity Act 2015* were recorded within the additional study area.



Author:	S. Wilkin
Reviewer:	T. Lambert
A3 Scale:	1:4,000
Job Ref:	11232

N

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Map Projection: GDA 1994 MGA Zone 56

Figure 3-2A

Updated Plant Community Types and Condition

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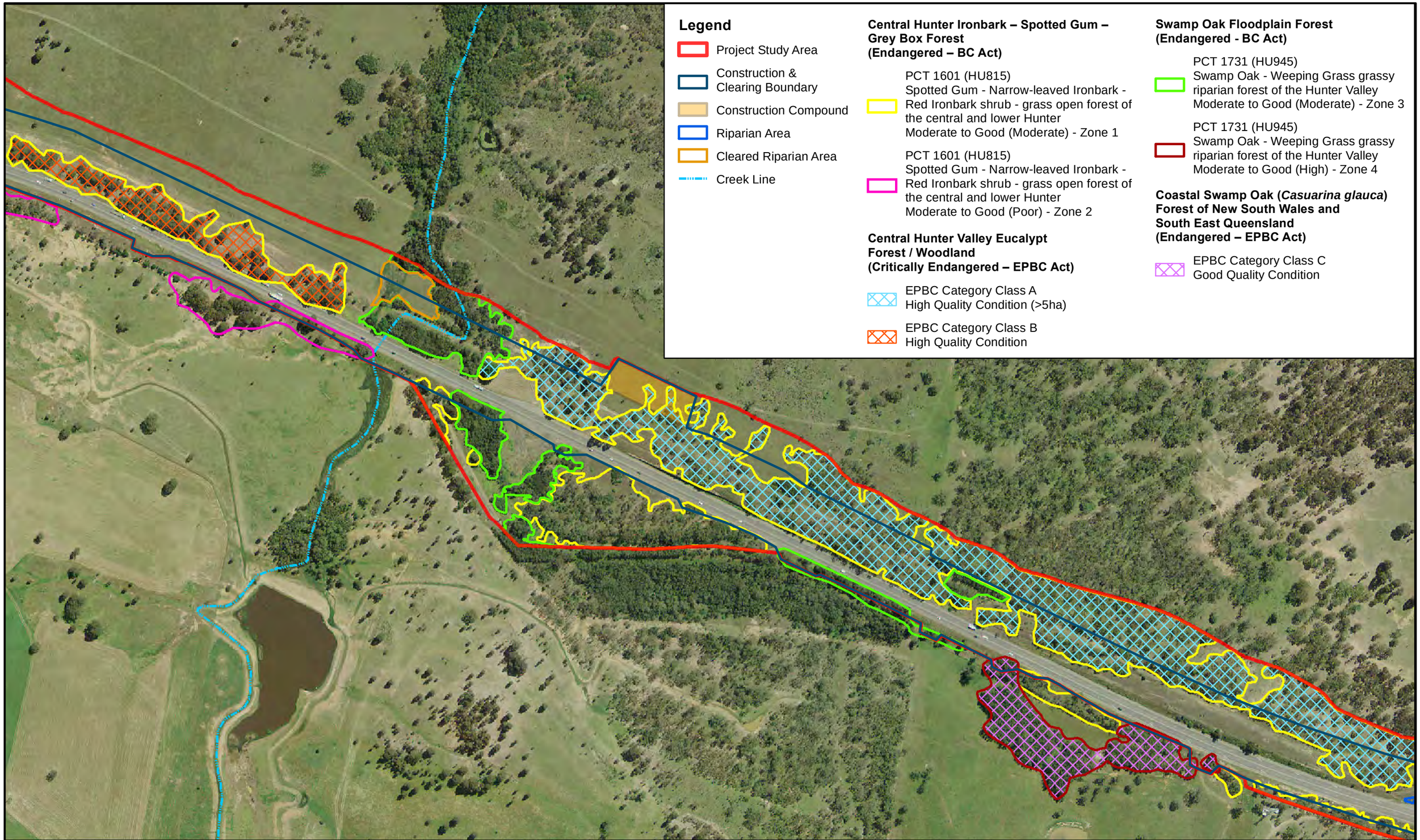

Author:	S. Wilkin
Reviewer:	T. Lambert
A3 Scale:	1:4,000
Job Ref:	11232

N

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Map Projection: GDA 1994 MGA Zone 56

Figure 3-2B

Updated Plant Community Types and Condition

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Legend

- Project Study Area
- Construction & Clearing Boundary
- Riparian Area
- Cleared Riparian Area

Central Hunter Ironbark – Spotted Gum – Grey Box Forest (Endangered – BC Act)

- PCT 1601 (HU815) Spotted Gum - Narrow-leaved Ironbark - Red Ironbark shrub - grass open forest of the central and lower Hunter Moderate to Good (Moderate) - Zone 1

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

- EPBC Category Class A High Quality Condition (>5ha)
- EPBC Category Class B High Quality Condition
- EPBC Category Class C Moderate Quality Condition

Swamp Oak Floodplain Forest (Endangered - BC Act)

- PCT 1731 (HU945) Swamp Oak - Weeping Grass grassy riparian forest of the Hunter Valley Moderate to Good (Moderate) - Zone 3
- PCT 1731 (HU945) Swamp Oak - Weeping Grass grassy riparian forest of the Hunter Valley Moderate to Good (High) - Zone 4

Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland (Endangered – EPBC Act)

- EPBC Category Class C Good Quality Condition

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A3 Scale:	1:4,000
Job Ref:	11232

N

0 50 100 200 Metres

Map Projection: GDA 1994 MGA Zone 56

Figure 3-2C

Updated Plant Community Types and Condition

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3.7 Fauna Species Recorded

A total of 31 fauna species were recorded within the additional study area. Six new commonly occurring fauna species were recorded that were previously not recorded in the BAR. These species included:

- Cow;
- Rabbit;
- Noisy Friarbird;
- Grey Butcherbird;
- Blue-faced Honeyeater; and
- Red-Bellied Black Snake.

No new threatened fauna species were recorded within the additional study area, however two species of threatened fauna previously recorded as part of the original REF were recorded within the additional study area. These were:

- Speckled Warbler; and
- Grey-crowned Babbler.

The observations in relation to these recorded species are summarised hereunder. Refer to Figure 4-1 for locations of threatened recorded fauna.

3.8 Hollow-bearing Trees

No additional hollow bearing trees were recorded in the additional study area. 18 hollow-bearing trees were to require removal from a total of 40 that were previously recorded as part of the original BAR. The updated impacts mean that the number to be retained and removed remains the same, though the distribution of retained and removed trees has altered. This will not alter the previously assessed impacts in relation to this consideration.

3.9 Fauna Habitat

No new fauna habitats were recorded with additional study area. Two fauna habitats that were previously recorded as part of the original REF were recorded within the additional study area and these include:

- Open Forest/Woodland; and
- Grassland.

No aquatic habitat was recorded within the additional study area.

4 THREATENED BIODIVERSITY

4.1 Threatened Fauna Species

Two threatened fauna species, Speckled Warbler and Grey-crowned Babbler were recorded within the additional study area.

Speckled Warbler was heard calling from the southern roadside of the New England Highway within Swamp Oak Forest on 9th May 2018 (Figure 4-1). This species was observed and heard calling from this same general location in previous field assessments.

Grey-crowned Babbler was observed in two locations within and adjoining the additional study area (Figure 4-1). On the 8th May 2018, two individuals of this species were observed bordering the north of the additional study area within eucalypt forest devoid of understorey. On the 9th May 2018, one individual of this species was observed on the southern roadside of the New England Highway in trees adjoining grazing lands.

The updated State OEH database search identified 16 threatened fauna species and the Federal Protected Matters Database Search recorded 19 threatened fauna species that were recorded and/or have potential habitat within a 10km radius of the additional study area.

Two additional threatened fauna species were identified by the OEH database as being recorded within a 10km radius of the additional study area. These two species comprised of Flame Robin and Dusky Woodswallow. The Flame Robin record occurred in open forest vegetation on the intersection of the Golden Highway and the New England Highway. Both of these species have habitat within the additional study area. An assessment of significance under the BC Act has been conducted in Appendix 3.

The Federal Protected Matters Database Search identified one additional threatened fauna species, the Greater Glider, as being recorded and/or having potential habitat within the additional study area. This species has potential fragmented habitat within the additional study area (Appendix 2) and therefore, an Assessment of Significance under the EPBC Act was conducted in Appendix 3. In general though, it would be surprising if this species actually occurred in the project study area as it is better known from coastal and mountainous areas.

The Greater Glider is listed as a threatened population, in Eurobodalla LGA, Seven Mile Beach National Park and the Mount Gibraltar Reserve under the BC Act. This species is not listed on the BC Act as a threatened population or threatened species within the Singleton LGA. Therefore, no assessment of significance for this species under the BC Act is required as part of this additional assessment.

Author:	S. Wilkin
Reviewer:	T. Lambert
A3 Scale:	1:4,000
Job Ref:	11232

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0 50 100 200

Metres

Map Projection: GDA 1994 MGA Zone 56

Figure 4-1A

Threatened Fauna Species and Hollow-bearing Tree Locations

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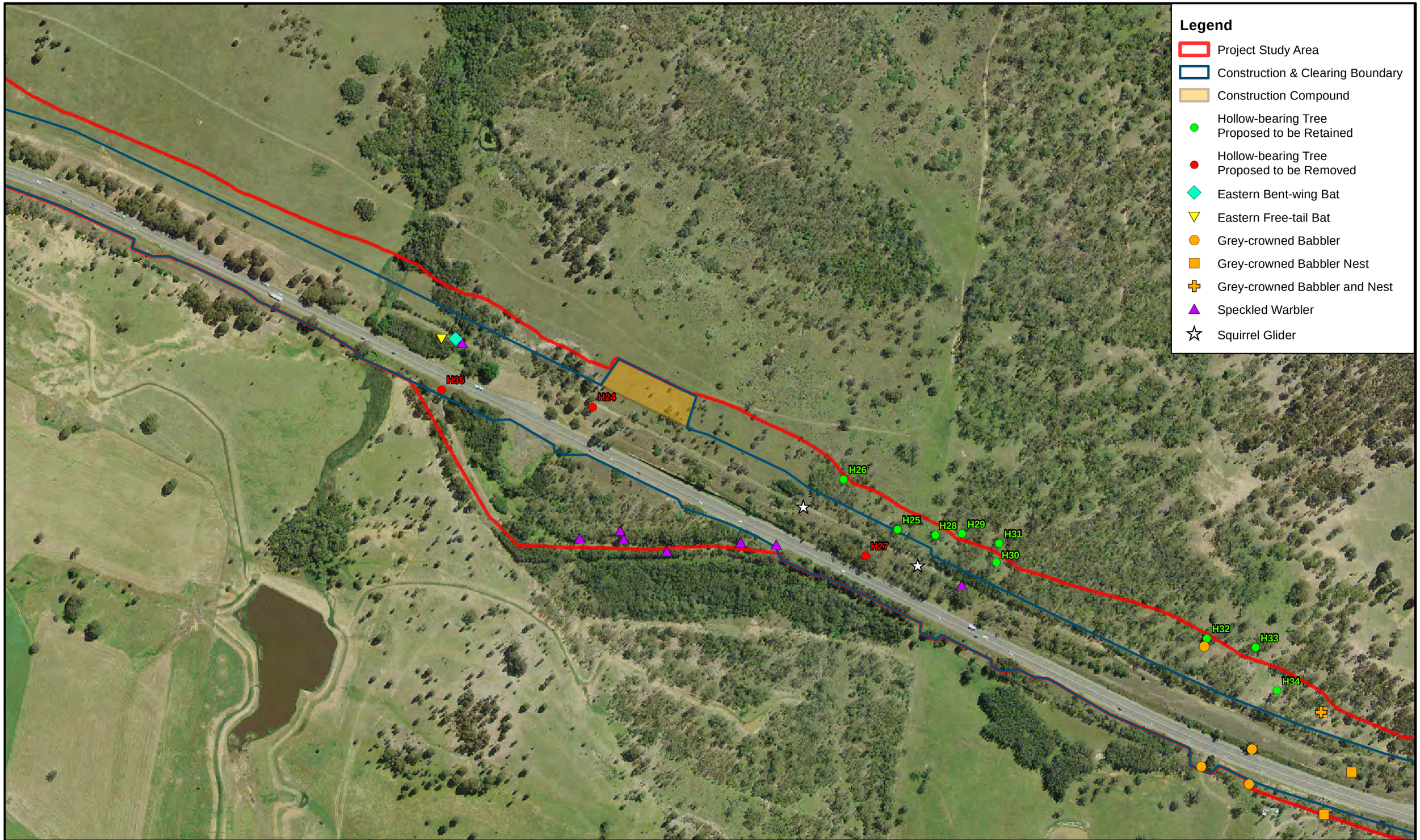

Author:	S. Wilkin
Reviewer:	T. Lambert
A3 Scale:	1:4,000
Job Ref:	11232

N

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Map Projection: GDA 1994 MGA Zone 56

Figure 4-1B

Threatened Fauna Species and Hollow-bearing Tree Locations

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Author:	S. Wilkin
Reviewer:	T. Lambert
A3 Scale:	1:4,000
Job Ref:	11232

N

0 50 100 200 Metres

Map Projection: GDA 1994 MGA Zone 56

Figure 4-1C

Threatened Fauna Species and Hollow-bearing Tree Locations

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No change in fauna habitat was recorded within the additional study area than was previously identified in the REF. Changes in impact resulting from the new clearing and construction boundary are considered likely to be minor. Therefore, no updated assessments of significance for the remaining threatened fauna species under the BC Act are considered to be required as part of this additional assessment.

4.2 Threatened Flora Species

No threatened species of flora were recorded within the additional 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 additional study area.

The updated Federal Protected Matters Database Search identified an additional two threatened flora species *Dichanthium setosum* and *Prasophyllum sp. Wybong* (C. Phelps ORG 5269) as having known or potential habitat within the study than those previously identified as part of the original BAR. Neither of these species were identified as having habitat within the study (Appendix 2). Therefore, no updated impact assessments for threatened flora species are required as part of this additional assessment.

No change in flora habitat was recorded within the additional study area than previously identified in the REF. Changes in impact resulting from the new clearing and construction boundary are considered likely to be minor. Therefore, no updated assessments of significance for any of the threatened flora species under the BC Act are considered to be required as part of this additional assessment.

4.3 Migratory Species

Excluding migratory marine bird species, the updated EPBC Act Federal Protected Matters Database Search did not identify any further migratory species that were not already addressed within the original REF and no additional migratory species were recorded during the current surveys. Therefore, no updated impact assessments for migratory species are considered to be required as part of this additional assessment.

4.4 Threatened Ecological Communities

4.4.1 BC Act Central Hunter Ironbark – Spotted Gum – Grey Box Open Forest

The Spotted Gum – Narrow-leaved Ironbark – Red Ironbark shrub – grass open forest of the central hunter and lower hunter is commensurate with Central Hunter Ironbark Spotted Gum Grey Box Open Forest listed as Endangered under the BC Act. This TEC was previously recorded in the BAR. 1.8 ha of this community was recorded within the additional study area (Figure 3-1). Figure 4-2 shows the distribution of this TEC in the project study area.

4.4.2 BC Act Swamp Oak Floodplain Forest

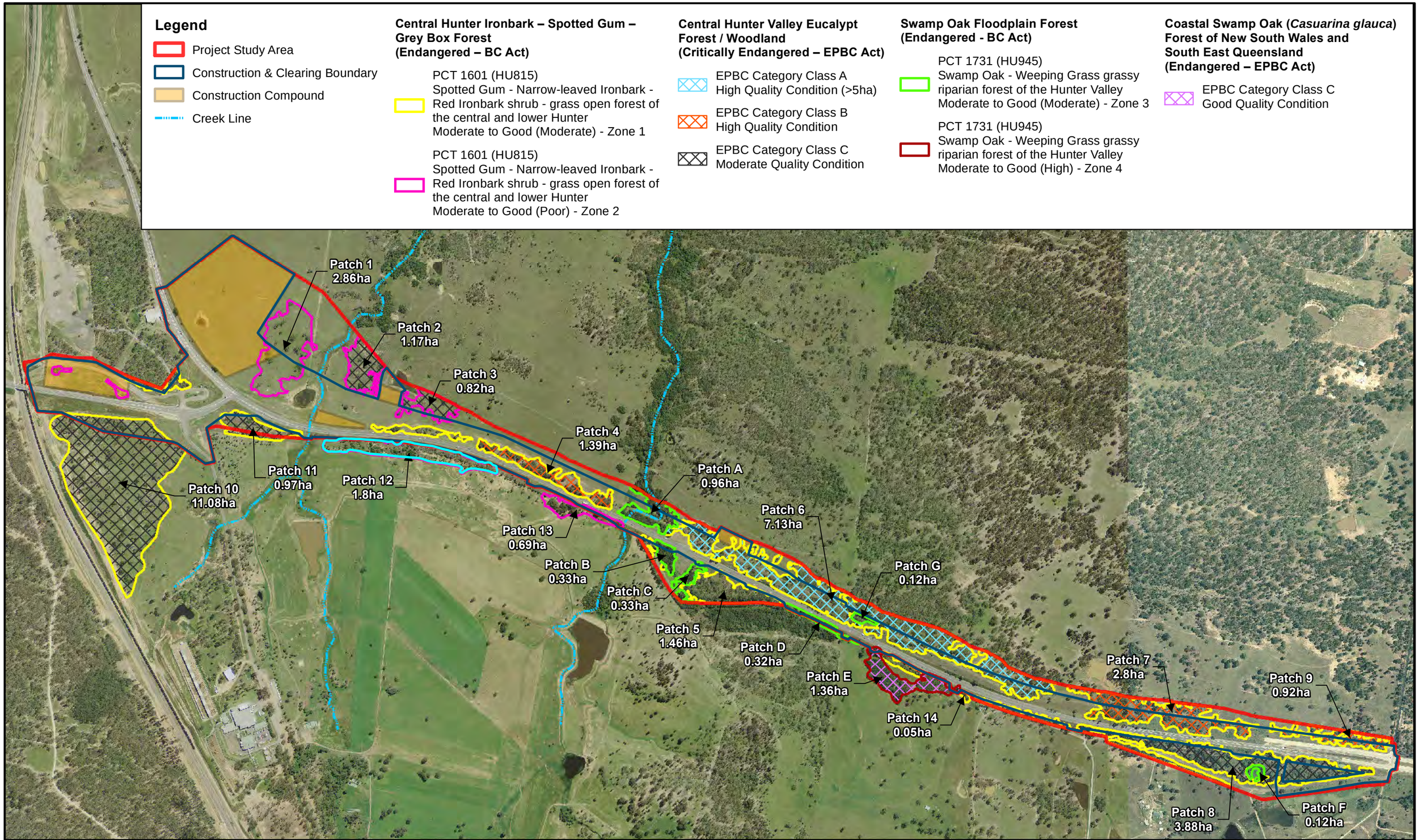
Swamp Oak Floodplain Forest was previously recorded in the BAR. Additional areas of this TEC were recorded in the additional study area (Figure 3-1). The additional area amounted to 0.28 ha within the additional study area. Figure 4-2 shows the distribution of this TEC in the project study area.

