APPENDIX F.1 UPDATED BDAR

Hills of Gold Wind Farm

Biodiversity Development Assessment Report

FINAL REPORT Version 10.1

Prepared for Hills of Gold Wind Farm Pty Ltd

24 January 2023

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- Jamie Chivers and Liam Edgeworth of Someva as part of targeted agency and community responses and associated targeted project redesign.
- Meredith Anderson of ENGIE for confirmation of project mitigation commitments.
- Matt Davis and Chani Wheeler of Arup.
- Neville Rosengren of Environmental Geosurveys Pty Ltd.
- Department of the Environment and Energy for access to the Protected Matters Search Tool of the Australian Government.
- NSW Environment, Energy and Science Group for access to the BioNet Atlas of NSW Wildlife.
- BirdLife Australia for access to the New Atlas of Australian Birds 1998-2013.
- NSW Department of Primary Industries for access to indicative mapping of freshwater threatened species and fish populations.

Biosis staff involved in this project were:

- Mark Venosta, Ian Smales and Felicity Williams (technical bird and bat inputs)
- Lauren Harley (GIS and mapping)

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	Callan Wharfe	Mitch Palmer	Mitch Palmer

Forward, certification and declarations

Biosis commenced control of this document and assessment in September 2021. Prior to Biosis taking custodianship, earlier drafts of this updated Biodiversity Development Assessment Report (updated BDAR) were prepared by Arup.

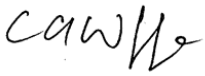
Prior to submission of the original Biodiversity Development Assessment Report (original BDAR) with the Project Environmental Impact Statement (EIS), Arup acted as lead biodiversity consultant and Accredited BAM Assessor (Matt Davis BAAS18090) for the project. Biosis undertook the fauna component of the field surveys, provided field support for flora surveys and vegetation mapping of the transmission line corridor, haul route and other ancillary investigation areas, and provided input into the fauna components of the BDAR only at this point.

Following Matt Davis' departure from Arup, Biosis assumed the role of finalising this updated BDAR. As such the role of Accredited BAM Assessor has been split between Matt Davis (BAAS18090) for development of the original BDAR, and Callan Wharfe (BAAS18138) and Mitch Palmer (BAAS17051) for updates undertaken in developing this updated BDAR, including aligning the BDAR with BAM 2020 requirements as part of the Response to Submission and Amendment Report process.

We certify that this report has been prepared on the basis of the requirements of, and information provided under, the Biodiversity Assessment Method (DPIE 2020) and s6.15 of the *Biodiversity Conservation Act 2016*.

In preparing this assessment we have acted in accordance with the Accredited BAM Assessor Code of Conduct.

We declare that we have considered the circumstances and there is no actual, perceived or potential conflict of interest.

Signature: Callan Wharfe 

Date: 24/01/2023

BAM Assessor Accreditation Number: BAAS181338

Signature: Mitch Palmer 

Date: 24/01/2023

BAM Assessor Accreditation Number: BAAS17051

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Glossary

AGL	Above ground level
Amendment Report	The Amendment Report prepared for the Project following exhibition of the EIS.
Assessment Area	Is the Assessment area for the proposal and includes the development footprint plus a 1500m landscape assessment buffer
BAM	Biodiversity Assessment Method 2020
BBAMP	Bird and Bat Adaptive Management Plan
BC Act	*Biodiversity Conservation Act 2016*
BCD	Biodiversity Conservation Division
BDAR	Biodiversity Development Assessment Report
BoM	Bureau of Meteorology
BOS	Biodiversity Offsets Scheme
BVM	Biodiversity Values Map
DAWE	Department of Agriculture, Water and Environment (now, DCCEEW)
DCCEEW	Department of Climate Change, Energy, the Environment and Water (formally DAWE)
Development Corridor	The development corridor is the broader investigation area used to inform the design layout and impact mitigation. The development corridor has the same meaning as 'subject land' as defined by the BAM, and has undergone ground-validated assessment as described in this BDAR. Figure 2 provides an overview of this area.
Development footprint	Is the area in which physical disturbance has been assessed within the Subject land to determine direct and indirect impacts as a result of the proposed Project. It includes permanent and temporary development footprint.
DNG	Derived Native Grassland
DPE	Department of Planning and Environment
EES	Environment, Energy and Science Group in the Department of Planning and Environment
EIS	The Environmental Impact Statement prepared and exhibited for the Project dated 18 October 2020.
EMS	Environmental Management Strategy
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FM Act	*Fisheries Management Act 1994*
GDEs	Groundwater Dependent Ecosystems
IBRA	Interim Biogeographic Regionalisation for Australia

Landscape assessment buffer	The development footprint plus a 1500m buffer.
LGAs	Local Government Areas
OEH	Office of Environment and Heritage
Permanent development footprint	This is the area of land that will be subject to permanent alteration as a result of installation and operation of Project infrastructure
PCT	Plant Community Type
RTS	The Response to Submissions Report prepared for the Project.
SEAR's	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
Subject land	The area to which the BAM has been applied, assessed and studied
TEC	Threatened Ecological Community
Temporary Development Footprint	This is the area of land that will be temporarily disturbed during construction of the project, and rehabilitated following construction in order to minimise permanent impacts to biodiversity. Mitigation measures in these areas are to include revegetation, spreading mulched or cleared vegetation and installing native grass seed using locally occurring species.
WTG	Wind turbine generator

Executive summary

Project description

Hills of Gold Wind Farm (the Proponent, previously Wind Energy Partners), a 100% owned subsidiary of ENGIE Australia, proposes to develop a wind farm on the ridgeline between Hanging Rock and Crawney Pass, approximately 60 kilometres south-east of Tamworth (the project).