No other TECs listed under the BC Act were recorded within the additional study area.

4.4.3 EPBC Act Central Hunter Valley Eucalypt Forest and Woodland Complex

The Spotted Gum – Narrow-leaved Ironbark – Red Ironbark shrub – grass open forest of the central hunter and lower hunter has the potential meet the criteria for the Central Hunter Valley Eucalypt Forest and Woodland Complex listed as critically endangered on the EPBC Act. This TEC was recorded in the previous BAR.

This TEC was recorded within the additional study area. An assessment of the condition of the patches within the additional study area is outlined below in Table 4-1.



Author:	S. Wilkin
Reviewer:	T. Lambert
A3 Scale:	1:10,000
Job Ref:	11232

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0 250 500 750 Metres

Map Projection: GDA 1994 MGA Zone 56

Figure 4-2

Threatened Ecological Communities and Patch Sizes

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Table 4-1: Key Characteristics for Central Hunter Valley Eucalypt Forest/Woodland Complex

Key Diagnostic Characteristic	Response
It occurs in the Hunter River catchment (typically called the Hunter Valley region) **AND**	Occurs within the Hunter River Catchment
It typically occurs on lower hillslopes and low ridges, or valley floors in undulating country; on soils derived from Permian sedimentary rocks; **AND**	Occurs the lower slopes and undulating hills on soils derived from Permian sediments and not on alluvial soils
It does not occur on alluvial flats, river terraces, Aeolian sands, Triassic sediments, or escarpments; **AND**	The community is on the Yellow and Red Podzolic soils of the Branxton and Rothbury soil types which are derived from Permian sediments as mapped by the Soil Landscapes of the Singleton 1:250,000 map sheet.
It is woodland or forest, with a projected canopy cover of trees of 10% or more; or with a native tree density of at least 10 native tree stems per 0.5 ha (at least 20 native tree stems/ha) that are at least one metre in height **AND**	The projected canopy cover is 15 to 25%
The canopy of the ecological community is dominated by one or more of the following four eucalypt species: *Eucalyptus crebra* (narrow-leaved ironbark), *Corymbia maculata* (syn. *E. maculata*) (spotted gum), *E. dawsonii* (slaty gum) and *E. moluccana* (grey box); **OR** a fifth species, *Allocasuarina luehmannii* (bulloak) dominates in combination with one or more of the above four eucalypt species, in sites previously dominated by one or more of the above four eucalypt species **AND**	The community is dominated by *Eucalyptus crebra*
Allocasuarina torulosa (forest oak/ she-oak, rose she-oak/oak), *Eucalyptus acmenoides* (white mahogany) and *E. fibrosa* (red/broad-leaved ironbark) are largely absent 15 from the canopy of a patch and **AND**	*Eucalyptus fibrosa* occurs occasionally throughout the community however it is lower than 5% of the canopy cover. *Eucalyptus acmenoides* and *Allocasuarina torulosa* are absent.
A ground layer is present (although it may vary in development and composition), as a sparse to thick layer of native grasses and other native herbs and/or native shrubs.	The groundlayer consists of native grasses such as *Rytidosperma tenuior, Chloris ventricosa and Bothriochloa macra, with native herbs us as Calotis sp. Dichondra repens and Cheilanthes sieberi.* A moderate invasion of exotic herbs and grasses occur within the groundlayer.
Does the community meet the key characteristics?	Yes

Condition Classification of the Central Hunter Valley Eucalypt Forest/Woodland

The conservation advice (Threatened Species Scientific Committee, 2015) for this TEC outlines the criteria to determine if a field verified community meets the EPBC Act listing. The conservation advice has classified the community in four classes. If the vegetation does not meet any of the criteria listed below, then the vegetation does not meet the criteria for listed as the EPBC Act community. These classes are as follows:

- Class A high quality is Patch size ≥ 5 ha **and** ≥50% of perennial understorey cover is native and contains at least 12 native understorey species;
- Class B high quality Is Patch size ≥ 0.5 ha **and** ≥70% of perennial cover in all floristics layers is native **and** contains at least 12 native understorey species;
- Class C moderate quality Is Patch size ≥ 0.5 ha **and** ≥50% of perennial understorey cover is native **and** contains at least 12 native understorey species; and
- Class D moderate quality Patch size ≥ 2 ha and ≥50% of perennial understorey is native **AND one** of the following:
    - The patch is contiguous with another patch of native vegetation ≥1 ha; **or**
    - The patch size has a least one large locally native tree (≥60 cm dbh) or at least one tree with hollows.

In the additional study area four patches (patches 10 to 13) of the Spotted Gum – Narrow-leaved Ironbark – Red Ironbark shrub – grass open forest of the central hunter and lower hunter met the key diagnostics for this community. However, only patches 10 and 11 meet the full criteria for the federal listing for this community, as per the below.

- Class C moderate quality:
    - Patches 10 and 11 are part of a patch that is ≥ 0.5 ha and ≥50% of the perennial understorey is native and both have greater than 12 native understory species
- Patches 12 and 13 do not meet the criteria for listing on the EPBC Act.

Patches 10 and 11 within and adjoining the additional study area meet the criteria for this community. Figure 4-2 shows the distribution of this TEC in the project study area.

A total of 1.79 ha of this TEC occurs within the additional study area (Table 4-2).

Table 4-2: Condition Classes and Area of Central Hunter Valley Eucalypt Forest and Woodland

Condition Class/Study area	Class A (ha)	Class B (ha)	Class C (ha)	Total (ha)
Original BAR study area	7.13	5.09	5.79	18.01
Additional study area	0	0	1.79	1.79
Project Study Area	**7.13**	**5.09**	**7.58**	**19.8**

4.4.4 EPBC Act Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland

The Swamp Oak Swamp Fringing Estuaries Sydney Basin and South East Corner Bioregions PCT has the potential to meet the criteria for Coastal Swamp Oak (*Casuarina glauca*) Forest, listed as endangered under the EPBC Act. This PCT was recorded within the additional study area in two patches (Patch D and E). Therefore, an assessment of these two patches within the additional study area is outlined below.

This community was listed on 20 March 2018 as endangered on the EPBC Act, and Swamp Oak Swamp Fringing Estuaries Sydney Basin and South East Corner Bioregions was previously recorded within the original REF. The original BAR recorded this PCT within the project study area and therefore all patches of this have been assessed to determine if they meet the EPBC criteria for this TEC as part of this additional assessment.

The assessment for the key diagnostic characteristics is outlined below in Table 4-3.

Table 4-3: Key Characteristics for Coastal Swamp Oak (*Casuarina glauca)* Forest of New South Wales and South East Queensland

Key Diagnostic Characteristic	Response
It occurs in South east Queensland, NSW North Coast, Sydney Basin or South East Corner Bioregion **AND**	Occurs in Sydney Basin Bioregion
It occurs in coastal catchments at elevations up to 50m ASL, on coastal flats, floodplains, drainage lines, lake margins wetlands and estuarine fringes where soils are at least occasionally saturated, water-logged or inundated. **AND**	Occurs on the Hunter River Floodplain at 50 ASL
It occurs on soils derived from unconsolidated sediments (including alluvium), typically hydrosols and sometimes organosols **AND**	The community is on the dark brown silt loam of the Prairie soils of the Rothbury soil landscape (eSpade web site)

Key Diagnostic Characteristic	Response
It is an open woodland, woodland or forest, or closed forest structure with a tree canopy that has a total crown cover of at least 10 percent **AND**	The total crown cover is approximately 50%
Has a canopy dominated by *Casuarina glauca*	*Casuarina glauca* is the dominant tree species
Does the community meet the key characteristics?	Yes

Condition Classification for Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland

Table 4-4 is an extract from the EPBC Act conservation advice for this community for the condition assessment for this TEC.

Patch E has been assessed against the EPBC Act criteria in accordance with Table 4-4.

- Patch E is connected to a larger patch of swamp oak vegetation offsite which is 1.36 ha in size;
- The patch has a total exotic species percentage cover of 30%. (See Plot 5 data in Table 3-3); and
- The patch did not contain any of the transformer species listed in Appendix B of the Conservation Advice.

Therefore, Patch E meets the criteria for a small contiguous patch of Good Quality Category C condition of Coastal Swamp Oak (*Casuarina glauca)* Forest listed as endangered on the EPBC Act.

The remaining patches A, B, C, D, F and G within the study area did not meet the criteria for the federal listing as they all had between 80% and 100% cover of exotic grasses.

Figure 4-2 shows the distribution of this TEC in the project study area.

4.5 EPBC Act Matters of National Environmental Significance

No other matters of national environmental significance have been identified by the updated protected matters search within the additional study area other than those previously recorded as part of the original BAR.

Table 4-4: Condition thresholds and categories for patches of Coastal Swamp Oak Forest – as outlined in the EPBC Act conservation advise for Coastal Swamp Oak (*Casuarina glauca)* Forest

Condition thresholds Patch size classes☆ ☆ Vegetation quality classes	**Large patch** The patch is at least 5 ha	**Medium patch** The patch is at least 2 ha and less than5 ha	**Small contiguous** patch** The patch is at least 0.5 ha and less than 2 ha, and is connected to a larger area of native vegetation of at least 5 ha	**Small patch** The patch is at least 0.5 ha and less than 2 ha
HIGH QUALITY **Predominantly native understorey** Non-native species comprise **less than 20**% of total understorey vegetation cover*	**CATEGORY A** A large patch that meets **key diagnostics** and has a predominantly native understorey	**CATEGORY B** A medium patch that meets **key diagnostics** and has a predominantly native understorey OR **A small patch** that meets key diagnostics and has a predominantly native understorey and is contiguous** with another large area of native vegetation		**CATEGORY C** A small patch that meets **key diagnostic**s and has a predominantly native understorey
GOOD QUALITY **Mostly native understorey** Non-native species comprise **less than 50%** of total understorey vegetation cover* **AND** transformer species*** comprise **less than 30%** of total understorey vegetation cover*	**CATEGORY B** A large patch that meets **key diagnostics** and has a mostly native understorey	**CATEGORY C** A medium patch that **meets key diagnostics** and has a mostly native understorey OR A small patch that **meets key diagnostics** and has a mostly native understorey and is contiguous** with another large area of native vegetation		
MODERATE QUALITY Some native understorey Non-native species comprise **less than 80%** of total understorey vegetation cover* **AND** transformer species*** comprise **less than 50%** of total understorey vegetation cover*	**CATEGORY C** A large or medium patch that meets **key diagnostics** and has some native understorey			

*Refers to total perennial understorey vegetation cover for the patch of the ecological community. Includes vascular plant species of all layers below the canopy with a life-cycle of more than two growing seasons. It includes herbs (graminoids and forbs), grasses, shrubs and juvenile plants of canopy species, but does not include annual plants, cryptogams, plant litter or exposed soil. Areas of little to no understorey vegetation cover (e.g. plant litter) are included if key diagnostics are met and non-native species are below thresholds.

**Contiguous means the patch is connected or in close proximity (within 30 m) to another area of native vegetation.

***Transformer species (e.g. *Chrysanthemoides monilifera, Asparagus* spp*, Pennisetum* spp*, Ipomoea* spp. Etc.) are non-native plant species with the potential to permanently change the character, condition, form or nature of patches of the ecological community. Annual weeds, such as *Symphyotrichum subulatum* (saltmarsh aster), may be seasonally very abundant and temporarily restrict the development of native species, but would not be counted as transformer weeds in determining condition.

5 PROJECT IMPACTS

5.1 Vegetation Impacts

Vegetation loss within the project study area is predicted to amount to 43.09 ha (including 29.13 ha cleared area).

The loss of vegetation will include two TECs. This will include the loss of 13.06 ha of endangered ecological communities, being Central Hunter Spotted Gum Grey Box Forest and Swamp Oak Floodplain Forest as listed on the BC Act. An impact of 9.57 ha of the critically endangered ecological community Central Hunter Valley Eucalypt Forest and Woodland as listed on the EPBC Act will now occur. 0.09 ha of Coastal Swamp Oak (*Casuarina glauca)* Forest as listed as endangered on the EPBC Act will also now occur.

Table 5-1 outlines the updated vegetation impacts. Note that not all of the BC Act-listed vegetation is listed under the EPBC Act, as not all patches satisfy the EPBC Act criteria, but all patches do satisfy BC Act criteria. While the last column provides areas for EPBC Act-listed communities, this is for information purposes only and total impact areas are not a combination of the areas given for BC Act and EPBC Act listed communities.

Table 5-1: Total Vegetation Impacts

Plant Community Type	Act	Act Status	Original BAR study area removal (ha)	Updated vegetation removal within the new project study 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

Plant Community Type	Act	Act Status	Original BAR study area removal (ha)	Updated vegetation removal within the new project study 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
Cleared Land (exotic)	N/A	N/A	16.20	29.13
Farm dams and cleared riparian areas	N/A	N/A	0.30	0.90
Total vegetation			**27.73**	**43.09**
Total BC Act TEC			**11.23**	**13.06**
Total EPBC Act TEC			**8.20**	**9.66**

5.1.1 Impacts to Central Hunter Valley Eucalypt Forest

The original BAR construction footprint was predicted to impact upon 8.20 ha of this TEC. One additional patch within the additional study area also meets Condition Class C for this EPBC TEC. The updated clearing and construction boundary will result in the removal of an additional 1.37 ha of this TEC. A revised total of 9.57 ha of this community will be impacted upon and therefore, an updated impact assessment was undertaken in Appendix 3 for this community. The assessment of significance determined a significant impact upon this community, consistent with the previous assessment in the BAR.

5.1.2 Impacts to Coastal Swamp Oak (*Casuarina glauca*) Forest

One patch of the Swamp Oak Weeping grass grassy riparian forest of the hunter valley (Patch E) within the project study area meets the criteria for listing of this EPBC TEC. Patch E meets the Good Quality Category C condition which is a small patch with a mostly native understorey and is contiguous with another large area of native vegetation. The project will remove a small area (0.09 ha) and has the potential for indirect impacts. However, an impact assessment in Appendix 3 was conducted and concluded that the project is unlikely to have a significant impact due to the small size of removal.

5.1.3 Impacts to Central Hunter Spotted Gum Ironbark Forest

The original BAR calculated that 10.40 ha of this TEC was to require removal as a result of the project. The updated clearing and construction boundary will impact upon 1.48 ha of this State-listed TEC. A revised total of 11.88 ha of this community will be impacted upon and therefore, an updated impact assessment was undertaken in Appendix 3 for this community. The assessment concluded that the project remains unlikely to result in a significant impact upon this TEC.

5.1.4 Impacts to Swamp Oak Floodplain Forest

The original BAR calculated that 0.83 ha of this TEC would require removal as a result of the project. An additional 0.35 ha of this State-listed TEC will be impacted upon by the project. A revised total of 1.18 ha of this community will be impacted upon and therefore, an updated impact assessment was undertaken in Appendix 3 for this community. The assessment concluded that the project remains unlikely to result in a significant impact upon this TEC.

5.2 Fauna Habitat Loss

Fauna habitat loss within the additional study area is predicted to amount to 43.09 ha (including 29.13 ha of cleared land / grassland). Table 5-2 outlines the total fauna habitat loss within the project study area.

Table 5-2: Fauna Habitat Loss

Fauna Habitat	Corresponding Vegetation Community	Original BAR study area removal (ha)	Updated vegetation removal (ha) within the new project study area
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

5.3 Hollow-bearing Trees

As part of the original BAR 18 hollow-bearing trees were proposed to be removed. As a result of the design changes 18 hollow-bearing trees will be required to be removed, although in slightly altered locations. Proposed migration measures are to install nest boxes of offset this removal as outlined in the original BAR.

5.4 Other Additional Impacts

No additional impacts within the additional study area during the construction or the operational phases of the project on biodiversity values are likely than have previously been addressed in the original REF and BAR.

6 SUPPLEMENTARY IMPACT ASSESSMENTS

Table 6-1 outlines the additional assessments of significance required as part of this additional assessment. The project is still likely to have a significant impact upon Central Hunter Valley Eucalypt Forest and Woodland Complex, which is listed as critically endangered under the EPBC Act. No other TEC's or species are likely to be significantly impacted by the project.

Table 6-1: Summary of supplementary assessments of significance

Species/Ecological Community	TSC/BC Act Status	EPBC Act	Recorded within additional study area	Likely Significant Impact?
Threatened Ecological Communities				
Central Hunter Valley Eucalypt Forest Woodland	Endangered	-	Yes	No
Central Hunter Valley Eucalypt Forest and Woodland Complex	Endangered	Critically Endangered	Yes	Yes, under the EPBC Act only
Swamp Oak Floodplain Forest	Endangered	-	Yes	No
Coastal Swamp Oak (*Casuarina glauca)* Forest	Endangered	Endangered	Yes	No
Fauna				
Flame Robin	Vulnerable	-	No	No
Dusky Woodswallow	Vulnerable	-	No	No
Greater Glider	-	Vulnerable	No	No

Note: Greater Glider is listed as an endangered population, however not in the Singleton LGA.