The project is State Significant Development and will be assessed under Part 4 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act). A referral under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) was submitted to the former Commonwealth Department of Agriculture, Water, and the Environment, now the Department of Climate Change, Energy, Environment and Water (DCCEEW). The Commonwealth Minister for the Environment declared the project to be a controlled project which requires assessment under the provisions of the EPBC Act. This means it is being bilaterally assessed under State and Commonwealth legislation in accordance with the *NSW Bilateral Agreement relating to environmental assessment 2015*.

The project will consist of the following:

- Up to 64 wind turbine generators (WTGs), each with:
  - A generating capacity of approximately 6 MW.
  - Three blades mounted to a rotor hub. In turn the hub will be mounted on a tubular steel tower. This will provide a total height from the tip of the blade to the ground of 232 metres.
  - A gearbox and generator assembly housed in a nacelle.
  - Adjacent hardstand areas for use as crane pads and laydown areas. These will be initially used to help build the WTGs. They will remain in place to allow for ongoing maintenance.
- Decommissioning of three current monitoring masts and installation of up to 10 new monitoring masts for power testing (the up to five previously proposed in the EIS and an additional five now proposed). Five of the new monitoring masts would be located close to a WTG location and five would be placed on the same location as a WTG prior to its installation and removed shortly before WTG installation. They would have a maximum height of approximately 150 m AGL, equivalent to the hub height of the installed WTGs. The exact number and locations of the monitoring masts would be defined at the detailed design stage. These masts assist in verifying the performance of the WTGs during operation of the Project.
- A 330 kV electrical substation, including transformers, insulators, switchyard and other ancillary equipment located between WTGs 20 and 26 or with an option north west of WTG 5 and 6.
- An operations and maintenance facility located either adjacent to the BESS / substation, or within the compound area between WTGs 55 and 56.
- A battery energy storage system (BESS) of approximately 100 MW/400 MWh (4 hours of storage of 100 MW of power) adjacent to the substation.
- Aboveground and underground 33 kV electrical reticulation and fibre optic cabling connecting the WTGs to the onsite substation (following site access tracks where practicable) (connection lines).

- A 330 kV single circuit twin conductor overhead transmission line (transmission line) to connect the onsite substation to the existing 330 kV TransGrid Liddell to Tamworth overhead transmission line network, located approximately 24 km west of the substation (based on existing substation location).
- A switching station to connect the Project to the 330 kV TransGrid Liddell to Tamworth line and enable the Project to connect to the gird. The switching station would also be located approximately 24 km west of the substation, or approximately 13.5 km from the WTG Project Area (based on existing substation location).
- An internal private access road network (combined total length of approximately 40 km) connecting the WTGs and other Project infrastructure to the public road network.
- Upgrades to local roads and crossings required for the delivery, installation and maintenance of WTG components and associated materials and structures.

The following temporary elements would be required during construction of the Project:

- Temporary site buildings and facilities for construction contractors / equipment, including two construction compounds, site offices, car parking and amenities for the construction workforce.
- Two temporary concrete batching plants to supply concrete for WTG footings and substation construction works, with the option to use any construction laydown area with the exception of the laydown areas along transport route proposed.
- Expansion of an existing Forestry Corporation of New South Wales (FCNSW) quarry within the Nundle State Forest.
- Earthworks for access roads, WTG platforms and foundations, potentially including controlled blasting in certain areas.
- Potentially rock crushing facilities for the generation of suitable aggregates for concrete batching and/or sized rock for access road and hardstand construction.
- Up to seven laydown areas for the temporary storage of construction materials, plant, and equipment construction.
- External water supply for concrete batching and construction activities.
- The transport, storage and handling of fuels, oils and other hazardous materials for construction and operation of wind farm infrastructure.
- Beneficial reuse of materials won from the development footprint during cut and fill and WTG foundation excavation for use in roads, hardstands and foundation material.

The Project also includes the subdivision of land to create two new lots for:

- The substation, Operations & Maintenance (O&M) facility and battery storage.
- The switchyard.

The final project layout, project infrastructure configuration, and development footprint presented in the Response to Submissions (RTS) and Amendment Reports for the Project were developed in consultation with project ecologists, the Proponent, and the NSW Biodiversity, Conservation and Science Directorate (BCS) and have been further refined in response to the issues raised, with a strong focus on further minimising the Project's overall biodiversity impact. In summary, the refinements and amendments made to the Project in consultation with ecologists and BCS since the original 2020 BDAR was prepared include:

- Reducing the number of WTGs from 97 (initial pre-EIS design), to 70 for EIS submission, to 65 for the initial amendment report, to 64 for the updated amendment report (current design) to reduce biodiversity impacts following further detailed investigations.
- Increasing spacing of WTGs in key areas across the subject land such as adjacent to Ben Halls Gap Nature Reserve to minimise the potential bird and bat collision and impacts associated with barrier effect.
- Layout changes to maximise separation of WTGs from sensitive habitats such as potential microbat roosts, hollow-bearing trees and areas of higher condition intact vegetation.
- Optimising wind farm, transmission line and access road layouts to further avoid ecologically sensitive areas based on additional surveys and improved mapping.
- Defining construction and engineering methods to reduce the construction program and amount of earthworks.
- Mapping and prioritising the use of existing access tracks to reduce the amount of vegetation clearance.
- Opting to use the transmission line corridor with the lowest ecological value of the seven options investigated in 2018.
- Undertaking a focussed study on potential ecological impacts along the transmission line corridor associated with the spanning of deep valleys by overhead power cables as part of the ongoing detailed design of the transmission line.

Recent design revisions relating to the removal of the previously proposed upgrades to the Devil's Elbow section of Barry Road, and the inclusion of a second option for the location of the BESS / batching plant / Substation location, has resulted in an increased level of impacts assessed in this BDAR compared to the March 2022 version of the BDAR. The impact assessed herein are however comprehensively refined, minimised, and remain lower that those included in the original 2020 BDAR. The proponent has committed to continuing to progress design optimisation in a detailed design process which is expected to reduce impacts from that presented in this BDAR.

More detail on the amended design and its impact on the assessment of biodiversity impacts is provided below.

Amended design and addressing submissions and BCS requests for further information

The following design amendments were made following exhibition of the EIS between December 2020 and January 2021 (Table 1), with further amendments made following feedback and consultation with BCS and Tamworth Council between March and September 2022. The reduced impact of these changes has been assessed in this updated Biodiversity Development Assessment Report (BDAR). The locations of the amened designs and a summary of the reduction in impacts are presented in Figure 1 below.

Table 1 Design amendments and impact / benefit

Project Amendment	Description	Impact/benefit
Development footprint revision	Exhibited project footprint (EIS) comprised:	Substantial reduction in direct impacts to biodiversity values have been realised through detailed design revision and

Project Amendment	Description	Impact/benefit
	• Permanent Development Footprint: approximately 242 ha • Temporary Development Footprint: approximately 271 ha • Total development footprint approximately 513 ha. Design revisions have resulted in the amended project footprint now comprising: • Permanent Development Footprint: approximately 144.6 ha • Temporary Development Footprint: approximately 302.4 ha • Total development footprint approximately 447.1 ha	footprint/infrastructure amendments. This is combined with a material reduction in the indirect impacts arising from the removal and relocation of turbines as well as a reduction in bulk earthworks and associated project infrastructure.
Removal of WP1	WP1 was the closest turbine to the Crawney Pass National Park and its removal reduces biodiversity impacts, native vegetation removal and the requirement for bulk earthworks. The road required to access the turbine has also been removed, further benefitting biodiversity values in that location.	WP1 was considered a Moderate Risk turbine and its removal benefits locally occurring threatened and non-threatened fauna species including microbats, Koala, Greater Glider, as well as to approximately 2ha of high condition PCT 1194 vegetation. Removal of this turbine location from the project design has the direct benefit of reducing native vegetation removal, but also reduces potential connectivity impacts as the turbine was acting as an outlier on the south-western extent of the array, and the turbines now occur in a more linear arrangement in that location.
Removal of WP19	WP19 has been removed reducing impacts to biodiversity values in the centre of the wind farm. Its removal will reduce the earthworks and vegetation clearance needed to install the turbine, supporting hardstand area and access road.	The removal of WP19 results in an increase separation gap from 1 – 1.5km between turbines in this location, to approximately 2.1km between turbine WP18 and turbines WP20-22 reducing habitat connectivity impacts in an areas of the wind farm where moderate condition habitats occur on either side of the ridgeline. The removal of WP19 also allows for an approximate 600 metre reduction of the intrusion into intact vegetation to the south of the development footprint.
Removal of WP23, 27 and 31	WP23, 27 and 31 have all been removed to reduce risk of direct and indirect impact biodiversity values including potential microbat breeding habitat, modelled potential owls breeding habitat, and intact vegetation. The removal of these turbines will reduce significant bulk earth works associated with hardstands and	All three of these turbines were assessed as high risk turbines (four assessed in total) in relation to potential impacts to biodiversity values. WP23 was considered high risk due to its occurrence as southern outlier in high condition intact native vegetation considered likely to support habitat for numerous threatened species, WP27 was located in close

Project Amendment	Description	Impact/benefit
	associated roads, and reduces the area of impact from the southern-most portion of the wind farm by 400 – 500m at each turbine location.	proximity to confirmed potential microbat breeding habitat, and WP31 occurred in proximity to modelled potential large forest owl breeding habitat. The removal of these three turbines will substantially benefit biodiversity values utilising the habitats along this southern portion of the wind farm, both directly through a reduction in vegetation removal, and indirectly through a reduction in potential collision risk, breeding habitat disturbance, and connectivity impacts.
Removal of WP41 and relocation of WP35 – WP47	WP41 has been removed to allow for increased spacing of turbines adjacent to Ben Halls Gap Nature Reserve (WP35 – WP47) to minimise the potential for impacts associated with barrier effect adjacent to the high quality habitats withing the Nature Reserve, and to proportionally reduce the potential for collision risk across the project.	Removal of WP41 and relocation of WP35 – WP47 allowed for turbines adjacent to BHGNR to achieve a minimum 400 metre spacing (WP38-WP47), and create a 1.2 kilometre east-west corridor between turbines WP40 and WP42. This project update is considered to substantially reduce the potential for barrier effect (barriers to species movements) adjacent to BHGNR, considered a higher risk areas, and across the subject land more broadly.
Reorientation of WP2 hardstand	The hardstand for WP2 has been reorientated such that it now occurs largely on exotic grassland.	This reorientation complements the reduction of impacts associated with the removal of WTG 1 and reduces impacts to high condition PCT 1194 by another 0.3 ha (on top of the 1 ha reduction highlighted above from the removal of WTG 1).
Relocation of WP47	WP47 has been relocated 209 metres north east of the exhibited location. This is to reduce the extent of vegetation clearance in this location.	The relocation of WTG 47 increases buffer distance from retained native vegetation on the escarpment and reduces native vegetation clearing. This reduces impacts to biodiversity values.
Relocation of WP50	WP50 has been moved approximately 130m to the north-east to avoid indirect impacts to conformed microbat potential breeding habitat.	WTG 50 was originally assessed as a high risk turbine. The relocation of WTG 50 avoids indirect impacts to the confirmed microbat potential breeding habitat that occurs to the south-west of the turbine and hardstand location. The turbine, turbine blade and zone of disturbance are now all located well outside the 100 m BAM prescribed microbat breeding habitat buffer to further reduce potential collision risks, and potential vibration impacts during construction.
Relocation of WP4,	WP4, WP11, WP32, WP36, WP64 and	Where possible turbines were relocated such