7 ADDITIONAL MITIGATION MEASURES

Two dams in the north west of the project study area, previous to be retained as outlined in the BAR, will now require removal as part of the design changes. These dams are unlikely to comprise important habitat for any threatened flora or fauna. It is however recommended that an additional mitigation measure be that an ecologist be present during the emptying or removal of the dams in order to relocate any displaced fauna such as turtles, frogs etc.

8 BIODIVERSITY OFFSETS

8.1 Ecosystem credits

A preliminary calculation using the FBA methodology to determine required ecosystem credits to offset the likely impacts of the project was completed as part of the original BAR. The calculations were undertaken using the linear assessment option of the Major Project module (Framework for Biodiversity Assessment or FBA methodology). Although this project is not a Major Project, the linear assessment option was considered to best suit the project design. Data collected from the BioBanking plots was used in the calculation.

As outlined in the original BAR, offsets are only required for Central Hunter Ironbark - Spotted Gum – Grey Box Forest – as this community is listed as an endangered ecological community on the BC Act and EPBC Act and more than 5 ha and 1 ha (respectively) is to be cleared in accordance with the Roads and Maritime Guideline for Biodiversity Offsets (2011).

Other native vegetation in the project area includes the Swamp Oak Floodplain Forest TEC, however as only 1.18 ha is being cleared, this does not meet the thresholds for requiring offsets in relation to impacts upon TECs. Offsets are only required to be considered if clearing of this TEC was to exceed 5 ha. The EPBC component of this PCT to be removed totals 0.09 ha and this also does not exceed the 1 ha threshold for requiring offsets.

Offsets could potentially be required in relation to the impacts of over 1 ha to the Swamp Oak Floodplain Forest, however this only applies if it is considered to be habitat for a species credit species. The only recorded species credit species is Squirrel Glider and this was found to occur within the Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower hunter. The Squirrel Glider is not expected to be primarily reliant upon the Swamp Oak Floodplain Forest. Other threatened species of fauna such as Speckled Warbler, Eastern Free-tail Bat and Eastern Bent-wing Bat were recorded in this community, but according to the guidelines offsets would only be required to be considered if clearing exceeded 5 ha. As no species credit species is considered likely to rely on the Swamp Oak Floodplain Forest, offsets are not required to be further considered in relation to species impacts of clearing this TEC.

The original BAR calculated a credit requirement of 520 ecosystem credits for the 10.40 ha of impact upon Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter (PCT 1601) in order to offset impacts upon this PCT.

As a result of the design changes, 11.88 ha of Central Hunter Ironbark - Spotted Gum – Grey Box Forest is now likely to be impacted upon. The BioBanking calculator determined that 560 biodiversity credits of Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter (PCT 1601) are now likely to be required to offset the updated impacts of the project.

9.57 ha of this PCT is also listed as Central Hunter Valley Forest and Woodland and will be required to be removed as part of the project. Proportionally this means 451 ecosystem credits of the total 560 credits have been calculated to be required to offset this community.

The Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower hunter, (HU815) is the like for like community that is required to offset residual impacts from the project.

A strategic assessment in accordance with Roads and Maritime's *Environment Protection and Biodiversity Conservation Act 1999* – Strategic Assessment policy states biodiversity offsets are required when a significant impact is determined to threatened biodiversity listed under the EPBC Act (Roads and Maritime Services, 2005). The project will result in a significant impact upon the critically endangered community listed under the EPBC Act of Central Hunter Valley Eucalypt Forest and Woodland Complex, therefore biodiversity offsets are required. The strategic assessment recommends that biodiversity offsets can be calculated using the FBA methodology.

8.2 Species credits

The Squirrel Glider was recorded as part of the field surveys in January 2016 within the project study area. This species was previously categorised as an ecosystem species in the Hunter 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 1 ha of clearing of this species habitat is to occur it has therefore been included as part of this additional assessment. The BioBanking calculator determined that 261 species credits would be required to offset the impacts to this species.

8.3 Biodiversity Offset Strategy

The future Biodiversity Offset Strategy will outline the methodology for finalising a biodiversity offset for the project, including refining credit requirements if project design is further refined leading to alteration of project impacts. Such offsets will provide suitable compensation for the biodiversity impacts of the project.

9 CONCLUSION

9.1 Additional Assessment Summary

This additional assessment has assessed the likely altered impacts to biodiversity as a result of the modified concept design. Generally, impacts to vegetation have increased when compared to the previous design. A summary of the additional impacts are as follows:

- Additional 1.48 ha of Spotted Gum – Narrow-leaved Ironbark – Red Ironbark Shrub – grass open forest of the central and lower hunter;
- Additional 0.35 ha of Swamp Oak Weeping grass grassy riparian forest of the hunter valley;
- Additional 12.93 ha of cleared land; and
- Additional 0.60 ha of dam and cleared riparian vegetation.

Coastal Swamp Oak (*Casuarina glauca)* Forest has recently also been listed as endangered under the EPBC Act. One patch of Swamp Oak Weeping grass grassy riparian forest of the hunter valley (Patch E) meets the good quality category C condition criteria for the listing of this community. The other patches do not meet the EPBC criteria.

Two patches of vegetation (Patches 10 and 11) within the additional study area meet moderate condition class C of the critically endangered ecological community of Central Hunter Valley Eucalypt Forest and Woodland. These patches will be impacted upon by the project.

An additional 1.83 ha of TECs will be removed as a result of the project when compared to the previous design and this comprises of the following extra impacts:

1. 0.35 ha of Swamp Oak Floodplain Forest listed as endangered on the BC Act, of which 0.09 ha of good quality category C condition for Coastal Swamp Oak (*Casuarina glauca)* Forest is listed as endangered on the EPBC Act; and
2. 1.48 ha of Central Hunter Ironbark – Red Ironbark – Grey Box Open Forest listed as endangered on the BC Act, of which 1.37 ha of moderate quality condition class C Central Hunter Valley Eucalypt Forest and Woodland Complex is listed as critically endangered on the EPBC Act;

A significant impact to Central Hunter Valley Eucalypt Forest and Woodland Complex was previously determined in the original REF and BAR and the additional area of removal does not alter this outcome.

None of the remaining TECs are likely to be significantly impacted upon by the project.

Five additional threatened species were identified by the updated database searches as having habitat or being recorded within the additional study area. Two federally listed flora species of *Dichanthium*

setosum – Vulnerable EPBC Act *Prasophyllum sp. Wybong* (C. Phelps ORG 5269) – Critically Endangered on the EPBC Act were assessed as not having habitat within the additional study area. Three additional threatened fauna species were identified as having habitat within the additional study area and impact assessments determined that the project is unlikely to have a significant impact. These three species include the following:

1. Dusky Woodswallow - vulnerable BC Act;
2. Flame Robin- vulnerable BC Act; and
3. Greater Glider - vulnerable EPBC Act.

Two previously threatened fauna species recorded as part of the original REF and BAR were recorded during the surveys in the additional study area:

- Speckled Warbler (BC Act-listed); and
- Grey-crowned Babbler (BC Act-listed);

An additional 40 ecosystem credits of Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter, (HU815) is likely to be required to be retired to offset the impacts of the project. Of these, 451 credits have been calculated for the federally listed proportion.

9.2 Final Biodiversity Assessment Summary

A final summary of impacts to biodiversity for the modified concept design is provided below:

1. Removal of 13.06 ha of native vegetation
2. Removal of 30.03 ha of non-native vegetation
3. Removal of 1.18 ha of Swamp Oak Floodplain Forest listed as endangered on the BC Act
4. Removal of 0.09 ha of good quality category C condition of Coastal Swamp Oak (*Casuarina glauca)* Forest listed as endangered on the EPBC Act
5. Removal of 11.88 ha of Central Hunter Ironbark – Red Ironbark – Grey Box Open Forest listed as endangered on the BC Act
6. Removal of 9.57 ha in three condition classes of Central Hunter Valley Eucalypt Forest and Woodland Complex listed as critically endangered on the EPBC Act as follows:
    a. 3.94 ha of High Quality Class A;
    b. 3.27 ha of High Quality Class B; and
    c. 2.30 ha of Moderate Quality Class C.
7. Removal of 13.6 ha of Open Forest/Woodland fauna habitat
8. Removal of 29.13 ha of cleared land / Grassland fauna habitat
9. Removal of 0.90 ha of farm dams and cleared riparian areas
10. Removal of 18 hollow-bearing trees

11. Six threatened fauna species were recorded and the significance of impact is considered to be unchanged from the previous assessment in the BAR (i.e. a significant impact is unlikely)
12. One migratory species was recorded and the significance of impact is considered to be unchanged from the previous assessment in the BAR (i.e. a significant impact is unlikely)
13. Preliminary biobanking credit calculations estimated that 560 ecosystem credits of Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter (1601) are likely to be required to offset project impacts.
14. Preliminary biobanking credit calculations estimated that 261 species credit species will be required to offset the project impacts to the Squirrel Glider.

The future Biodiversity Offset Strategy will outline the methodology for finalising a biodiversity offset for the project, including refining credit requirements if project design is further refined leading to alteration of project impacts. Such offsets will provide suitable compensation for the biodiversity impacts of the project.

Two dams in the north west of the project study area, previous to be retained as outlined in the BAR, will now require removal as part of the design changes. These dams are unlikely to comprise important habitat for any threatened flora or fauna. It is however recommended that an additional mitigation measure be that an ecologist be present during the emptying or removal of the dams in order to relocate any displaced fauna such as turtles, frogs etc.

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Appendix 1

Updated Database Searches

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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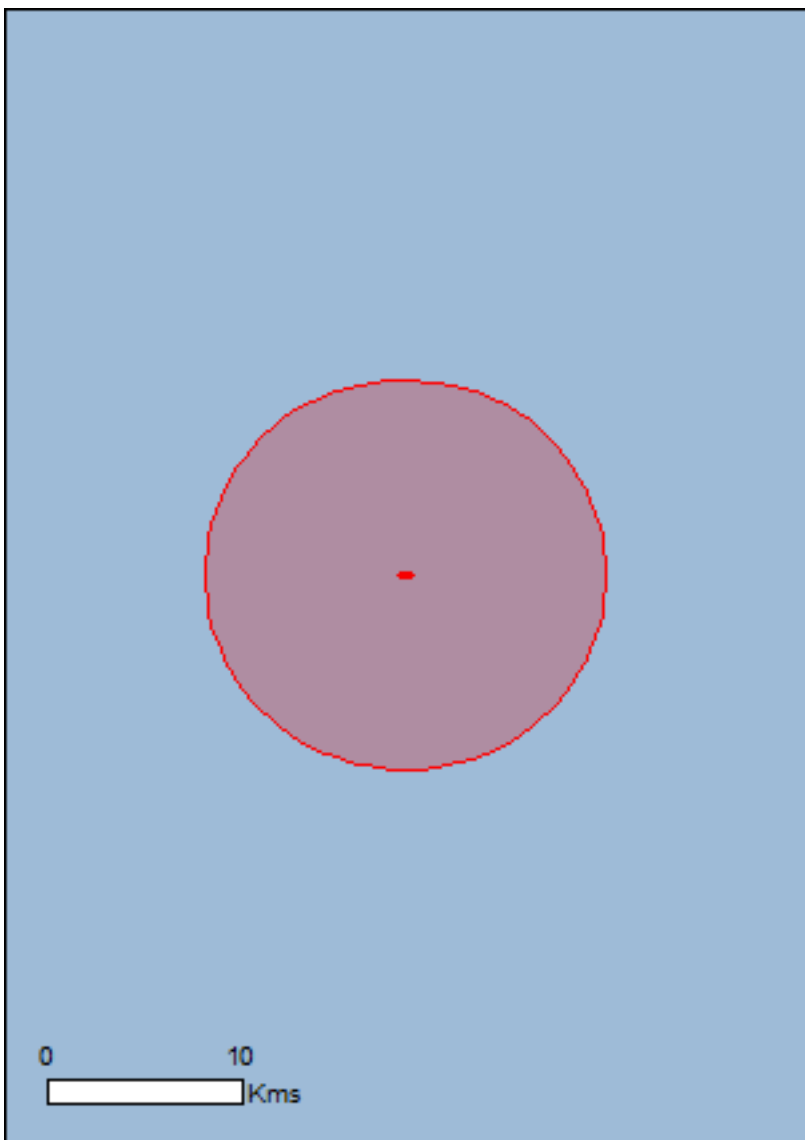

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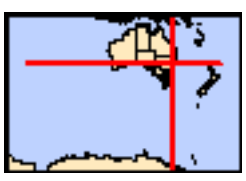

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	32
Listed Migratory Species:	16

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	3
Commonwealth Heritage Places:	None
Listed Marine Species:	22
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	1
Regional Forest Agreements:	1
Invasive Species:	43
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Hunter estuary wetlands	40 - 50km upstream

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	Community likely to occur within area
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community may occur within area
Hunter Valley Weeping Myall (Acacia pendula) Woodland	Critically Endangered	Community may occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Frogs		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat may occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Plants		
Acacia bynoeana Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat may occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus glaucina Slaty Red Gum [5670]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus pumila Pokolbin Mallee [16510]	Vulnerable	Species or species habitat likely to occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area
Persoonia pauciflora North Rothbury Persoonia [67214]	Critically Endangered	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Prostanthera cineolifera [11233]	Vulnerable	Species or species habitat likely to occur within area
Pterostylis gibbosa Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area
Rutidosis heterogama Heath Wrinklewort [13132]	Vulnerable	Species or species habitat likely to occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Commonwealth Land - Australian Telecommunications Corporation
Commonwealth Land - Defence Housing Authority

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
[Cuculus saturatus](#) Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat may occur within area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
[Hirundapus caudacutus](#) White-throated Needletail [682]		Species or species habitat known to occur within area
[Lathamus discolor](#) Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
[Merops ornatus](#) Rainbow Bee-eater [670]		Species or species habitat may occur within area
[Monarcha melanopsis](#) Black-faced Monarch [609]		Species or species habitat known to occur within area
[Monarcha trivirgatus](#) Spectacled Monarch [610]		Species or species habitat may occur within area
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat may occur within area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat known to occur within area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
[Pandion haliaetus](#) Osprey [952]		Species or species habitat likely to occur within area
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat known to occur within area
[Rostratula benghalensis (sensu lato)](#) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Belford	NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Protasparagus plumosus Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-32.643045 151.233758,-32.643406 151.232556,-32.643262 151.229895,-32.642846 151.227642,-32.642846 151.227642

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Data from the BioNet BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1Â°; ^^ rounded to 0.01Â°). Copyright the State of NSW through the Office of Environment and Heritage. Search criteria : Licensed Report of all Valid Records of Threatened (listed on TSC Act 1995) or Commonwealth listed Entities in selected area [North: -32.59 West: 151.18 East: 151.28 South: -32.69] returned a total of 247 records of 18 species.
Report generated on 20/04/2018 4:10 PM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Aves	Climacteridae	8127	*Climacteris picumnus victoriae*		Brown Treecreeper (eastern subspecies)	V,P		4	
Animalia	Aves	Acanthizidae	0504	*Chthonicola sagittata*		Speckled Warbler	V,P		12	
Animalia	Aves	Pomatostomidae	8388	*Pomatostomus temporalis temporalis*		Grey-crowned Babbler (eastern subspecies)	V,P		16	
Animalia	Aves	Artamidae	8519	*Artamus cyanopterus cyanopterus*		Dusky Woodswallow	V,P		1	
Animalia	Aves	Petroicidae	0382	*Petroica phoenicea*		Flame Robin	V,P		3	
Animalia	Mammalia	Dasyuridae	1008	*Dasyurus maculatus*		Spotted-tailed Quoll	V,P	E	1	
Animalia	Mammalia	Phascolarctidae	1162	*Phascolarctos cinereus*		Koala	V,P	V	1	
Animalia	Mammalia	Petauridae	1137	*Petaurus norfolcensis*		Squirrel Glider	V,P		3	
Animalia	Mammalia	Pteropodidae	1280	*Pteropus poliocephalus*		Grey-headed Flying-fox	V,P	V	6	
Animalia	Mammalia	Molossidae	1329	*Mormopterus norfolkensis*		Eastern Freetail-bat	V,P		7	
Animalia	Mammalia	Vespertilionidae	1372	*Falsistrellus tasmaniensis*		Eastern False Pipistrelle	V,P		1	
Animalia	Mammalia	Vespertilionidae	1346	*Miniopterus australis*		Little Bentwing-bat	V,P		1	
Animalia	Mammalia	Vespertilionidae	1834	*Miniopterus schreibersii oceanensis*		Eastern Bentwing-bat	V,P		7	
Animalia	Mammalia	Vespertilionidae	1357	*Myotis macropus*		Southern Myotis	V,P		2	
Animalia	Mammalia	Vespertilionidae	1361	*Scoteanax rueppellii*		Greater Broad-nosed Bat	V,P		3	
Animalia	Mammalia	Vespertilionidae	1025	*Vespadelus troughtoni*		Eastern Cave Bat	V,P		1	
Plantae	Flora	Myrtaceae	4096	*Eucalyptus glaucina*		Slaty Red Gum	V,P	V	177	
Plantae	Flora	Orchidaceae	6399	*^^Cymbidium canaliculatum*		Cymbidium canaliculatum population in the Hunter Catchment	E2,P,2		1	

NEW SOUTH WALES FLORA ONLINE

Search Result

Click on a name to see the page for that taxon.
* denotes an introduced species
+ denotes a threatened species
‡ denotes a gazetted weed.

Threatened species collected in a 25 km radius around BELFORD (151.26666,-32.65)

Apocynaceae	*Cynanchum*	+ *elegans*
Asteraceae	*Ozothamnus*	+ *tesselatus*
	Rutidosis	+ *heterogama*
Fabaceae - Mimosoideae	*Acacia*	+ *bynoeana*
Lamiaceae	*Prostanthera*	+ *cineolifera*
Myrtaceae	*Angophora*	+ *inopina*
	Callistemon	+ *linearifolius*
	Eucalyptus	+ *castrensis*
		+ *fracta*
		+ *glaucina*
		+ *parramattensis subsp. decadens*
		+ *pumila*
	Melaleuca	+ *groveana*
Orchidaceae	*Diuris*	+ *pedunculata*
Proteaceae	*Grevillea*	+ *parviflora subsp. parviflora*
	Persoonia	+ *pauciflora*
Zannichelliaceae	*Zannichellia*	+ *palustris*

This page URL:
http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&spatquer=yes&makekey=&near=BELFORD&state=NSW&coord=151.26666,-32.65&range=0.24175&vasc=yes&threat=both

EPS

Appendix 2

Updated Threatened Fauna Assessment

EPS

Table 1 Threatened Fauna Species

Scientific Name	Common Name	*BC* Act[1]	EPBC Act[2]	Habitat Description	Records[3]	Likelihood of occurrence	Impact assessment Required
Artamus cyanopterus	Dusky Woodswallow	V	-	This species habitat is within woodlands and dry sclerophyll forests dominated by Eucalypts and Mallee associations. This species feeds on insects and other invertebrates captured on the wing. Occasionally feeds on nectar, fruit and seeds. Distribution of this species is widespread in NSW from the coast to inland including the western slopes and plains.	1	Moderate. Open forest and woodland occurs within the revised study area.	Yes
Petroica phoenicea	Flame Robin	V	-	Prefers clearings or areas with open understorey. Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. In winter birds migrate to drier more open habitats in the lowlands (valleys and western slopes and plains).	3	Moderate. Habitat for this species occurs in the revised study area.	Yes
Petauroides volans	Greater Glider	E2 – not in Singleton LGA	V	The Greater Glider occurs in eucalypt forests and woodlands along the east coast of Australia. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Shelters during the day in tree hollows.	K	Low - Moderate. Habitat for this species occurs in the revised study area.	Yes

Notes

1: V= Vulnerable, E1 = Endangered species, E2 = Endangered population.

2: V = Vulnerable, E = Endangered, CE = Critically Endangered as listed under the EPBC Act.

3: P = Predicted, K = Known by database searches.

Table 2 Additional Threatened Flora species

Scientific Name	Common Name	*BC* Act[1]	EPBC Act[2]	Habitat Description	Records[3]	Likelihood of occurrence	Potential Impacts
Dichanthium setosum	Blue Grass	V	V	Associated with heavy basaltic black soils and red-brown loams with clay subsoil. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. Associated species include White Box (*Eucalyptus albens*), Silver-leaved Ironbark (*Eucalyptus melanophloia*), Yellow Box (*Eucalyptus melliodora*) and Manna Gum (*Eucalyptus viminalis*).	K	Low. No habitat for this species occurs within the revised study area.	Low
Prasophyllum sp. Wybong (C. Phelps ORG 5269)	A Leek Orchid	-	CE	Endemic to NSW, it is known from near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell, Tenterfield, Currabubula and the Pilliga area. Most populations are small, although the Wybong population contains by far the largest number of individuals.	K	Low. No habitat for this species occurs within the revised study area.	Low

Notes

1: V= Vulnerable, E1 = Endangered species, E2 = Endangered population.

2: V = Vulnerable, E = Endangered, CE = Critically Endangered as listed under the EPBC Act.

3; P = Predicted, K = Known by database searches.

EPS

Appendix 3

Additional Assessment of Significance

1 Assessments of Significance for BC Act Communities

1.1 Central Hunter Ironbark Spotted Gum – Grey Box Forest

Central Hunter Ironbark Spotted Gum – Grey Box Forest – Seven part Test BC Act	Response
Profile: Central Hunter Ironbark Spotted Gum Grey Box Forest is listed as endangered under the BC Act. Found in the Central Hunter Valley mainly between Maitland and Muswellbrook, occurring in areas of undulating country including low rises and slopes on all aspects. Mostly occurs on clayey soils on Permian sediments, may also occur on alluvial and colluvial soils in valleys. Characterised by Narrow-leaved Ironbark (*Eucalyptus crebra*), Spotted Gum (*Corymbia maculata*) and Grey Box (*Eucalyptus moluccana*) forming an open forest. Other tree species such as Red Ironbark (*Eucalyptus fibrosa*) and Forest Red Gum (*Eucalyptus tereticornis*) may be present, and occasionally dominate or co-dominate.	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	(i) The community is of generally of Moderate to Good quality within the study area, with some areas being in better condition than others, as shown in the BAR mapping. Peake (2006) has mapped 15,605 ha of this community within the Singleton LGA and 18,305 ha within the Central Hunter. As shown in the BAR mapping, the vast majority of the extensive remnant vegetation in the immediate locality is comprised of this community. The removal of 11.88 ha of this community equates to 0.06 % removal in the locality and 0.07 % of the extent of this community in the Central Hunter. Extensive areas of this community in the immediate locality adjoining the study area. Therefore, it is considered that the removal of a comparatively small area of this community is not likely to place the local occurrence of this community at risk of extinction. (ii) The project will remove a comparatively small linear strip of this community as described in point (i). Furthermore, the vegetation within the study area is also already modified as a result of previous agricultural practices and roadside management. The project is therefore unlikely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Central Hunter Ironbark Spotted Gum – Grey Box Forest – Seven part Test BC Act	Response
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(i) The project will remove or modify a maximum of 11.88 ha of this Central Hunter Ironbark Spotted Gum Forest in various conditions. (ii) The impacts of the project will increase the distance between remnants of this community to the north and south of the existing New England Highway and Golden Highway within the study area. However the existing highways have already created separations in this regard. It is considered unlikely that the results of the project will significantly increase the existing fragmentation or isolation of this community in the locality. To the north and south of the study area this community will remain well connected to other extensive areas of the same community. (iii) The community within the study area has minimal understorey with a moderate to high weed invasion. A comparatively narrow linear section of this community will be removed. The importance of the habitat to be removed to the long-term survival of this community in the locality is considered to be low, due to the extensive areas that are connected to and surround the study area.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of critical habitat listed on the BC Act
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	No recovery plan or threatened abatement plan has been written for this community. No specific strategy for managing this ecological community has been developed under the Saving Our Species program.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project may increase the operation of the Key Threatening Process ('KTP'), "Clearing of vegetation". However, the comparative impacts in a local context area considered to be minor. The project may increase the operation of the KTP "Invasion of native plant communities by African Olive (*Olea europaea L. subsp. Cuspidate*)" as this species was present within this community. The project will remove the species during clearing operations. However, mitigation measures such as washdown sites, and disposing of contaminated soil and plant material offsite in an approved disposal area will further reduce the spread of this weed. Therefore, the project may potentially result in a very minor contribution to this KTP although this can be managed through on-site management.
Conclusion	The project is unlikely to have a significant impact upon the Central Hunter Ironbark Spotted Gum – Grey Box Forest due to the reasons outlined above.

1.2 Swamp Oak Floodplain Forest

Swamp Oak Floodplain Forest – Seven-part Test BC Act	**Response**
Profile: Swamp Oak Floodplain forest is listed as endangered under the BC Act. Found on the coastal floodplains of NSW occurring on the fringes of coastal estuaries on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Associated with grey-black clay-loams and sandy loams where the groundwater is saline or sub-saline. This community is dominated by *Casuarina glauca* with occasional occurrences of *Eucalyptus tereticornis*. Other trees including *Acmena smithii* (Lilly pilly), *Glochidion spp*. (cheese trees) and *Melaleuca spp*. (paperbarks) may be present as subordinate species, and are found most frequently in stands of the community northwards from Gosford.	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	(i) The ecological community is of moderate quality in some areas, however, Peake (2006) has mapped 1,168 ha of this community within the Singleton LGA and 1,217 ha within the Central Hunter. The removal of 1.18 ha of this community equates to 0.07 % removal in the locality and 0.06 % of the extent of this community in the Central Hunter. Therefore, it is considered unlikely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction. ii) The project will remove a small linear strip of this community. Furthermore, the vegetation within the study area is already modified as a result of previous agricultural practices. Therefore, the project is unlikely to substantially and adversely modify the composition of the community more than what is already occurring. It is considered unlikely that the local occurrence will be placed at risk of extinction.

Swamp Oak Floodplain Forest – Seven-part Test BC Act	Response
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(i) The project will remove or modify 1.18 ha of this community. (ii) The project will not substantially fragment or isolate habitat this community further, as it is already relatively fragmented. It will remain connected to contiguous areas of the same community to the north and south of the study area. (iii) The community within the study area has minimal understorey with a high to moderate weed invasion. A linear section of this community will be removed and it is unlikely to result in further modification, fragmentation or isolation to a level that would impact on the long term survival of this community.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of critical habitat.
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	No recovery plan or threatened abatement plan has bene written for Swamp Oak Floodplain Forest.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project may increase the operation of the KTP "Clearing of native vegetation" however, the project will remove a maximum of 1.18 ha of mostly lower quality habitat and as such we consider that this is a very small contribution to this KTP. The project may increase the operation of the KTP "Invasion of native plant communities by African Olive (*Olea europaea L. subsp. Cuspidate*)" as this species was present within this community. The project will remove the species during clearing operations, however mitigation measures such as washdown sites, and disposing of contaminated soil and plant material offsite in an approved disposal area will reduce the further spread of this weed. Therefore, the project may result in a very small contribution to this KTP.
Conclusion	The project is unlikely to have a significant impact upon Swamp Oak Floodplain Forest.

2 Significance Assessment for BC Act Species

2.1 Dusky Woodswallow

Dusky Woodswallow – Seven part Test BC Act	Response
Profile: The Dusky Woodswallow is listed as Vulnerable on the BC Act. Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. Dusky Woodswallows are widespread in eastern, southern and south western Australia. The species occurs throughout most of New South Wales, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range. Eats invertebrates and insects captured whilst hovering over the canopy or water (OEH Threatened Species Profile).	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	This species was not recorded within the study area. Habitat occurs in the woodlands and open forests. The project will remove woodland and open forest habitat for this species. A large expanse of high quality habitat occurs in close proximity throughout the locality. Whilst the project will affect a comparatively small area of potential habitat for this species it is considered unlikely to have an adverse effect on the life cycle of the Dusky Woodswallow such that a viable local population will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.

Dusky Woodswallow – Seven part Test BC Act	Response
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(i) The project will remove 13.06 ha of habitat within the study area. (ii) The project will widen the existing habitat gap. However, this is unlikely to fragment or isolate from other areas of habitat of this species more than that which is already is occurring. (iii) Compared to the extensive areas of habitat in the immediate locality, the project will remove a small linear area of habitat. As there are large areas of habitat remaining in the vicinity of the study area and the habitat within the study area is considered to be likely of contextually low importance, the habitat is not considered to be significant for the long-term survival of this species in the locality.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of critical habitat.
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery plan for this species.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project may increase the operation of the KTP "Clearing of native vegetation" however, the project will remove a comparatively small area of habitat. This will contribute a small amount to this KTP.
Conclusion	The project is unlikely to have a significant impact upon the Dusky Woodswallow.

2.2 Flame Robin

Flame Robin – Seven part Test BC Act	Response
Profile: Flame Robin is listed as Vulnerable on the BC Act. Habitat for this species includes tall moist eucalypt forests and woodlands often on ridges and slopes. Prefers clearings or areas of open understorey where it forages on invertebrates taken from the ground or tree trunks, logs and coarse woody debris. The Flame Robin occurs from south eastern Austral and ranges near the Queensland border to south east South Australia and also in Tasmania (OEH Threatened species profiles).	
a) In the case of a threatened species, whether an action is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	This species was not recorded within the study area. Habitat occurs in the woodlands and open forests. The project will remove woodland and open forest habitat for this species. A large expanse of high quality habitat occurs in close proximity throughout the locality. Whilst the project will affect a comparatively small area of potential habitat for this species it is considered unlikely to have an adverse effect on the life cycle of the Flame Robin such that a viable local population will be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable.
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or* *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not Applicable.

Flame Robin – Seven part Test BC Act	Response
(d) in relation to the habitat of a threatened species, population or ecological community: *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and* *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality*	(i) The project will remove 13.06 ha of habitat within the study area. (ii) The project will widen the existing habitat gap. However, this is unlikely to fragment or isolate from other areas of habitat of this species more than that which is already is occurring. (iii) Compared to the extensive areas of habitat in the immediate locality, the project will remove a small linear area of habitat. As there are large areas of habitat remaining in the vicinity of the study area and the habitat within the study area is considered to be likely of contextually low importance, the habitat is not considered to be significant for the long-term survival of this species in the locality.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	The study area is not located near any declared areas of critical habitat.
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery plan for this species.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The project may increase the operation of the KTP "Clearing of native vegetation" however, the project will remove a comparatively small area of habitat. This will contribute a small amount to this KTP.
Conclusion	The project is unlikely to have a significant impact upon the Flame Robin

3 SIGNIFICANCE ASSESSMENTS FOR EPBC ACT

3.1 Central Hunter Valley Eucalypt Forest and Woodland

Central Hunter Valley Eucalypt Forest and Woodland – EPBC Act Assessment	Response
Profile: The Central Hunter Valley Eucalypt Forest and Woodland is listed as Critically Endangered on the EPBC Act. This community comprises of eucalypt woodland or forest with an open to sparse shrub understorey and grassy ground cover and mostly occurs on soils derived from Permian sediments. The community occurs in Hunter Valley and Goulburn Valley in the north east of NSW in the Hunter River Catchment. Dominant canopy species include *Corymbia maculata, Eucalyptus dawsonii, Eucalyptus moluccana* and *Eucalyptus crebra*. A shrubby understory includes *Bursaria spinosa, Acacia amblygona, Acacia decora, Acacia implexa Breynia oblongifolia, Daviesia genistifolia, Daviesia ulicifolia, Notelaea microcarpa* and *Pultenaea spinosa*. Groundlayer is grassy with species likely to occur including *Cheilanthes sieberi, Desmodium varians, Dichondra repens, Eremophila debilis, Lomandra multiflora, Aristida ramosa, Cymbopogon refractus* and *Microlaena stipoides*.	
Reduce the extent of the ecological community	The project will reduce the extent of the community by 9.57 ha. This community occurred in three condition classes as set out in the conservation advice. The extent of these classes within the supplementary study area is as follows. The project will remove the following areas of these classes: • 3.98 ha of Class A High Quality • 3.29 ha of Class B High Quality • 2.30 ha of Class C Moderate Quality The removal of this community includes vegetation that meet the criteria for high quality Class A and B. Therefore, the project will reduce the extent of this community.
Fragment or increase fragmentation of an ecological community	The impacts of the project will increase the distance between remnants of this community to the north and south of the existing New England Highway and Golden Highway within the study area. However, the existing highways have already created separations in this regard. It is considered unlikely that the results of the project will significantly increase the existing fragmentation of this community in the locality. To the north and south of the study area, this community will remain well connected to other extensive areas of the same community.
Adversely affect habitat critical to the survival of an ecological community	The Conservation Advice for this community identifies that areas that meet the moderate or higher condition class are critical to the survival of this community. All of the community to be removed within the construction footprint is classified as moderate or higher quality. According to the Conservation Advice the project will therefore reduce habitat critical to the survival of the community at a Commonwealth level.

Central Hunter Valley Eucalypt Forest and Woodland – EPBC Act Assessment	Response
Modify or destroy abiotic (non-living) factors necessary for the community's survival, including reduction in groundwater, or substantial alterations to surface water drainage patterns	The project is not likely to result in a reduction of groundwater. However, the project will require the extension of existing culverts. These culverts are unlikely to result in substantial alterations to surface water. Significant modification of other abiotic factors necessary for the community's survival is unlikely to occur.
Cause a substantial change in the species composition of an occurrence of an ecological community, including decline or loss of functionally important species *(i) assisting invasive species, that are harmful to the listed ecological community to become established* *(ii) causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community*	i) Currently there is a moderate weed invasion of African Olive, exotic grasses and weeds. The project will implement management measures to ensure that the weeds that currently occur are not further spread into retained areas of this community. (ii) The current land use of agricultural practices, with the use of fertilisers and herbicides are currently occurring within the community. Best practice sediment, erosion and pollutant control procedures will be implemented by the project. Therefore, the project is unlikely to inhibit the growth of species that occur within this community.
Interfere with the recovery of an ecological community	The project is unlikely to interfere with the recovery of this ecological community, it is extensive in occurrence in the locality.
Conclusion	The project is reducing the extent of this ecological community by 9.57 ha and is impacting upon an area considered critical to the survival of this community (as defined in the Conservation Advice), as outlined above. It is therefore considered that the project is likely to result in a significant impact on this critically endangered ecological community at a Commonwealth level. Appropriate biodiversity offsets will be provided as compensation for this impact.

Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community – EPBC Act Assessment	Response
Profile: The Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community is listed as Endangered on the EPBC Act. The structure of Coastal Swamp Oak Forest can vary from forest to woodland depending on its location in the landscape and disturbance history. The ecological community occurs in sub-tropical, sub-humid and temperate climatic zones from Curtis Island, north of Gladstone, in Queensland to Bermagui in southern New South Wales. The ecological community is found within the South Eastern Queensland (SEQ), NSW North Coast (NNC), Sydney Basin (SYB) and South East Corner (SEC) IBRA7 bioregions (Department of the Environment and Energy, 2012). The canopy layer is dominated by *Casuarina glauca* (swamp oak, swamp she-oak). This often occurs as a relatively uniform upper layer of swamp oak, with height and density dependent on the local environmental conditions. A number of *Eucalyptus* spp. can emerge from the canopy, with typical examples including *Eucalyptus tereticornis* (forest red gum), *E. botryoides* (bangalay), *E. grandis* (flooded gum), *E. longifolia* (woollybutt), or *E. robusta* (swamp mahogany). In more freshwater patches of the ecological community, *Melaleuca* species, including *Melaleuca ericifolia* (swamp paperbark), *M. linariifolia* (narrow-leaved paperbark), *M. quinquenervia* (broad-leaved paperbark), and/or *M. styphelioides* (prickly-leaved paperbark), may occur in the canopy, sub-canopy or as an emergent.	
Reduce the extent of the ecological community	The project will reduce the extent of the community by 0.09 ha of Good Quality category C condition of this community. Therefore, the project will reduce the extent of this community.
Fragment or increase fragmentation of an ecological community	The impacts of the project remove a small area in the road verge of the New England Highway. The small area of this community proposed to be impacted within the study area adjoins the existing highway where edge effects and disturbance are already present. The community will remain well connected to other areas of the same community.
Adversely affect habitat critical to the survival of an ecological community	The Conservation Advice for this community identifies that areas that meet category A or B condition class are critical to the survival of this community. The vegetation within the study area is good quality category c. Vegetation classified as category A or B are critically to the survival of the community. The very small area of the community to be removed is considered unlikely to affect habitat critical to the survival of the community.
Modify or destroy abiotic (non-living) factors necessary for the community's survival, including reduction in groundwater, or substantial alterations to surface water drainage patterns	The project is not likely to result in a reduction of groundwater. However, the project will require the extension of existing culverts. These culverts are unlikely to result in substantial alterations to surface water. Significant modification of other abiotic factors necessary for the community's survival is unlikely to occur.
Cause a substantial change in the species composition of an occurrence of an ecological community, including decline or loss of functionally important species: *(i) assisting invasive species, that are harmful to the listed ecological community to become established* *(ii) causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community*	i) Currently there is a moderate-high weed invasion of African Olive, exotic grasses and weeds. The project will implement management measures to ensure that the weeds that currently occur are not further spread into retained areas of this community. (ii) The current land use of agricultural practices, with the use of fertilisers and herbicides are currently occurring within the community. Best practice sediment, erosion and pollutant control procedures will be implemented by the project. Therefore, the project is unlikely to inhibit the growth of species that occur within this community.

Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community – EPBC Act Assessment	Response
Interfere with the recovery of an ecological community	The project is unlikely to interfere with the recovery of this ecological community.
Conclusion	The project is reducing the extent of this good quality category C by 0.09 ha. It is unlikely that the project will have a significant impact upon this community.

3.2 Greater Glider

Greater Glider listed as vulnerable on the EPBC Act Is the population an important population within the study area?	Answer
Key source population for either breeding or dispersal	A large number of hollow-bearing trees with suitable hollows for this species were recorded in the study area. From a total of 40 hollow-bearing trees, 18 (45%) are required to be removed for the project. The study area provides foraging, roosting and breeding habitat for this species. However, this species has not previously been recorded within the Singleton LGA (OEH database search) and is unlikely to be a key source population for breeding.
Populations that are necessary for maintaining genetic diversity; and/or	The study area provides potential foraging and breeding habitat. Vegetation to be impacted upon consists of only a small area (11.88 ha). This species has not previously been recorded within the Singleton LGA (OEH database search). A large expanse of high quality habitat occurs to the north of the New England Highway, which provides similar potential foraging and breeding habitat for this species. The project will remove hollow-bearing trees which would reduce potential breeding habitat for this species.
At or near the limit of the species range.	The Greater Glider occurs from the Windsor Tableland in north Queensland through to central Victoria, with an elevational range from sea level to 1200 m above sea level. The Study Area occurs near Belford in NSW and is not at the limit of this species range.
Is the population within the project area part of an important for Greater Glider?	No, the project area does not form part of an important population for this species.

Greater Glider – EPBC Act Assessment	Response
Profile: The Greater Glider is listed as Vulnerable on the EPBC Act. The Greater Glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The distribution may be patchy even in suitable habitat. The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest), with an elevational range from sea level to 1200 m above sea level. The greater glider is considered to be particularly sensitive to forest clearance and to intensive logging, although responses vary according to landscape context and the extent of tree removal and retention.	
Lead to a long term decrease in size of an important population	This species was not recorded within or nearby to the study area. The forested sections of the study area provide potential foraging roosting and breeding habitat. 11.88 ha of Central Hunter Valley Eucalypt Forest will be removed as part of this project. The project is unlikely to lead to a long term decrease in size of an important population.
Reduce the area of occupancy of an important population	This species is not known to currently occupy the study area and therefore, the project is unlikely to reduce the occupancy of an important population.
Fragment an existing population into two or more populations	The project will generally maintain existing vegetation connectivity within the study area. Also, this species is highly mobile and therefore, the project is unlikely to fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of the species	The study area is not critical habitat for the survival of this species.
Disrupt the breeding cycle of an important population	This species is not known to currently occupy the study area. Whilst there is potential breeding habitat it is unlikely to disrupt the breeding cycle of an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The project will remove and modify a small area of potential foraging, breeding and roosting habitat for this species which will result in the decrease in the availability of habitat. The decrease in habitat is small in comparison to the extent of habitat to be retained as well as the availability of habitat in the surrounding area. Therefore, the project is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	The project is unlikely to introduce invasive species such as exotic plant species that are potentially harmful to this species.
Introduce disease that may cause the species to decline	The project is unlikely to introduce disease that will impact upon this species.
Interfere with the recovery of the species	The project will remove a small area of potential habitat and as such this could be seen to interfere with the recovery of this species. However, the impacts of the project are relatively minor in nature and are not expected to interfere with the recovery of this species.

Greater Glider – EPBC Act Assessment	Response
Conclusion	The project is unlikely to result in a significant impact upon the Greater Glider and further assessment is not required.

Appendix 4

Flora Species List

Life Form	Family	Species	Common Name	BC Act	EPBC Act	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
						% Cover	Abundance	% Cover	Abundance	% Cover	Abundance	% Cover	Abundance	% Cover	Abundance	% Cover	Abundance	% Cover	Abundance
Tree	Casuarinaceae	*Casuarina glauca*	Swamp Oak	'	'									60	100			40	37
Tree	Myrtaceae	*Corymbia maculata*	Spotted Gum	'	'							<2	2						
Tree	Myrtaceae	*Eucalyptus crebra*	Narrow-leaved Ironbark	'	'	20	5	30	21					<1	1	20	27		
Tree	Myrtaceae	*Eucalyptus melliodora*	Yellow Box	'	'					5	1								
Tree	Myrtaceae	*Eucalyptus moluccana*	Grey Box	'	'	5	3			15	5			<1	1				
Tree	Myrtaceae	*Eucalyptus sideroxylon*	Mugga Ironbark	'	'					5	4	1	1						
Tree	Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum	'	'							3	1						
Tree	Myrtaceae	*Melaleuca decora*		'	'					2	1								
Tree	Myrtaceae	*Melaleuca styphelioides*	Prickly-leaved Tea Tree	'	'					5	1								
Tree	Proteaceae	*Grevillea robusta*	Silky Oak	'	'									<1	1				
Small Tree	Casuarinaceae	*Allocasuarina luehmannii*	Bulloak	'	'	10	26			5	2								
Mistletoe	Loranthaceae	*Amyema spp.*	Mistletoe species	'	'	<1	1												
Shrub	Fabaceae Mimosoideae	*Acacia decurrens*	Black Wattle	'	'					2	1					<1	1		
Shrub	Fabaceae Mimosoideae	*Acacia implexa*	Hickory Wattle	'	'											<1	1		
Shrub	Fabaceae Mimosoideae	*Acacia podalyriifolia*	Queensland Silver Wattle	'	'	<1	1												
Shrub	Asteraceae	*Cassinia aculeata*	Dogwood	'	'											1	15		
Shrub	Rosaceae	*Cotoneaster spp.**		'	'											5	1		
Shrub	Asteraceae	*Ozothamnus diosmifolius*	White Dogwood	'	'	<1	1	<1	2										
Shrub	Fabaceae	*Daviesia ulicifolia*	Gorse Bitter Pea	'	'											<1	1		
Shrub	Chenopodiaceae	*Enchylaena tomentosa*	Ruby Saltbush	'	'			1	2										
Shrub	Scrophulariaceae	*Eremophila debilis*	Winter Apple	'	'	<1	4			<1	3			2	60	5	100		
Shrub	Apocynaceae	*Gomphocarpus physocarpus**	Balloon Cotton Bush	'	'	<1	1												
Shrub	Verbenaceae	*Lantana camara**	Lantana	'	'													1	35
Shrub	Myrtaceae	*Leptospermum spp.*	-	'	'					<1	1								
Shrub	Oleaceae	*Olea europaea subsp. cuspidata**	African Olive	'	'	10	200			<1	2	5	45	40	85	60	100		
Shrub	Cactaceae	*Opuntia aurantiaca**	Tiger Pear	'	'			2	33										
Shrub	Cactaceae	*Opuntia stricta**	Common Prickly Pear	'	'	2	1					<1	1			<1	1		

Life Form	Family	Species	Common Name	BC Act	EPBC Act	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
						% Cover	Abundance	% Cover	Abundance	% Cover	Abundance	% Cover	Abundance	% Cover	Abundance	% Cover	Abundance	% Cover	Abundance
Shrub	Malvaceae	*Pavonia hastata**		'	'									<1	4	5	150		
Shrub	Fabaceae	*Pultenaea spp.*		'	'											<1	100		
Shrub	Euphorbiaceae	*Ricinus communis**	Castor Oil Plant	'	'							<1	2						
Shrub	Lamiaceae	*Spartothamnella juncea*	Bead Bush	'	'									1	6				
Sedge	Cyperaceae	*Carex inversa*		'	'							<1	100						
Sedge	Cyperaceae	*Cyperus gracilis*	Slender Flat-sedge	'	'	<1	1	1	50										
Rush	Juncaceae	*Juncus usitatus*		'	'							<1	50						
Herb	Asteraceae	*Ageratina adenophora**	Crofton Weed	'	'													2	50
Herb	Asteraceae	*Bidens pilosa**	Cobbler's Pegs	'	'							<1	1					<1	20
Herb	Asteraceae	*Calotis cuneifolia*	Purple Burr-daisy	'	'			<1	1										
Herb	Apiaceae	*Centella asiatica*	Indian Pennywort	'	'							<1	100						
Herb	Asteraceae	*Chrysocephalum apiculatum*	Yellow Buttons	'	'	1	2	<1	20										
Herb	Asteraceae	*Cirsium vulgare**	Spear Thistle	'	'							<1	5					<1	30
Herb	Commelinaceae	*Commelina cyanea*	Native Wandering Jew	'	'													<1	50
Herb	Asteraceae	*Conyza spp.**	Fleabane	'	'							<1	15						
Herb	Phormiaceae	*Dianella caerulea*	Blue Flax-lily	'	'									<1	1				
Herb	Convolvulaceae	*Dichondra repens*	Kidney Weed	'	'							<1	65	<1	100	<1	50	<1	80
Herb	Chenopodiaceae	*Einadia hastata*	Berry Saltbush	'	'					<1	15								
Herb	Apiaceae	*Foeniculum vulgare**	Fennel	'	'							<1	3						
Herb	Molluginaceae	*Galenia pubescens*	Galenia	'	'					2	15			5	55			<1	25
Herb	Rubiaceae	*Galium aparine*	Goosegrass	'	'							<1	50					5	500
Herb	Geraniaceae	*Geranium molle*	Cranesbill Geranium	'	'							<1	15						
Herb	Amaranthaceae	*Gomphrena celosioides*	Gomphrena Weed	'	'	<1	1												
Herb	Asteraceae	*Hypochaeris glabra**	Smooth Catsear	'	'							<1	2						
Herb	Brassicaceae	*Lepidium africanum**		'	'			<1	1										
Herb	Lomandraceae	*Lomandra multiflora subsp. multiflora*	Many-flowered Mat-rush	'	'	<1	3									<1	5		
Herb	Lomandraceae	*Lomandra filiformis*	Wattle Mat-rush	'	'	<1	1									<1	15		

Life Form	Family	Species	Common Name	BC Act	EPBC Act	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
						% Cover	Abundance	% Cover	Abundance	% Cover	Abundance	% Cover	Abundance	% Cover	Abundance	% Cover	Abundance	% Cover	Abundance
Herb	Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush	'	'											<1	6		
Herb	Alliaceae	*Nothoscordum gracile**	Onion Weed	'	'							<1	35						
Herb	Oxalidaceae	*Oxalis corniculata**	Clover Sorrel	'	'					<1	50	<1	20			<1	10		
Herb	Plantaginaceae	*Plantago lanceolata**	Lamb's Tongues	'	'	<1	4					<1	25			2	20		
Herb	Portulacaceae	*Portulaca oleracea*	Pigweed	'	'			1	50			<1	3						
Herb	Polygonaceae	*Rumex crispus**	Curled Dock	'	'							<1	3					5	10
Herb	Asteraceae	*Senecio madagascariensis**	Fireweed	'	'	<1	2	<1	50	<1	80	<1	3						
Herb	Malvaceae	*Sida rhombifolia**	Paddy's Lucerne	'	'	<1	2	1	5					<1	3				
Herb	Solanaceae	*Solanum nigrum**	Black-berry Nightshade	'	'					<1	2	<1	50						
Herb	Solanaceae	*Solanum prinophyllum*	Forest Nightshade	'	'													<1	15
Herb	Asteraceae	*Sonchus oleraceus**	Common Sowthistle	'	'					2	100							<1	3
Herb	Verbenaceae	*Verbena bonariensis**		'	'	<1	3											<1	3
Herb	Verbenaceae	*Verbena officinalis**	Common Verbena	'	'							<1	15			1	3		
Herb	Verbenaceae	*Verbena rigida**	Veined Verbena	'	'					1	35	<1	85						
Herb	Plantaginaceae	*Veronica filiformis*	Creeping Speedwell	'	'											<1	3		
Herb	Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell	'	'											<1	50		
Herb	Campanulaceae	*Wahlenbergia stricta*	Australian Bluebell	'	'	<1	20												
Grass	Poaceae	*Aristida ramosa*	Purple Wiregrass	'	'	2	25	1	50	1	20					5	85		
Grass	Poaceae	*Aristida vagans*	Three-awned Speargrass	'	'											5	15		
Grass	Poaceae	*Austrostipa scabra*	Speargrass	'	'									<1	10				
Grass	Poaceae	*Bothriochloa macra*	Red Grass	'	'	2	100	5	100	5	100			<1	30	1	55		
Grass	Poaceae	*Capillipedium spicigerum*	Scented-top Grass	'	'	2	100					1	30						
Grass	Poaceae	*Chloris gayana**	Rhodes Grass	'	'	<1	3					2	500					10	200
Grass	Poaceae	*Chloris truncata*	Windmill Grass	'	'	<1	3	<1	40							<1	1		
Grass	Poaceae	*Cymbopogon refractus*	Barbed Wire Grass	'	'	5	100			1	15					<1	15		
Grass	Poaceae	*Cynodon dactylon*	Couch	'	'			10	100	1	1	5	500						
Grass	Poaceae	*Ehrharta erecta**	Panic Veldtgrass	'	'									<1	15			5	<1

Life Form	Family	Species	Common Name	BC Act	EPBC Act	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
						% Cover	Abundance	% Cover	Abundance	% Cover	Abundance	% Cover	Abundance	% Cover	Abundance	% Cover	Abundance	% Cover	Abundance
Grass	Poaceae	*Entolasia stricta*	Wiry Panic	'	'											<1	1		
Grass	Poaceae	*Eragrostis benthamii*		'	'	<1	1	80	300										
Grass	Poaceae	*Eragrostis curvula*	African Lovegrass	'	'	<1	1												
Grass	Poaceae	*Eragrostis elongata*	Clustered Lovegrass	'	'			1	10			<1	3						
Grass	Poaceae	*Hyparrhenia hirta**	Coolatai Grass	'	'					15	200								
Grass	Poaceae	*Melinis repens**	Red Natal Grass	'	'	2	50									20	50		
Grass	Poaceae	*Microlaena stipoides*	Weeping Grass	'	'							1	80	<1	50	1	100		
Grass	Poaceae	*Oplismenus aemulus*	Australian Basket Grass	'	'													1	50
Grass	Poaceae	*Panicum effusum*	Hairy Panic	'	'									<2	1				
Grass	Poaceae	*Panicum maximum**	Guinea Grass	'	'	70	300	<1	2	15	100	90	5000	<1	1	30	100	80	1000
Grass	Poaceae	*Paspalum dilatatum**	Paspalum	'	'							1	50						
Grass	Poaceae	*Pseuderanthemum variabile*	Pastel Flower	'	'	<1	5	1	100					<1	100	<1	60		
Grass	Poaceae	*Rytidosperma tenuius*	Wallaby Grass	'	'	<1	5							<1	1				
Grass	Poaceae	*Sporobolus creber*	Western Rat-tail Grass	'	'			<1	1										
Fern	Pteridaceae	*Cheilanthes sieberi subsp. sieberi*	Poison Rock Fern	'	'	<1	2			<1	30					<1	100		
Climber	Ranunculaceae	*Clematis glycinoides*	Headache Vine	'	'									<1	10				
Climber	Fabaceae Faboideae	*Desmodium varians*	Slender Tick-trefoil	'	'			1	5										
Climber	Fabaceae	*Glycine clandestina*		'	'											<1	15		
Climber	Fabaceae	*Glycine tabacina*		'	'									<1	25	2	100		
Climber	Fabaceae	*Hardenbergia violacea*	False Sarsparilla	'	'	1	1												
Climber	Apocynaceae	*Marsdenia rostrata*	Milk Vine	'	'							2	15	<1	15			<1	25

Note: Red text denotes newly recorded species

Appendix 5

Field Data Sheets

DECCW VEGETATION FIELD SURVEY FORM

Module 1 (Minimum requirements)

Location B2GH
Contingency Review

				Survey code	Plot no.	Recorders	
Date		Plot ID.		BB1		AM DL	
AMG grid reference	zone 54 55 56 datum			Easting		Northing	Position in quadrat
Base plot size		Orientation of 0.1ha plot			marked	yes no	photo # / orientation

GPS Mark # (Start 50m transect)	BB1	Photo # (Facing down transect)	100 - 0006 93°E
		Photo # (Facing N)	100 - 0007 65°NE
		Photo # (~~Facing E~~)	100 - 0008 149°SE
		Photo # (~~Facing S~~)	
		Photo # (Facing W)	

Structure & composition (within 0.04 ha quadrat)

Keith class		Confidence: high mod low N.A
Regional veg class (BVT)		Confidence: high mod low N.A
BioMetric type (or NVCA)		Confidence: high mod low N.A.
Other:		Confidence: high mod low N.A.