Project Amendment	Description	Impact/benefit
WP11, WP32, WP36, WP64 and WP70	WP70 were relocated within the project layout to maximise separation between the operational turbines and hollow-bearing trees (or clusters of trees) supporting potential breeding habitat for species of threatened owls, and other habitat features which increase the potential for collision risk.	that the rotor swept area was >100 m from retained (confirmed) hollow-bearing trees, to minimise the potential for disturbance to nesting birds, should the habitat be utilised for such purposes in the future. A separation distance of 100 m is based on the BAM requirement for species polygons for threatened owls to extend 100 m (radius) from potential/confirmed nest trees. Other turbines were located to maximise the separation distance for tree canopies and other habitat features to ensure they present no more than a 'low risk' of collision.
Monitoring Masts at WTG Location prior to WTG Installation	Decommissioning of three current monitoring masts and installation of up to 10 additional monitoring masts for power testing (five previously proposed in the EIS, and five additional as part of this Amendment Report). The new monitoring masts will be located close to a turbine location with a maximum height of approximately 150 m AGL, equivalent to the hub height of the installed turbines. The additional five masts proposed will be temporary and placed on the same location as a turbine prior to its installation and removed shortly before turbine installation.	Up to 10 temporary monitoring masts are now proposed with the exact number and location being confirmed at the detailed design stage. No additional impacts will result, as the 5 new proposed monitoring masts will be located within assessed turbine footprints. The exact number and location will be defined at the detailed design stage.
Transmission Line realignment	The transmission line north of WP12 and to the east of WP2 has been realigned. This will reduce the vegetation clearance. Further analysis of opportunity to reduce clearing of native vegetation where overhead clearance is expected to be sufficient to avoid impacts.	Relocation of approximately 3 km of the transmission line corridor in this area has reduced impacts to patches of high condition native vegetation and relocated the footprint predominantly in areas of exotic grassland, further to the south and closer to the turbines. This design revision has resulted in materially reduced direct impacts to native vegetation and habits, including mapped habitat for Koala and Spotted-tailed Quoll.

Project Amendment	Description	Impact/benefit
Removal of transmission vegetation	Portions of the vegetation previously assessed to be removed for transmission line have been reassessed in a targeted study by AECOM to identify native vegetation that will remain un-impacted due to the spanning of valleys from the overhead power lines, remaining well over the height of the mature vegetation.	A reduction in the total clearing footprint will ensure an overall reduction in direct impacts to native vegetation. Portions of the vegetation previously assessed to be removed within the transmission line easement have been confirmed as able to remain based on further detailed design following a targeted study by AECOM (2021) to identify native vegetation that will remain un-impacted due to the height of the overhead power lines where they span across valleys. The lines in these areas have now been confirmed to remain well over the height of the mature vegetation, enabling the vegetation to be retained and further reducing biodiversity impacts.
Traffic Access to Project Area	Project traffic will access the development footprint via Morrisons Gap Road and Crawney Road, with heavy traffic transporting large infrastructure components accessing the site from Crawney Road only. The Head of Peel Road will not be used for project related construction and operational traffic and will be for emergency use only. As a result, road upgrades previously proposed at Devil's Elbow will not be undertaken	Reduction in number of waterway crossings and impacts to native vegetation and fauna habitat through removing access along Head of the Peel Road.
Removal and realignment of internal road networks	Removal of the internal road from the development footprint near southern end of Head of Peel Road into western part of the subject land. Sections of track between WP16 to WP17, WP17 to WP18, WP46 to WP47 and WP66 to WP67 and have been reassessed to avoid biodiversity impact and following contractor input on reducing earthworks and required width of footprint.	Removal of internal roads will directly and indirectly benefit previously impacted biodiversity values due to a reduction in vegetation clearing, bulk earthworks and fragmentation of vegetation and habitats.
Key Intersection, Devil's Elbow and Morrison Gap Road design update	The proposed road upgrades at Devil's Elbow have been removed from the project, and the upgrade to the Barry Road/Morrison Gap Road intersection has been substantially reduced.	Impacts associated with the exhibited project footprint in the EIS at Devil's Elbow comprised approximately 17ha of native vegetation which is generally in high condition. Substantial design revisions and a new bypass reduced the impact assessed in this location down to 2.5 ha of native vegetation. However, following feedback and consultation with Council, the proposed site access via Barry Road/Morrison Gap Road has been removed from the project,

Project Amendment	Description	Impact/benefit
		along with the proposed upgrades to Devil's Elbow. This has substantially reduced impacts to high condition vegetation, comprising Box Gum Woodland Critically Endangered Ecological Community and supporting habitat for threatened fauna species. Changes to the proposed site access have also reduced previously assessed impact to native vegetation and habitats at the corner of Barry Road/Morrison Gap Road to only minor trimming being required.
Transport Route Updates	The transport route for OSOM from the Port of Newcastle to the Project Area has been amended by the following: • Removal of the tower route option via Tamworth; • Removal of the Head of Peel Road route ('Southern Route') (as stated above) and associated alternate routes through Nundle including Happy Valley Road, Jenkins St, Gill St, Innes St; • Inclusion of route optionality in Muswellbrook; • Two additional laybys for OSOM traffic on Lindsay Gap Road and Morrisons Gap Road and one on Crawney Road to allow existing road users to pass slower moving Project traffic. • Access to the site for construction and haulage of large infrastructure components will now be from Crawney Road, to the western extent of the wind farm corridor with three options to access the site as shown on Figure 2	Overall, the refined transport route represents a reduction in biodiversity impacts, particularly with the replacement of access via Devil's Elbow and Barry Road/Morrison Gap Road with the access via Crawney Road with the remaining impacts fully assessed in the updated BDAR. It should be noted that the total Development Footprint assessed as impacted in this BDAR considers an accumulated impact from all these options whereas the proponent has committed to construction of only one option. This will result in a lower level of impact to what has been assessed.
Ancillary Infrastructure Amendments	As a result of the removal of the Head of Peel Road access to the Project Area, the construction laydown area and batching plant at the top of the Head of Peel Road access route has been deleted. The laydown area / batch plant has been relocated to the footprint of the BESS / substation and O&M facility. Substation, BESS and O&M configuration has been amended following further substation design works	Changes to the location of temporary concrete batching plant locations, optionality for a new O&M location, alternate construction compound and additional met masts have overall, resulted in a reduction to previously presented impacts on biodiversity values. Flexibility has been incorporated to locate the BESS/Batching/Substation either near WP20 and WP26, or north-west of WP5 and WP6. Locating infrastructure near WP20 and WP26

Project Amendment	Description	Impact/benefit
	Option to relocate O&M to WP56 based on feedback in the Hazards and Risk Report	will require only a 330 kV overhead line, locating infrastructure near WP5 and WP6 will require approximately 9 kilometres of 33 kV overhead lines, which are lower than 330 kV lines, and do not allow for the same span over vegetation and gully areas. The use of the 33kV line is considered the worst case scenario, and as such the impact assessment has been updated based on this eventuality.
	Laydown Area and Concrete Batching Plant optionality for all laydown areas with the exception of laydowns along Morrisons Gap Road to host concrete batching plants (total number of batching plants for the Project will not increase and will remain as two).	
	An additional temporary construction compounds are proposed adjacent to WTG 56 and at the eastern (downslope) extent of the Devil's Elbow bypass in an existing cleared pullover bay. No impacts to vegetation will occur at the Devil's Elbow compound.	
Quarry areas	Construction and operation of a quarry with an extraction limit of up to 500,000 tonnes per annum to enable it to supply a range of quarry products solely for construction of the Hills of Gold Wind Farm. This includes two quarrying areas; • Expansion an existing Forestry Corporation of New South Wales (FCNSW) which is focussed on the existing FCNSW quarry operations area. This site has an area of approximately 13.2 ha, which includes the extraction pit, processing and stockpiling areas, overburden /topsoil emplacement areas and surface water management structures. Known as the "western operation area" • A back up "satellite" quarrying area located on the hill immediately to the east of the existing quarry. This site has an area of approximately 9.9 ha, which includes the extraction pit, processing and stockpiling areas, overburden /topsoil emplacement areas and surface water management structures. Known as the "eastern operation area". Note, this area would only be used should the quarry materials demand from the Project exceed anticipated extraction from the western operation area.	The quarry site/s are located within Hanging State Forest, in an active pine (*Pinus radiata*) plantation area, that has recently been highly disturbed, subjected to bushfire impacts in 2019, and subsequently remaining areas salvaged and harvested. Small areas of native vegetation to the south of the eastern operations area would remain and managed at the request of FCNSW. Impacts of the quarry site/s on biodiversity would be negligible. Sourcing construction materials from the Verden Road Quarry would significantly reduce construction traffic through Nundle and on the local and regional road network. This would result in very significant, tangible benefits for the local and broader community.

Project Amendment	Description	Impact/benefit
	The proposed quarry site/s are located on Verden Road within the Hanging Rock State Forest on land managed by FCNSW.	

The following table highlights the reduction of impact the project revisions have had on native vegetation since the EIS presented publicly exhibited in 2020.

Table 2 Revised direct vegetation impacts

Vegetation condition class	2020 BDAR Area (ha)	Updated BDAR Area (ha)	% Reduction	% of mapped vegetation
Planted or urban vegetation	7.39	0.84	89	0.2
Exotic grassland	272.36	235.78	13	55.2
Derived Native Grasslands	30.91	39.43	-28 (increase)	9.2
Native vegetation – Low condition	37.11	33.64	9	7.9
Native vegetation – Moderate condition	73.8	63.29	14	14.8
Native vegetation – High condition	64.88	54.19	16	12.7
TOTAL	**486.45**	**427.16**	**12**	**100.0**

The ongoing project amendments have reduced the impacts to native vegetation as a result of clearing by a total of 17%, with a reduction of 16% occurring in areas of high condition native vegetation. As a result, a total of 16.16 hectares of native vegetation (varying in condition from low to high) will no longer be impacted by the Project.

Table 3 demonstrates the reduction in residual impacts required to be offset under the Biodiversity Offset Scheme, following implementation of all efforts made to avoid and minimise impacts, to ensure no net loss to biodiversity.