NVIS level V (within 0.04 ha quadrat)

Stratum	Growth form	Species name	Cover	Abund.	For the entire	Field
Upper		Central Hunter			Upper stratum	
Upper		Narrow leaved Ironbark			Height to crown (m) min mode max	
Upper		Condition - Moderate				
Mid					Mid stratum	
Mid					Height to crown (m) min mode max	
Mid						
Ground					Ground stratum	
Ground					Height to crown (m) min mode max	
Ground						

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern
Cover: 0–1,1,2,3,4,5,10,15,20,25,30,35, etc. Abundance: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000,>1000

Transect number________	Number of hits (tally)	%
Native over-storey cover (%)	80, 5, 30, 5, 10, 5, 30, 5, 0, 5	17.5
Native mid-storey cover (%)	5, 0, 0, 5, 0, 0, 0, 0, 0, 0	~~5~~ 0.1
Native ground cover (grasses) (%)	HHT II ~~14~~	~~7.5~~
Native ground cover (shrubs) (%)		
Native ground cover (other) (%)	III 6	2.5
Exotic plant cover (%)	HHT HHT 20	-

Ground/Leaves: HHT HHT HHT HHT HHT HHT 60

Record within 50m x 20m quadrat	# of Trees with a hollow/s (>5cm diam.)	0	
	Total length of fallen logs (>10cm diam.)	3	(m)
	Native regeneration (0 = No; 1 = Yes)	1	
	Average crown diameter	3	(m)
	Average foliage cover	25	(%)

Not LPBC

8/5/18

DECCW VEGETATION FIELD SURVEY FORM

Module 2 Full floristics GH2B

Site no. GH1

Floristics

(within 0.04 ha quadrat)

Stratum	Growth form	Field name	Species name	Cover	Abund.	Field no.	RBG no.
	1	E crebra		20	~~35~~		
	2	E moluccana		5	3		
	3	Allocas. littoralis		10	26		
	X	Panicum maxim		~~8~~ 70	300+		
	X	~~Verbena bonariensis~~		<1	3		
	4	Cymbopogon refractus		5	100+		
	~~5~~ X	Grassl red. capillipedium spicigerum		~~10~~ <1	20		
	5	Ozothamnus diosmifolius		<1	1		
	X	Senecio madagascariensis		<1	~~10~~ 2		
	6	Aristida vagans		~~1~~ 2	25		
	X	~~Eragrostis curvula~~	African lovegrass	<1	1		
	X	Molin's ...		2	50		
	~~5~~	~~C~~ capillipedium ~~s~~ spicigerum		2	100		
	X	chloris gayana		<1	3		
	X	African olive	Olea europea	10	200		
	7	Hardenbergia violacea		~~21~~	1		
	8	Flat creeper	Evolvulus debilis	<1	4		
	9	cheilanthes sieberi		<1	2		
	10	cyperus ~~tricep~~ gracilis		<1	1		
	11	chrysocephalum apiculatum		1	20		
	12	Wahlenbergia stricta	<1	~~20~~	6 20		
	13	~~Ak~~ Pseuderanthemum variabile		<1	5		
	14	Rhytidosperma ~~laevii~~ tenuis		<1	5		
	15	Bothriochloa macra		2	100		
	X	Plantago lanceolata		<1	4		
		~~olive~~				see above	
	X	Sida rhombifolia		<1	2		
	X	Opuntia stricta		2	1		
	16	Cootamundra wattle Acacia podalyriifolia		<1	1		
	17	Lomandra multiflora		<1	3		

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: (<1%see explanatory notes) 1,2,3,4,5,10,15,20,25,30,35, etc. crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 (>1000 see explanatory notes)

~~20~~ 10x40 site too small for 20x20m

18 Lomdra fillifomis

X white bindi Gomphrena celosioides <1 1

X Narrow leaf cotton <1 1 Gomphocarpus physocarpus

19 Windmill grass Chloris truncata <1 3

20 mistletoe - muellerina eucalyptoides <1 1

21 Eragrostis benthamii <1 1

21 natives.
14 Exotics

DECCW VEGETATION FIELD SURVEY FORM

Module 1 (Minimum requirements)

Location B2GH Contingency Review

			Survey code	Plot no.	Recorders		
Date	8/5/18	Plot ID.	BB2		AM DL		
AMG grid reference	zone 54 55 56	datum	Easting		Northing		Position in quadrat
Base plot size		Orientation of 0.1ha plot		marked	yes no	photo # / orientation	

GPS Mark # (Start 50m transect)	BB2	Photo # (Facing down transect)	100-0015 77°E
		Photo # (~~Facing N~~)	100-0016 350°NE
		Photo # (Facing E)	100-0017 110°E
		Photo # (Facing S)	
		Photo # (Facing W)	

Structure & composition (within 0.04 ha quadrat)

Keith class		Confidence: high mod low N.A
Regional veg class (BVT)		Confidence: high mod low N.A
BioMetric type (or NVCA)		Confidence: high mod low N.A.
Other:		Confidence: high mod low N.A.

NVIS level V (within 0.04 ha quadrat)

Stratum	Growth form	Species name	Cover	Abund.	For the entire	Field
Upper		Central hunter			Upper stratum Height to crown (m) min mode max	
Upper		Narrow-leaved Ironbark				
Upper		Condition - Moderate - Poor				
Mid					Mid stratum Height to crown (m) min mode max	
Mid						
Mid						
Ground					Ground stratum Height to crown (m) min mode max	
Ground						
Ground						

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern
Cover: 0–1.1,2.3,4.5,10,15,20,25,30,35, etc. Abundance: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000,>1000

Transect number_____	Number of hits (tally)	%
Native over-storey cover (%)	10, 5, 10, 20, 10, 40, 5, 5, 5,	11%
Native mid-storey cover (%)	0, 0, 0, 0, 0, 0, 0, 0, 0,	0
Native ground cover (grasses) (%)	𝍸 𝍸 𝍸 𝍸 𝍸 | |	56
Native ground cover (shrubs) (%)	1	2
Native ground cover (other) (%)		
Exotic plant cover (%)	11	4
Leaves/Ground:	𝍸 𝍸 𝍸 𝍸	40

Record within 50m x 20m quadrat	# of Trees with a hollow/s (>5cm diam.)	0	
	Total length of fallen logs (>10cm diam.)	3	(m)
	Native regeneration (0 = No; 1 = Yes)	1	
	Average crown diameter	3m	(m)
	Average foliage cover	15	(%)

No EPBC
moderate cond

DECCW VEGETATION FIELD SURVEY FORM

Site no. GH2

Module 2 Full floristics

Golden Highway
8/5/2018

Floristics
(within 0.04 ha quadrat)

Stratum	Growth form	Field name	Species name	Cover	Abund.	Field no.	RBG no.
N	N1	E. crebra		30	21		
	~~X~~	~~Allocasuarina luehmannii~~					
N	2	Couch		10	100		
*	X	Sida rhombifolia		<1	5		
*	X	Pigweed	Portulaca oleracea	1	50		
	3	Ozothamnus diosmifolius		<1	2		
*	X	Senecio mad		<1	50		
	4	Bothriochloa macra		5	100		
	5	Eragrostis sp. benthii		80	1000		
	6	Chrysocephalum apiculatum		<1	20		
*	X	African mustard	Lepidium africanum	<1	1		
	7	Windmill grass	Chloris truncata	<1	40		
*	X	Panicum maximum		<1	2		
*	8	Sporobolus creber		<1	1		
*	X	Tiger pear	Opuntia aurantiaca	2	35		
	9	Clustered eragrostis	Eragrostis elongata	1	10		
	10	Calotis ~~spike~~	lappulacea	<1	1		
	11	Aristida vagans		1	50		
	12	Einadia nutans?	Enchylaena tomentosa	1	2		
	13	Pseudognaphalium variabile		1	100		
	14	Desmodium varians		1	5		
	15	Cyperus ~~[illegible]~~ gracilis		1	50		

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: (<1%see explanatory notes) 1,2,3,4,5,10,15,20,25,30,35, etc. crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 (>1000 see explanatory notes)

15 Natives
7 Exotic

NO
NOS enough
Native Non-grassy

DECCW VEGETATION FIELD SURVEY FORM

Module 1 (Minimum requirements)

Note = much of ~~site~~ plot is outside site. Plot was completed just in case we need to consider if 'sliver' is adjoining an area of 'Central Hunter.'

Location B2GH Contingency Review

			Survey code	Plot no.	Recorders	
Date	8/5/18	Plot ID.	BB3		AM DL	
AMG grid reference	zone 54 55 56	datum	Easting		Northing	Position in quadrat
Base plot size		Orientation of 0.1ha plot		marked	yes no	photo # / orientation

GPS Mark # (Start 50m transect)	BB3	Photo # (Facing down transect)	100-0028 90° E
		Photo # (Facing N)	100-0029 54° NE
		Photo # (Facing E)	100-0030 119° SE
		Photo # (Facing S)	
		Photo # (Facing W)	

Structure & composition (within 0.04 ha quadrat)

Keith class		Confidence: high mod low N.A
Regional veg class (BVT)		Confidence: high mod low N.A
BioMetric type (or NVCA)		Confidence: high mod low N.A.
Other:		Confidence: high mod low N.A.

NVIS level V (within 0.04 ha quadrat)

Stratum	Growth form	Species name	Cover	Abund.	For the entire	Field
Upper		Central Hunter - Low (?)			Upper stratum	
Upper		Poor Condition			Height to crown (m) min mode max	
Upper						
Mid					Mid stratum	
Mid					Height to crown (m) min mode max	
Mid						
Ground					Ground stratum	
Ground					Height to crown (m) min mode max	
Ground						

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern
Cover: 0–1.1.2.3.4.5.10.15.20.25.30.35. etc. Abundance: 1.2.3.4.5.6.7.8.9.10.20.50.100.500.1000.>1000

Transect number	Number of hits (tally)	%
Native over-storey cover (%)	0, 10, 10, 0, 0, 0, 0, 0, 0, 0	2
Native mid-storey cover (%)	0, 0, 0, 0, 0, 0, 0, 0, 0, 0	0
Native ground cover (grasses) (%)	1	2
Native ground cover (shrubs) (%)		0
Native ground cover (other) (%)	1	2
Exotic plant cover (%)	𝍸 𝍸 𝍸 𝍸 𝍸 111	36

Leaves/Ground: 𝍸 𝍸 𝍸 𝍸

Record within 50m x 20m quadrat	# of Trees with a hollow/s (>5cm diam.)	0	
	Total length of fallen logs (>10cm diam.)	3	(m)
	Native regeneration (0 = No; 1 = Yes)	1	
	Average crown diameter	2	(m)
	Average foliage cover	45	(%)

No ~~to~~ poor

DECCW VEGETATION FIELD SURVEY FORM

Module 2 Full floristics GH2B 8/5/18

Site no. GHB3

Floristics
(within 0.04 ha quadrat)

Stratum	Growth form	Field name	Species name	Cover	Abund.	Field no.	RBG no.
	1	E molluca		15	5		
	2	E sideroxylon		5	4		
	3	Cypogon Refaltw		1	15		
	X	Panicum m	aximum	15	100		
	X	sonkus olerucus		2	5,100		
	4	Allocasuarina le	hmanni	5	2		
	5	~~E~~ E melli	dora	5	<1		
	6	Eromophila d	ebilis	<1	3		
	7	cheilthus	sieberi	<1	20		
	X	senecio ma	d	<1	80		
	X	Hypergenia	hirta	15	200		
	X	verbena b	Verbena ridiga	1	35		
	X 8	Arista vag	ans	1	20		
	9	Melaleuca stu	phlodes	53	1		
	10	Bothriocha	~~calcum~~ macra	5	100		
	11	Couch cyn	odon dactylon	1	1		
	—	~~[illegible]~~	~~[illegible]~~	~~20~~	~~100~~		
	12	Acacia meldica	acacia decurrens	2	1		
	13	Melaleuca	decora	2	1		
	X	Solanum ni	grum	<1	2		
	14	Eihartea has	tata	<1	15		
	X	oxalis ~~sp~~	corniculata	<1	50		
	X	Galena pubesc	ens [illegible]	2	15		
	~~15~~	~~[illegible]~~		<1	[illegible]		
	X	African olive	olea europea	<1	2		
	16	Leptospermum	sp	<1	1	8	

5% 2

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: (<1%see explanatory notes) 1,2,3,4,5,10,15,20,25,30,35, etc. crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 (>1000 see explanatory notes)

16 natives
9 Exotics

DECCW VEGETATION FIELD SURVEY FORM

Module 1 (Minimum requirements)

Location B2GH Contingency Review

Survey code	Plot no.	Recorders
BB4		AM DL

Date	9/5/18	Plot ID.	AMG grid reference	zone 54 55 56	datum	Easting	Northing	Position in quadrat
Base plot size		Orientation of 0.1ha plot		marked	yes no	photo # / orientation		

GPS Mark # (Start 50m transect)	BB4	Photo # (Facing down transect)	100-0031 274°W
		Photo # (Facing N)	
		Photo # (Facing E)	
		Photo # (Facing S)	
		Photo # (Facing W)	

Structure & composition (within 0.04 ha quadrat)

Keith class		Confidence: high mod low N.A
Regional veg class (BVT)		Confidence: high mod low N.A
BioMetric type (or NVCA)		Confidence: high mod low N.A.
Other:		Confidence: high mod low N.A.

NVIS level V (within 0.04 ha quadrat)

Stratum	Growth form	Species name	Cover	Abund.	For the entire	Field
Upper		Central Hunter (?)			Upper stratum Height to crown (m) min mode max	
Upper		Poor				
Upper						
Mid					Mid stratum Height to crown (m) min mode max	
Mid						
Mid						
Ground					Ground stratum Height to crown (m) min mode max	
Ground						
Ground						

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern
Cover: 0–1,1,2,3,4,5,10,15,20,25,30,35, etc. Abundance: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000,>1000

Transect number_____	Number of hits (tally)	%
Native over-storey cover (%)	70, 0, 0, 0, 0, 70, 0, 0, 0, 70	21
Native mid-storey cover (%)	0, 0, 0, 0, 0, 0, 0, 0, 0, 0	0
Native ground cover (grasses) (%)		0
Native ground cover (shrubs) (%)		0
Native ground cover (other) (%)		0
Exotic plant cover (%)	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 ||||	98

Leaves / Ground : 1

Record within 50m x 20m quadrat	# of Trees with a hollow/s (>5cm diam.)	0	
	Total length of fallen logs (>10cm diam.)	2	(m)
	Native regeneration (0 = No; 1 = Yes)	0	
	Average crown diameter	8	(m)
	Average foliage cover	10	(%)

Cotton Bush Chrysocoma
Verbena
African Olive
Moth Vine

DECCW VEGETATION FIELD SURVEY FORM

Module 2 Full floristics

Site no. GHB4

Floristics GoB2GH 9/5/18
(within 0.04 ha quadrat)

Stratum	Growth form	Field name	Species name	Cover	Abund.	Field no.	RBG no.
	1	E tereticornis		3	1		
	2	E sideroxyn		1	1		
	X	African olive	olea europa	5	45		
	X	Panicum Maxim		90	710	20	
	3	milk vine	mardenia costrata	2	6	15	
	X	Caster oil	Ricinus comaunis	<1	2		
	X	Galium aparine		<1	50		
	X	verbena officile		<1	15		
	X	veined verbena	ridiga	<1	65		
	X	chloris gayana		2	500		
	4	Centella asitacia		<1	100		
	X	Paspalum dilatum		1	50		
	X	C. vulgare	Ricinus	<1	5		
	X	Fennel	Foeniculum vulgare	<1	3		
	X	Solanum Nigrum		<1	50		
	X	Senecio mad.		<1	3		
	5	Juncus ~~sebicundus~~ ustatus		<1	50		
	X	Plantago	lanceolata	<1	35		
	6	Corymbia	maculata	5	2		
	7	Cynodon dactylon		5	~~100~~ 500?		
	X	onion weed	~~Nod~~ Nothoscordum borbonicum	<1	55		
	X	Rumex crispix		<1	3		
	X	Oxalis corniculata		<1	20		
	X	Geranium molle		<1	15		
	X	Hypochaeris glabra?		<1	2		
	9	Dichondra repens		<1	65		
	10	carex inversa	spicigerum	<1	100		
	X	Red scented grass	Capillipedium	<1	30		
	11	Microlena stipoides		1	80		
	12	Eragostis elongata		<1	3		

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: (<1%see explanatory notes) 1,2,3,4,5,10,15,20,25,30,35, etc. crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 (>1000 see explanatory notes)

13 natives
22 Exotics

10 x 40 m side of Road

Partial veg on site. plot to determine condition for EPBC assessment

13 Pigweed X <1 3 Portulacea oleracea

X Conzya abinaci <1 15

X Bidens pilosa <1

X Opuntia stricta <1

DECCW VEGETATION FIELD SURVEY FORM

Module 1 (Minimum requirements)

Location B2G4 Contingency Review

			Survey code	Plot no.	Recorders		
Date	9/5/18	Plot ID.	BBS		AM DL		
AMG grid reference	zone 54 55 56	datum	Easting		Northing		Position in quadrat
Base plot size		Orientation of 0.1ha plot		marked	yes no	photo # / orientation	

GPS Mark # (Start 50m transect)	BBS	Photo # (Facing down transect)	100-0033 267°W
		Photo # ~~(Facing N)~~	100-0034 238°SW
		Photo # ~~(Facing E)~~	100-0035 303°NW
		Photo # (Facing S)	
		Photo # (Facing W)	

Structure & composition (within 0.04 ha quadrat)

Keith class		Confidence: high mod low N.A
Regional veg class (BVT)		Confidence: high mod low N.A
BioMetric type (or NVCA)		Confidence: high mod low N.A.
Other:		Confidence: high mod low N.A.