Table 3 Reductions in project refinements

Relevant matter	Details	2020 BDAR Direct impacts	2022 (October) Updated BDAR Direct impacts	Change in direct impacts
Native vegetation communities and ecosystem credit species habitats.	Direct loss of native vegetation communities associated with site clearing	207.7 ha	190.54 ha	-17.16 ha
Threatened ecological communities	Direct loss of Ribbon Gum—Mountain Gum—Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion	57.43 ha	27.24 ha	-27.24 ha
	Direct loss of White Box Yellow Box Blakely's Red Gum Woodland and	13.33 ha	8.15 ha	-5.18 ha

Relevant matter	Details	2020 BDAR Direct impacts	2022 (October) Updated BDAR Direct impacts	Change in direct impacts
	derived native grassland			
Habitat for threatened fauna species – species credit species	Large-eared Pied Bat*	61.08 ha	19.75 ha foraging habitat 0 ha breeding habit	-41.33 ha
	Eastern Cave Bat*	62.49 ha	19.75 ha foraging habitat 0 ha breeding habitat	-42.74 ha
	Large Bent-winged Bat*	23.12 ha	0 ha (breeding habitat)	-23.12 ha
	Little Bent-winged Bat*	23.12 ha	0 ha (breeding habitat)	-23.12 ha
	Southern Myotis	2.21 ha	3.93 ha	1.72 ha
	Eastern Pygmy-possum	30.42 ha	22.36 ha	-8.06 ha
	Koala	50.76 ha	46.28 ha	-4.48 ha
	Squirrel Glider	26.20 ha	17.50 ha	-8.70 ha
	Booroolong Frog	1.59 ha	0.95 ha	-0.64 ha
	Border Thick-tailed Gecko	0.17 ha	0.67 ha	0.50 ha
	Powerful Owl	Assessed as not present as none were observed during surveys	17.26 ha	N/A
	Sooty Owl	As above	1.99	N/A
	Barking Owl	As above	84.57	N/A
	Masked Owl	As above	16.29	N/A
	Greater Glider	N/A	36.28	N/A
	Spotted-tailed Quoll	N/A	45.62	N/A
Total Change				-199.51 ha

As a result targeted field survey, significant refinement has been achieved for previously assumed potential roosting / breeding habitat locations for cave dwelling bats including the threatened Eastern Cave Bat, Large Bent-winged Bat, Little Bent-winged Bat and Large-eared Pied Bat within and surrounding the development footprint. The former conclusion of a potential significant impact to Large-eared Pied Bat has been updated to unlikely based on a lack of optimal breeding habitat and removal and relocation of high risk turbines. Further information is provided in Section 8.8.

Substantial work has been undertaken to minimise the potential for operation impacts to the above listed microbat species, as well and bird and bat species generally. This work has included substantial project redesign to maximise turbine spacing to minimise the potential for operational turbines creating barriers to

species movement, and to minimise the risk of fauna colliding with turbines and turbine blades. The Proponent has also made firm commitments to an operation Bird and Bat Adaptive Management Plan that will prescribe how potential operational impacts will be reduced, via proactive and reactive turbine curtailment, rigorous monitoring to record potential impacts, and a strict Trigger Action Response Plan designed to ensure operational impacts do not go unnoticed or allowed to continue if and when they are recorded.

It can be seen from Table 3 above that assumed impact to Barking Owl, Masked Owl and Powerful Owl have increased from those assessed in previous version of this BDAR. This has occurred following a consultation with BCS, and a requirement to conservatively assume all areas containing potentially suitable hollow-bearing trees initially be included in the species polygons, which were then refined based on targeted surveys undertaken in September 2022. Previous assumptions of presence were restricted to areas considered to provide the highest potential for owl breeding habitat, comprising forested gullies supporting dense intact vegetation (DEC 2006), whilst this was considered appropriate for Sooty Owl, it was requested by BCS that all areas supporting potential nest trees (hollows >20 centimetres in diameter), be conservative assumed to be habitat, irrespective of landscape position, to determine an upper quantum of impacts.

This upper quantum of impacts is considered to substantially overestimate of the actual impact to each of the target species' breeding habitat. Home ranges of breeding individuals have been reported as; 255 hectares for Barking Owl (Taylor et al 2002, NPWS 2003), 350 hectares for Powerful Owl (Kavanagh 1997, DEC 2006), and at least 400 hectares for Masked Owl (DEC 2006), suggesting very few pairs would occur within, and surrounding, the subject land during breeding season. It should also be noted that targeted survey undertaken to date over eight separate nights, across three seasons have recorded one Masked Owl individual, and no evidence of Barking Owl, Powerful Owl or Sooty Owl. Further assessment is provided in Section 5 and Section 8 of this BDAR.

The Proponent intends to implement best practice processes for minimising the direct and indirect impacts noted above, including:

- Pre-clearing protocols, including pre-clearing inspections, establishment of exclusion zones and on-ground identification of specific habitat features to be retained and/ or relocated.
- Vegetation clearing protocols will be implemented including staged habitat removal, fauna handling and unexpected threatened species finds procedures for species (including of wombats, Koala, and other fauna) and any specified seasonal limits on clearing activities.
- A Biodiversity Management Plan will be implemented including the following specific requirements to minimise and manage any risk of fauna injury mortality during construction:
  - Strategies for fauna management during construction including any identification roles, responsibilities and contingency measures such as temporary stop works and engagement of fauna specialist.
  - Requirements for temporary deterrent fencing, signage and/or requirements to modify driver behaviour and regular visual inspections to minimise the risk of fauna injury / mortality (particularly Koala and Spotted Tailed Quoll) due to vehicle strike or entrapment in deep excavations, with details to be developed during the preparation of the BMP.
  - Opportunity for egress to any species that may become trapped in any open excavation in the form of graded exits or tools to support climbing out.
  - Opportunities for the salvage and re-use of important habitat features, including tree-hollows and bush rock, are to be identified and detailed procedures for the implementation of these activities are to be adopted.

- A Bird and Bat Adaptive Management Plan will be developed and implemented for the monitoring of threatened or at risk species subject to adverse operational impacts. A framework for key components of this plan is provided in Section 8.10.2.
- Proactive and reactive (triggered) 'smart turbine curtailments' to reduce the potential for operation impacts to threatened and non-threatened bird and bat species.

This amended BDAR has been prepared in accordance with the requirements of the *Biodiversity Conservation Act 2016* (NSW, BC Act) and the NSW Biodiversity Assessment Method (BAM, DPIE 2020). This BDAR was originally prepared in accordance with the BAM 2017 (OEH 2017) method, however as the final submission will occur after October 22, 2021 all amendments have been prepared to comply with BAM 2020 requirements.

Consultation was carried out with BCS and NSW National Parks and Wildlife Service (NPWS) before preparing the original BDAR. Consultation has continued since public exhibition of the original BDAR and EIS. BCS was consulted on this amended BDAR on the 3 February 2021 and 27 May 2021. This amended BDAR was also shared with BCS and NPWS prior to formal lodgement.

Following the Response to Submissions, further consultation with BCS and NPWS occurred on the 27 February and 11 March 2022 to discuss points raised in Response to Submissions, and discuss the aspects surrounding the development of the more detailed frameworks for the Bird and Bat Adaptive Management Plan. Consultation was again undertaken on 13 May 2022 and 16 August 2022 to discuss BCS RFIs, responses provided and proposed survey methods for finalising the requirements for impact assessment for threatened owl species.

A single development footprint has been assessed that covers the wind farm infrastructure, internal roads, transmission line easement, access tracks, and transport haul route.

The development footprint includes the construction and operational footprints, including temporary and permanent footprints. A wider 500 metre landscape buffer was added to the development footprint to assess landscape impacts, as required under the BAM. The development footprint plus the buffer is referred to in this BDAR as the "assessment area".

The following biodiversity values were identified in the subject land through a desktop study and targeted field investigations.

Topography

- The topography includes a range of plateaus, ridgelines, and escarpments. The ridgetop where the WTGs will be installed is relatively flat.

Vegetation

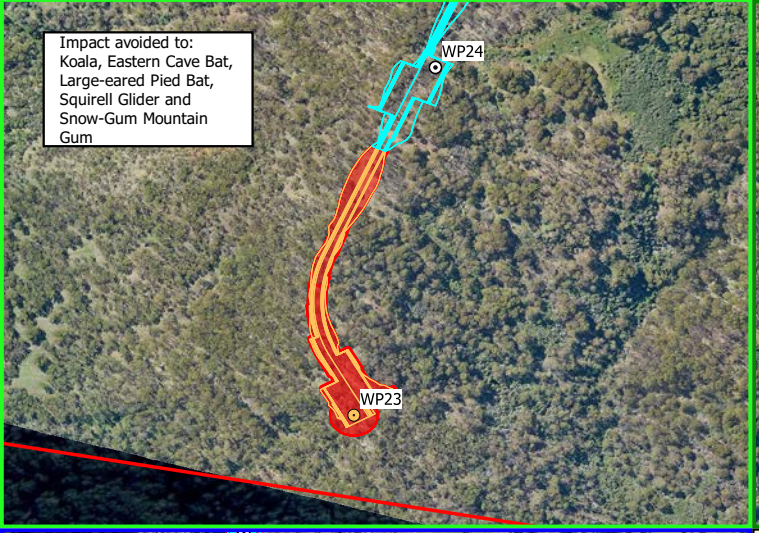
- The majority (55.5 % or 236.62 ha) of the mapped vegetation within the development footprint is composed of exotic grassland or planted/urban vegetation, with 44.5 % of the mapped vegetation being classified as native vegetation.
- The 190.54 ha of mapped native vegetation within the development footprint, occurs across 19 separate PCTs with varying levels of disturbance and condition, stratified into 45 vegetation zones.
- The mapped native vegetation within the development footprint (190.54 ha) represents 2.7% of the approximate 7091 ha contained within the assessment area.