NVIS level V (within 0.04 ha quadrat)

Stratum	Growth form	Species name	Cover	Abund.	For the entire	Field
Upper		Swamp Oak Forest			Upper stratum	
Upper					Height to crown (m)	
Upper					min mode max	
Mid					Mid stratum	
Mid					Height to crown (m)	
Mid					min mode max	
Ground					Ground stratum	
Ground					Height to crown (m)	
Ground					min mode max	

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern
Cover: 0-.1,1,2,3,4,5,10,15,20,25,30,35, etc. Abundance: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000,>1000

Transect number_____	Number of hits (tally)	%
Native over-storey cover (%)	10, 5, 60, 20, 40, 15, 50, 10, 20, 0	23
Native mid-storey cover (%)	5, 15, 0, 10, 0, 0, 0, 30, 0, 0	6
Native ground cover (grasses) (%)	111	8
Native ground cover (shrubs) (%)	111	6
Native ground cover (other) (%)	𝍸 𝍸 1	21
Exotic plant cover (%)	𝍸 𝍸 𝍸 11	34
Leaves/ Ground :	𝍸 𝍸 𝍸	30

Record within 50m x 20m quadrat	# of Trees with a hollow/s (>5cm diam.)	0	
	Total length of fallen logs (>10cm diam.)	11	(m)
	Native regeneration (0 = No; 1 = Yes)	1	
	Average crown diameter	2	(m)
	Average foliage cover	50	(%)

GH5

DECCW VEGETATION FIELD SURVEY FORM

Module 2 Full floristics GH2 Bel

Site no. ~~GH2B~~

9/5/18

Floristics (within 0.04 ha quadrat) Swamp Oak Forest

Stratum	Growth form	Field name	Species name	Cover	Abund.	Field no.	RBG no.
	1	Casuarina glauca		60	100		
	2	E mollucana		<1	1		
	3	E crebra		<1	1		
	X	Olea europaea		40	85		
	X	Panicum maximum		<1	1		
	4	Microlena stipodies		<1	50		
	5	Panicum effusum		<1	60		
	6	Eromphia deblis		2	60		
	X	Ehrharta erecta		<1	15		
	7	Grevellia robusta JNV		<1	1		
	X	wide leaf creeper	Galena pubescens	5	55		
	9	Ozothamnus variable		<1	100		
	10	Rhitrosperma tenuior		<1	1		
	11	Lonthna?	Spartothamnella juncea	1	6		
	12	Dianella careila		<1	1		
	13	Austrostipa scabra		<1	10		
	14	Bothriochloa ~~macr~~	macra	<1	30		
	15	Glycine tabacina		<1	25		
	X	~~Sida~~ Paveria hastata		<1	4		
	16	Clematis ~~aristata~~ glycinoides		<1	10		
	17	Dichondra repens		<1	100		
	X	Sida rhombifolia		<1	3		
	18	milk vine	Marsdenia rostrata	<1	15		

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: (<1%see explanatory notes) 1,2,3,4,5,10,15,20,25,30,35, etc. crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 (>1000 see explanatory notes)

10x40

17 natives

6 Exotics

DECCW VEGETATION FIELD SURVEY FORM

Module 1 (Minimum requirements)

Location B2GH

			Survey code	Plot no.	Recorders		
Date	9/5/18	Plot ID.		BB6	AM DL		
AMG grid reference	zone 54 55 56	datum	Easting		Northing		Position in quadrat
Base plot size		Orientation of 0.1ha plot		marked	yes no	photo # / orientation	

GPS Mark # (Start 50m transect)	BB6	Photo # (Facing down transect)	100-0035	295°NW
		Photo # (Facing N)	100-0036	266° W
		Photo # (Facing E)	100-0037	327°NW
		Photo # (Facing S)		
		Photo # (Facing W)		

Structure & composition (within 0.04 ha quadrat)

Keith class		Confidence: high mod low N.A
Regional veg class (BVT)		Confidence: high mod low N.A
BioMetric type (or NVCA)		Confidence: high mod low N.A.
Other:		Confidence: high mod low N.A.

NVIS level V (within 0.04 ha quadrat)

Stratum	Growth form	Species name	Cover	Abund.	For the entire	Field
Upper		Central Hunter			Upper stratum	
Upper		Moderate			Height to crown (m)	
Upper					min mode max	
Mid					Mid stratum	
Mid					Height to crown (m)	
Mid					min mode max	
Ground					Ground stratum	
Ground					Height to crown (m)	
Ground					min mode max	

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern
Cover: 0--1.1.2.3.4.5.10.15.20.25.30.35. etc. Abundance: 1.2.3.4.5.6.7.8.9.10.20.50.100.500.1000.>1000

Transect number_____	Number of hits (tally)	%
Native over-storey cover (%)	5, 50, 30, 10, 20, 25, 5, 0, 0, 0	14.5
Native mid-storey cover (%)	0, 0, 10, 5, 40, 30, 0, 0, 0, 0	8.5
Native ground cover (grasses) (%)	𝍸 𝍸 I	22
Native ground cover (shrubs) (%)		
Native ground cover (other) (%)	𝍸	10
Exotic plant cover (%)	𝍸 𝍸 𝍸 𝍸 𝍸	50
Leaves / Ground: 𝍸 IIII		12

Record within 50m x 20m quadrat	# of Trees with a hollow/s (>5cm diam.)	0	
	Total length of fallen logs (>10cm diam.)	7	(m)
	Native regeneration (0 = No; 1 = Yes)	1	
	Average crown diameter	3	(m)
	Average foliage cover	10	(%)

DECCW VEGETATION FIELD SURVEY FORM

Module 2 Full floristics GH2B

Site no. GH6

Floristics 9/5/18 Central Hunter
(within 0.04 ha quadrat)

Stratum	Growth form	Field name	Species name	Cover	Abund.	Field no.	RBG no.
	T1.	E. crebra		20	27		
	*	Olea europea		60	100		
	*	Panicum maximum		30	100		
	*	Pavonia hastata		5	150		
	2	Microlena stipoides		1	100		
	*	Melinis repens	20	4	50		
	*	Plantago lanceolata	2	<1	20		
	3	Lomandra multiflora		<1	5		
	4	Aristida vagans	5	<1	15		
	5	Glycine clandestina		<1	65		
	6	Lomandra filiformis		<1	15		
	7.	Cheilanthes sieberi		<1	100		
	8.	Glycine tabacina	2	<1	100		
	9	Entolasia stricta		<1	1		
	10	creeping speedwell	veronica filiformis	<1	3		
	11	Bothriochloa macra	1	<1	55		
	*	Oxalis corniculata		<1	10		
	*	Creeping verbena	Verbena officinale 1	<1	3		
	12	Poa[illegible]		<1	60		
	13	Lomandra longifolia		<1	6		
	14	Wahlenbergia communis		<1	50		
	15	~~Cassinia~~ Cassinia ~~uncata~~	uncata	1	15		
	16	Acacia implexa		<1	1		
	17	Alt Herb tobacco?	pultenea sp.	<1	100		
	18	Cymbopogon refractus		<1	15		
	19.	Euchiton sphaericus[illegible]	5	<1	100		
	20.	Acacia decurrens		<1	1		
	21	Aristida ramosa		5	25		
	22	Chloris truncata		<1	1		
	—	~~Oxalis corniculata~~		<1	1		

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: (<1%see explanatory notes) 1,2,3,4,5,10,15,20,25,30,35, etc. crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 (>1000 see explanatory notes)

X ~~R~~ Opuntia stricta <1 1
X Cotoneaster sp 5 1
23 Dichondra repens <1 50
24 Daviesia ulicifolia <1 1

24 Natives
9 Exotics

DECCW VEGETATION FIELD SURVEY FORM

Module 1 (Minimum requirements)

Location B2GH Contingency Review

			Survey code	Plot no.	Recorders		
Date	9/5/18	Plot ID.	BB7		AM DL		
AMG grid reference	zone 54 55 56	datum	Easting		Northing		Position in quadrat
Base plot size		Orientation of 0.1ha plot		marked	yes no	photo # / orientation	

GPS Mark # (Start 50m transect)	BB7	Photo # (Facing down transect)	100-004 294°M W
		Photo # (Facing N)	
		Photo # (Facing E)	
		Photo # (Facing S)	
		Photo # (Facing W)	

Structure & composition (within 0.04 ha quadrat)

Keith class		Confidence: high mod low N.A
Regional veg class (BVT)		Confidence: high mod low N.A
BioMetric type (or NVCA)		Confidence: high mod low N.A.
Other:		Confidence: high mod low N.A.

NVIS level V (within 0.04 ha quadrat)

Stratum	Growth form	Species name	Cover	Abund.	For the entire	Field
Upper		Swamp Oak			Upper stratum Height to crown (m) min mode max	
Upper						
Upper						
Mid					Mid stratum Height to crown (m) min mode max	
Mid						
Mid						
Ground					Ground stratum Height to crown (m) min mode max	
Ground						
Ground						

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern
Cover: 0–1,1.2,3,4,5,10,15,20,25,30,35, etc. Abundance: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000,>1000

Transect number_____	Number of hits (tally)	%
Native over-storey cover (%)	5, 10, 30, 40, 10, 40, 30, 30, 5, 70	27
Native mid-storey cover (%)	10, 20, 0, 0, 0, 0, 0, 40, 0, 0	7
Native ground cover (grasses) (%)		0
Native ground cover (shrubs) (%)		0
Native ground cover (other) (%)	IIII	3
Exotic plant cover (%)	HHT HHT HHT HHT HHT HHT HHT HHT HHT	90

Leaves/Ground: 1

Record within 50m x 20m quadrat	# of Trees with a hollow/s (>5cm diam.)	0	
	Total length of fallen logs (>10cm diam.)	2	(m)
	Native regeneration (0 = No; 1 = Yes)	1	
	Average crown diameter	5	(m)
	Average foliage cover	25	(%)

DECCW VEGETATION FIELD SURVEY FORM

Module 2 Full floristics

GH2B

9/5/18 D.L.

Site no. GHB7

Floristics
(within 0.04 ha quadrat)

Stratum	Growth form	Field name	Species name	Cover	Abund.	Field no.	REG no.
	1	Casuarina glauca		40	37		
	x	Ehrharta erecta		5	<1		
	X	Galium aparine		~~80~~	~~100~~	5	500
	x	Panicum maximum		~~40~~	~~100~~	✓	
	x	Cirsium vulgare		<1	30		
	2	Milkvine	Marsdenia rostrata	<1	25		
	X	Lantana camara		1	35		
	3	Oplismenus	aemulus	1	50		
	X	Chloris gayana		10	200		
	X	Rumex crispus		5	10		
	X 3	Cynea commelina		<1	150		
	X	Sonchus oleraceus		<1	3		
	X	Wide leaf creeper	Galena pubens	<1	2	25	
	5	Solanum prinophyllum		<1	15		
	X	Crofton Weed	Ageratina adenophora	[illegible]	50		
	X	Verbena bonariensis		<1	3		
	X	Bidens pilosa		<1	20		
	6	Dichondra repens		<1	80		

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: (<1%see explanatory notes) 1,2,3,4,5,10,15,20,25,30,35, etc. crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 (>1000 see explanatory notes)

10 x 40

6 Natives

12 Exotics

EPS

Appendix 6

BioBanking Credit Report

Biodiversity credit report

This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 15/05/2018 Time: 1:19:48PM Calculator version: v4.0

Major Project details

Proposal ID:	0158/2016/3898MP
Proposal name:	Belford to Golden Highway
Proposal address:	New England Highway Belford NSW 2335
Proponent name:	Roads and Maritime Services
Proponent address:	Level 1 59 Darby Street Newcastle NSW 2300
Proponent phone:	02 4924 0630
Assessor name:	Deborah Landenberger
Assessor address:	9 Yacaaba Street Nelson Bay NSW 2315
Assessor phone:	02 4981 1600
Assessor accreditation:	0158

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter	11.88	559.56
Total	11.88	560

Credit profiles

1. Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter, (HU815)

Number of ecosystem credits created	87
IBRA sub-region	Hunter

Offset options - Plant Community types	Offset options - IBRA sub-regions
Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter, (HU815)	Hunter and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter, (HU815)

Number of ecosystem credits created	473
IBRA sub-region	Hunter

Offset options - Plant Community types	Offset options - IBRA sub-regions
Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter, (HU815)	Hunter and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Summary of species credits required

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Squirrel Glider	Petaurus norfolcensis	11.88	261

Appendix E

Updated CHAR

Removed for confidentiality

Appendix F

Supplementary noise assessment

ARUP

Subject	Update to Review of Environmental Factors - Noise and Vibration		
Date	25 June 2018	**Job No/Ref**	245608

1 Introduction

This technical note is provided to summarise amendment to the noise and vibration assessment carried out as part of the Review of Environmental Factors (REF) for the Belford to Golden Highway Project (B2GH Noise and Vibration Assessment Report_R02, 17 January 2017). The revised assessment incorporates analysis of potential changes in noise impact due to the modified concept design, including:

- Reassessment of operational road traffic noise impacts based on modified concept design and traffic data
- Analysis of change in maximum noise level events in accordance with Practice Note iii of the RTA Environmental Noise Management Manual (ENMM)
- Qualitative analysis of construction noise impacts due to the modified concept design, including the installation of a steel fibre concrete pavement roundabout at the Golden Highway.

The following sections summarise results of each stage of analysis.

2 Operational road traffic noise

The validated project SoundPLAN model was updated to incorporate:

- Geometrical changes in design alignment; and
- Updated Build and No-Build road traffic figures

The traffic figures used for acoustic modelling are provided in Table 1 for reference.

Table 1: Revised traffic volumes used in revised acoustic modelling

Road Section	Direction	Time period	Vehicle Type	Year of opening (2021)				Design year (2031)				Speed Limit (No build)	Speed Limit (Build)
				'No Build' scenario		'Build' scenario		'No Build' scenario		'Build' scenario			
				Volume	%	Volume	%	Volume	%	Volume	%		
New England Highway - East of Golden Highway	Westbound	Daytime 7am-10pm	LV	9284	91%	9575	91%	11129	93%	11206	91%	80/ 100	100
			HV	935	9%	958	9%	883	7%	1120	9%		
			Total	10219	100%	10533	100%	12012	100%	12326	100%		
		Night-time 10pm-7am	LV	3948	90%	3958	91%	4825	94%	4652	91%		
			HV	417	10%	411	9%	305	6%	483	9%		
			Total	4365	100%	4370	100%	5131	100%	5135	100%		
	Eastbound	Daytime 7am-10pm	LV	12722	91%	13015	91%	14958	91%	15252	91%	100	80/100
			HV	1240	9%	1260	9%	1453	9%	1473	9%		
			Total	13962	100%	14276	100%	16411	100%	16725	100%		
		Night-time 10pm-7am	LV	1165	90%	1176	90%	1370	90%	1382	90%		
			HV	135	10%	134	10%	158	10%	157	10%		
			Total	1300	100%	1310	100%	1528	100%	1538	100%		
	Eastbound (on-ramp)	Daytime 7am-10pm	LV	0	0%	4113	91%	0	0%	4759	91%	N/A	70/80
			HV	0	0%	407	9%	0	0%	471	9%		
			Total	0	0%	4520	100%	0	0%	5230	100%		
		Night-time	LV	0	0%	1318	88%	0	0%	1547	88%		
			HV	0	0%	176	12%	0	0%	207	12%		

Road Section	Direction	Time period	Vehicle Type	Year of opening (2021)				Design year (2031)				Speed Limit (No build)	Speed Limit (Build)
				'No Build' scenario		'Build' scenario		'No Build' scenario		'Build' scenario			
				Volume	%	Volume	%	Volume	%	Volume	%		
		10pm-7am	Total	0	0%	1494	100%	0	0%	1754	100%		
New England Highway - North of Golden Highway	Northbound	Daytime 7am-10pm	LV	7334	90%	7734	90%	8890	93%	9025	90%	80/ 100	70/100
			HV	802	10%	845	10%	674	7%	982	10%		
			Total	8136	100%	8579	100%	9564	100%	10007	100%		
		Night-time 10pm-7am	LV	2413	89%	2439	89%	3015	94%	2864	89%		
			HV	304	11%	307	11%	180	6%	359	11%		
			Total	2718	100%	2746	100%	3195	100%	3223	100%		
	Southbound	Daytime 7am-10pm	LV	9953	91%	10363	91%	11705	91%	12116	91%	100	100
			HV	963	9%	996	9%	1125	9%	1158	9%		
			Total	10916	100%	11359	100%	12831	100%	13274	100%		
		Night-time 10pm-7am	LV	931	90%	943	91%	1095	90%	1107	91%		
			HV	99	10%	99	9%	115	10%	115	9%		
			Total	1029	100%	1042	100%	1210	100%	1222	100%		
Golden Highway	Westbound	Daytime 7am-10pm	LV	2597	91%	3059	91%	3057	91%	3519	91%	70	70/80
			HV	253	9%	290	9%	293	9%	330	9%		
			Total	2850	100%	3349	100%	3350	100%	3849	100%		
		Night-time 10pm-7am	LV	2660	93%	2695	93%	3129	93%	3165	93%		
			HV	203	7%	199	7%	236	7%	232	7%		
			Total	2863	100%	2894	100%	3365	100%	3397	100%		
	Eastbound		LV	3811	90%	4328	91%	4485	90%	4952	90%	70	80

Road Section	Direction	Time period	Vehicle Type	Year of opening (2021)				Design year (2031)				Speed Limit (No build)	Speed Limit (Build)
				'No Build' scenario		'Build' scenario		'No Build' scenario		'Build' scenario			
				Volume	%	Volume	%	Volume	%	Volume	%		
		Daytime 7am-10pm	HV	429	10%	410	9%	499	10%	530	10%		
			Total	4240	100%	4738	100%	4983	100%	5482	100%		
		Night-time 10pm-7am	LV	1336	86%	1459	93%	1573	86%	1603	87%		
			HV	217	14%	108	7%	252	14%	236	13%		
			Total	1553	100%	1566	100%	1825	100%	1839	100%		

LV = light vehicles; HV = heavy vehicles

Predicted operational noise levels have been recalculated based on the modified concept design and the traffic figures shown in Table 1. The results are summarised in Table 2, along with the change in predicted noise levels compared to a 'no build' scenario. The receivers assessed are consistent with the receivers considered as part of the REF (see Section 6.7.1 of the REF).

Table 2: Predicted road traffic noise levels on the Year of Opening and Design Year

Receiver ID	Opening year, dB(A)				Design year, dB(A)				NCG criteria, dB(A)		Are the -NCG 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	YES	YES	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	YES	-0.1	-0.2	0.1	0.1

Predicted noise levels are above the NCG criteria at the two noise-sensitive receiver locations closest to the New England Highway (R5 and R7), however the relative increase in noise level between Build and No-Build is <2 dB, therefore no receiver locations qualify for consideration of additional noise mitigation. This is consistent with the outcomes of the REF assessment.

3 Maximum noise level assessment

3.1 Maximum noise level criteria

Maximum noise events, including compression braking, acceleration and deceleration, are assessed against the provisions of Practice Note (iii) of the 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.

3.2 Maximum noise level analysis

The installation of a roundabout immediately east of the railway line on the Golden Highway has the potential to alter maximum noise level events in the proximity of residential receivers R1 and R2 due to vehicles approaching the roundabout. The occurrence of compression braking, acceleration and deceleration is likely to already exist on the approach to the New England Highway interchange, however installation of the roundabout may bring maximum noise impacts closer to residential receivers.

An analysis was undertaken using worst case sound power levels for trucks accelerating, decelerating and engaging compression brakes in order to compare potential change in maximum noise level impacts at the potentially affected receivers R1 and R2. A summary of predicted noise levels is presented in Table 3.

Table 3: Maximum noise level event predictions

Scenario	Distance to nearest affected residential receiver (m)	Event	Sound power level (dBA)	Predicted sound pressure level (dBA)
Receiver 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
Receiver 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 impacts 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 3.

At both receivers R1 and R2, compression braking events are likely to be in exceedance of criteria for awakening events as summarised in Section 3.1 but below levels that are likely to significantly affect health and wellbeing. For acceleration events, internal noise levels at R1 fall within the awakening reaction criteria range, and internal noise levels at R2 marginally exceed awakening criteria by up to 2 dB. Internal noise levels at both receivers may therefore result in awakening of receivers. Deceleration events are expected to result in noise levels below awakening criteria within receivers R1 and R2.

4 Construction noise analysis

A qualitative analysis of potential noise impacts due to the modified concept design, including the installation of a steel fibre concrete pavement roundabout on the Golden Highway is required. Detailed constructability information for the proposed roundabout is not available at the time of writing this note. However based on some general assumptions on the differences in construction between the design assessed for the REF and the modified concept design, it is not expected that the overall noise and vibration impacts will alter significantly from the quantitative assessment undertaken as part of the REF. Furthermore, the mitigation strategies summarised in the REF are still considered relevant to amelioration of any noise and vibration impacts associated with the modified concept design. This includes preparation of a Noise and Vibration Management Plan (NVMP) as part of the Construction Environmental Management Plan (CEMP) for the project which identifies all potential significant noise and vibration generating activities and measures to be implemented during construction to minimise noise and vibration impacts.

Appendix G

Landscape character and visual impacts review

ARUP

Subject Landscape and Visual Summary

Date 8 June 2018 **Job No/Ref** 245608

1 Background

Roads and Maritime Services (Roads and Maritime) proposes to upgrade the New England Highway between Belford and the Golden Highway. A Landscape and Visual Impact Assessment (LCVIA) was prepared to support the Review of Environmental Factors (REF) for the proposal. The REF was placed on public display between 30 June 2017 and 28 July 2017, and as a result of submissions received, design refinements have been made to the proposal. This technical memo documents changes to the LCVIA associated with the modified proposal.

1.1 Methodology

1.1.1 Review of modified concept design

The modified proposal has been analysed to document the design changes that will inform the landscape and visual assessment review.

The key design changes identified in terms of landscape and visual include:

New England Highway

- Central median width reduced from 12 m to 8.5 m
- A flatter cut slope which responds more sensitively to the low lying topography
- Introduction of a wire rope barrier adding additional road furniture within a rural context.

Flyover alignment

- The vertical incline of the proposed flyover bridge would be accentuated in comparison to the design assessed in the REF. The horizontal alignment skew is anticipated to increase in comparison to the REF design
- Tighter radius and civil geometry reducing extent of land acquisition
- Impact on dam.

Roundabout

- Additional civil alignment works and introduction of a roundabout within the rural context.
- The realigned abattoir access would result in an enlarged footprint of road infrastructure at this location and additional vegetation removal.

1.1.2 Additional assessment

The key design changes have been assessed against the Landscape Character Zones (LCZ) and viewpoints identified in the LCVIA prepared for the REF (see Appendix J of the REF). Impacts have been evaluated using the Roads and Maritime Landscape Character and Visual Impact Grading Matrix (2013).

The design changes have also been assessed against the urban design principles and objectives developed for the proposal (see Section 2.3.2 of the REF).

2 Assessment

2.1 Landscape character assessment

Refer to *Table 6-39: Landscape impacts during operation* in the REF.

2.1.1 LCZ 1 | Wooded Edge

- The addition of a roundabout and removal of the u-turn facility to the north of the Golden Highway is not anticipated to alter the landscape impact for this character zone
- Consistent with the REF, the modified proposal would result in the removal of the Whittingham rest area, introduction of additional road infrastructure in the form of additional lanes, earthworks and flyover structure
- Consistent with the REF, the landscape impacts associated with the modified proposal for LCZ 1 would remain as **low-moderate adverse.**

2.1.2 LCZ 2 | Floodplain

- Consistent with the REF, the introduction of a flyover structure on the embankment would contrast with the low lying floodplain landscape
- The tighter radius and civil geometry would reduce the extent of land acquisition in comparison to the REF design, consolidating the road infrastructure and minimising impact on agricultural land
- Realignment of the flyover would impact on a local farming dam. The dam is considered to contribute to the character of the floodplain landscape
- Additional vegetation clearance would occur due to the realigned abattoir access
- On balance and consistent with the REF, the landscape impacts associated with the modified proposal for LCZ 2 would remain as **moderate adverse.**

2.1.3 LCZ 3 | Spotted Gum Forest

- Consistent with the REF design, the proposal would result in localised vegetation removal along the northern edge of the New England Highway and an incremental enlargement of the road infrastructure in this character area, including lighting and signage
- Consistent with the REF design, the landscape impacts associated with the modified proposal for LCZ 3 would remain as **low-moderate adverse.**

2.2 Visual assessment

Refer to *Table 6-40: Visual impacts during operation* in the REF.

2.2.1 Viewpoint 1 - United Petroleum service station

Consistent with the REF design, the introduction of an elevated flyover bridge structure, lighting columns, signage and VMS would result in a **moderate adverse** impact.

2.2.2 Viewpoint 2 - Abattoir

The addition of a roundabout and removal of the u-turn facility is not anticipated to alter the visual impact associated with this viewpoint.

Realignment of the abattoir access would result in an enlarged footprint of road infrastructure at this location, which would be emphasised by the removal of existing vegetation. However, the magnitude of change is considered to remain as 'moderate', consistent with the REF and therefore remain as a **low-moderate adverse** impact.

2.2.3 Viewpoint 3 - Road users of the existing Golden Highway

Consistent with the REF design, the introduction of an elevated flyover bridge structure, lighting columns, signage and VMS would result in a **moderate adverse** impact.

2.2.4 Viewpoint 4 - Residential property 3193 New England Highway

Consistent with the REF design, localised vegetation removal to the east and introduction of lighting columns and signage are anticipated to result in a low magnitude of change, resulting in a **low-moderate adverse** visual impact.

2.2.5 Viewpoint 5 | Road users of the existing New England Highway

Consistent with the REF design, the introduction of the flyover bridge and associated infrastructure would impinge on the distant views to the north and contrast with the low lying landform, resulting in a high magnitude of change and a **moderate adverse** visual impact.

2.3 Summary of Urban design principles and objectives

The urban design strategy included within the REF 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. Key considerations during the concept design development are outlined below:

Abutments

The Belford to Golden Highway flyover proposes spill-through abutments in response to the gas mains and future maintenance requirements. The rock proposed for the spill-through abutments will complement the local landscape, and subject to durability testing, the local underlying geology to assist with relating the proposed structure to the existing context.

Parapets

The parapet walls will be continuous, single plane unadorned surface, with a generous overlap at abutments. The colour palette of the parapet walls will work to respond to the rock colour of the spill through abutments.

Piers and superstructure

Piers have been positioned to allow views between the abutments and the piers and ensure slightlines requirements are achieved. The bridge design considerations (including location of gas main and gas main access, drainage arrangements, cut and fill) limited opportunities for the Belford to Golden Highway to relate to the existing bridge structures in the area, specifically the unique colour banding of the retaining walls associated with the Hunter Expressway bridge.

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

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

Appendix H

Consideration of clause 228(2) factors and matters of national environmental significance

Clause 228(2) Checklist

In addition to the requirements of the *Is an EIS required?* guideline (DUAP 1995/1996) and the *Roads and Related Facilities EIS Guideline* (DUAP 1996) as detailed in the REF, the following factors, listed in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000*, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
Any environmental impact on a community?	
Construction of the proposal would have a number of environmental impacts. The local community would experience changing traffic conditions, an altered visual amenity and noise and air quality impacts.	Short-term, minor, negative impacts
Aboriginal archaeological sites would be impacted by the proposal, some of which are of moderate scientific value. Protection of sites outside of the proposal area and salvage of Aboriginal objects prior to construction under the provision of a project AHIP would help to conserve the science associated with these sites.	Long-term, minor negative impacts
The proposal would result in the loss of around 13.06 hectares of threatened vegetation under the TSC/BC Act and 9.66 hectares of threatened vegetation under the EPBC Act, as well as reduce the habitat available for a range of birds and mammals. Of the vegetation to be removed under the EPBC Act, 9.57 ha is listed as Critically Endangered, which is considered to be a significant impact. A biodiversity offset strategy would help to offset this loss.	Long-term, major, negative impacts
The proposal would reduce existing congestion and delays experienced at the New England Highway / Golden Highway intersection, improve road safety and provide for effective network performance in consideration of future traffic forecasts.	Long-term, major, postive impacts
Any transformation of a locality?	
The proposal would have some minor visual, air and noise amenity impacts during construction. The management measures proposed in this submissions report would help reduce these impacts.	Short-term, minor, negative impacts
The proposal would result in the permanent removal of around 43.09 hectares of vegetation. Around 18 hectares of land zoned Heavy Industrial as part of the Whittingham Industrial Area would be acquired and the scale and dominance of the road corridor in the locality would be increased through construction of the flyover and duplication of the New England Highway. The Whittingham rest area would also be removed by the project.	Long-term, minor, negative impacts
Any environmental impact on the ecosystems of the locality?	
The proposal would result in the loss of around 13.06 hectares of threatened vegetation under the TSC/BC Act and 9.66 hectares of threatened vegetation under the EPBC Act. Of the vegetation to be removed under the	Long-term, major, negative impacts

Factor	Impact
EPBC Act, 9.57 ha is listed as Critically Endangered, which is considered to be a significant impact. The proposal would also reduce habitat for a range of birds and mammals, including threatened species, in the locality and impact habitat connectivity. The mitigation measures identified, including a biodiversity offset strategy and provision of an aerial fauna crossing, would help to offset this loss and conserve the diversity of flora and fauna and sustainability of ecosystems.	
Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? The proposal would have some temporary adverse impacts on local aesthetic values during construction. The proposal would result in the loss of around 13.06 hectares of threatened vegetation under the TSC/BC Act and 9.66 hectares of threatened vegetation under the EPBC Act, as well as reduce the habitat available for a range of birds and mammals. Of the vegetation to be removed under the EPBC Act, 9.57 ha is listed as Critically Endangered, which is considered to be a significant impact. A biodiversity offset strategy would help to offset this loss. The Whittingham rest area would also be removed by the project, however other light and heavy vehicle rest areas are located around 10 kilometres away.	Short-term, minor, negative impacts Long-term, major, negative impacts Long-term, minor, negative impacts
Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? The proposal would result in impact to Aboriginal archaeological sites of moderate scientific value. However, protection of sites outside of the proposal area and salvage of Aboriginal objects prior to construction would help to conserve the science associated with these sites.	Long-term, minor, negative impacts
Any impact on the habitat of protected fauna (within the meaning of the National Parks and Wildlife Act 1974)? The proposal would remove around 43.09 hectares of habitat for a range of birds and mammals, including the Squirrel Glider listed as threatened under the TSC/BC Act. However, this is considered unlikely to result in an adverse effect on the lifecycle of the Squirrel Glider such that a viable local population is placed at risk of extinction. This is primarily due to the extensive habitat that extends to the north and south of the proposal. Mitigation measures, such as the construction of an aerial fauna crossing, would help mitigate any impacts to the lifecycle of the Squirrel Glider.	Long-term, minor, negative impacts
Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? The proposal would remove around 43.09 hectares of habitat for a range of birds and mammals, however it is considered unlikely that the proposal	Long-term, minor, negative impacts

Factor	Impact
would have an adverse effect on the lifecycle of any of the six threatened species recorded in the study area. This is primarily due to the extensive habitat that extends to the north and south of the proposal and th mitigation measures proposed.	
Any long-term effects on the environment? The proposal would impact Aboriginal archaeological sites of moderate scientific value. However, salvage of Aboriginal objects is prior to construction would help to conserve the science associated with these sites. The proposal would also result in the loss of around 13.06 hectares of threatened vegetation under the TSC/BC Act and 9.66 hectares of threatened vegetation under the EPBC Act, as well as reduce the habitat available for a range of birds and mammals. Of the vegetation to be removed under the EPBC Act, 9.57 ha is listed as Critically Endangered, which is considered to be a significant impact. A biodiversity offset strategy would help to offset this loss.	Long-term, minor, negative impacts Long-term, major, negative impacts
Any degradation of the quality of the environment? The proposal would have temporary environmental impacts during construction associated with changed traffic conditions, noise and air emissions and visual amenity impacts. These impacts are anticipated to be minor and not likely to result in degradation of the quality of the environment.	Short-term, minor, negative impacts
Any risk to the safety of the environment? During construction, the proposal may require the transportation and storage of hazardous or contaminated materials in limited quantities. These materials would be managed in accordance with the mitigation measures proposed in this submissions report. The potential risk to the safety of the environment would be minor and limited to the construction period. The proposal would improve the current road safety, especially at the New England Highway / Golden Highway intersection.	Short-term, minor, negative impacts Long-term, major, positive impacts
Any reduction in the range of beneficial uses of the environment? The proposal requires acquisition of around 18 hectares of land zoned as Heavy Industrial as part of the Whittingham Industrial Area. This would reduce the land available for development as part of an industrial estate. However, the proposal would also contribute to improved accessibility to this precinct. The Whittingham rest area would also be removed by the project, however other light and heavy vehicle rest areas are located around 10 kilometres away.	Long-term, minor, negative and positive impacts
Any pollution of the environment? Construction of the proposal would result in dust generation and air and noise emissions from machinery and construction vehicles. The management measures proposed in this submissions report would help	Short-term, minor, negative impacts

Factor	Impact
reduce these impacts. During operation, pollution would largely be consistent with the current use.	 Nil
Any environmental problems associated with the disposal of waste? During construction, a number of waste streams would be produced by the proposal. Waste would be classified to identify suitable recycling and safe disposal methods in accordance with Roads and Maritime *Environmental Procedure – Management of Wastes on Roads and Maritime Services Land* and the requirements of the Waste Classification Guidelines. During operation, waste generation is expected to be minimal and consistent with the current use.	 Short-term, minor, negative impacts Nil
Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? The proposal is unlikely to affect any resources that are, or are likely to become, in short supply.	 Nil
Any cumulative environmental effect with other existing or likely future activities? There is potential for adverse cumulative impacts to occur during construction of the project, including traffic, noise, air quality and visual amenity impacts. These impacts would be short-term and manageable. Further, all cumulative impacts can be justified by the long-term positive impacts of the proposal.	 Short-term, minor, negative impacts
Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The proposal would not impact coastal processes or coastal hazards, including those under projected climate change conditions.	 Nil

Matters of National Environmental Significance

Under the environmental assessment provisions of the *Environment Protection and Biodiversity Conservation Act 1999*, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of the Environment.

A referral is not required for proposed actions that may affect nationally listed threatened species, populations, endangered ecological communities and migratory species. Impacts on these matters are still assessed as part of the REF and Submissions Report in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor	**Impact**
Any impact on a World Heritage property? The proposal would not impact any World Heritage properties.	Nil
Any impact on a National Heritage place? The proposal would not impact any National Heritage places.	Nil
Any impact on a wetland of international importance? The proposal would not impact any wetlands of international importance.	Nil
Any impact on a listed threatened species or communities? The proposal would result in the clearing of around 9.66 hectares of vegetation listed as an endangered ecological community under the EPBC Act. Of this, 9.57 ha is listed as Critically Endangered, which is considered to be a significant impact. This submission report has been prepared to meet the requirements of the EPBC Act strategic assessment approval for Roads and Maritime Division 5.1 road activities. As such, A biodiversity offset strategy would be prepared and implemented to help offset this loss. Therefore, a referral to the Australian Department of the Environment is not required.	Significant
Any impacts on listed migratory species? The White-throated Needletail migratory species was recorded in the study area and habitat considered potential for the other migratory species would be removed by the proposal. However, it is considered that the proposal would not result in any significant impact to migratory species.	Minor
Any impact on a Commonwealth marine area? The proposal would not impact a Commonwealth marine area.	Nil
Does the proposal involve a nuclear action (including uranium mining)? The proposal does not involve nuclear action.	Nil

Factor	Impact
Additionally, any impact (direct or indirect) on Commonwealth land? The proposal would not impact on Commonwealth land.	Nil