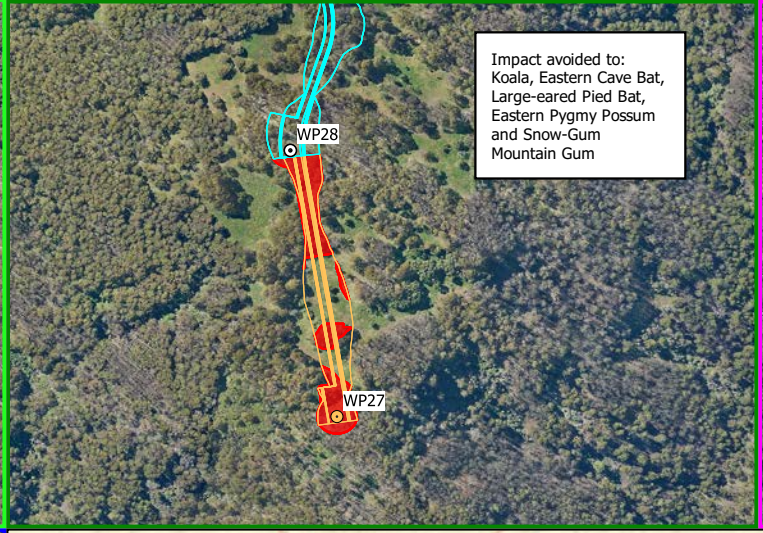
Communities and species

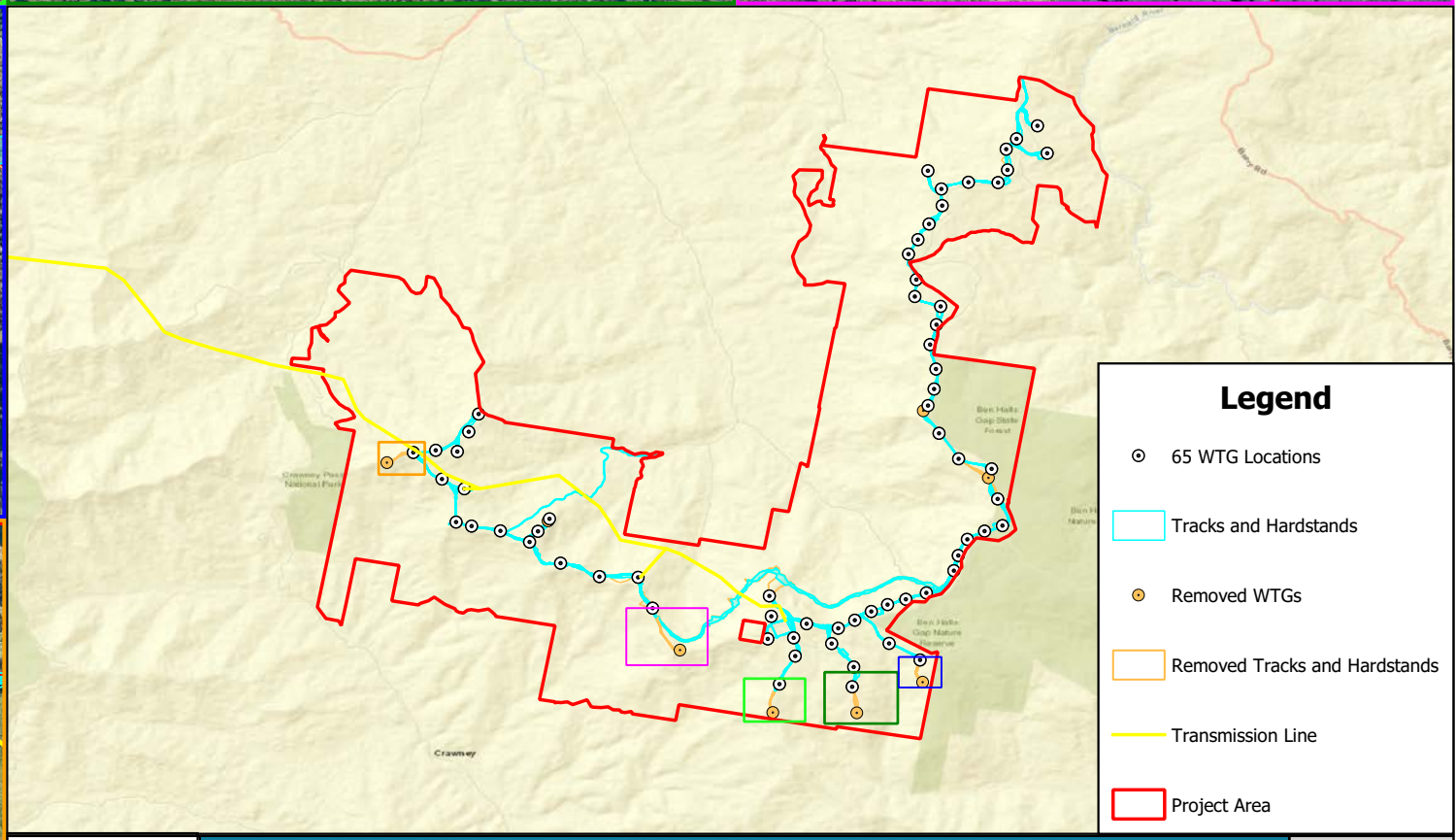
- A total of 24 Plant Community Types (PCTs) were identified and mapped within the subject land, of these PCTs 19 will be impacted by the project.

- Two State-listed Threatened Ecological Communities (TECs) were identified and mapped within the development footprint, White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box Gum Woodland, Critically Endangered) (8.05 ha) and Ribbon Gum - Mountain Gum - Snow Gum Grassy Forest/Woodland (Endangered) (27.24 ha).
- One nationally-listed Critically Endangered Ecological Community (CEEC) was identified and mapped, within the development footprint, White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box Gum Woodland) (8.05 ha).
- A total of 12 state-listed BAM species credit fauna species were recorded or assumed to be present, including three bats, three arboreal mammals, one amphibian, one reptile, and four birds.
- Five nationally-listed threatened fauna either occur or are highly likely to occur, Koala, Large-eared Pied Bat, Greater Glider, Spotted-tailed Quoll and Booroolong Frog.
- No migratory fauna flightpaths or routes were observed or mapped throughout the assessment area.
- Nankeen Kestrel, Brown Goshawk and Wedge-tailed Eagles are present onsite, and while not listed these species, are protected and considered subject to potential collision risk.

The mitigation approach was to firstly avoid and minimise impacts through design phase refinements. However, there will be certain unavoidable impacts if the project is built. Therefore, mitigation measures have been identified to minimise the Project's biodiversity impacts. This includes (adaptive) management and monitoring measures. It also includes the use of biodiversity offsets to ensure no net loss of biodiversity.







N

0 3 6 km

Coordinate System: WGS 84 EPSG 4326

Removal of Five Wind Turbines

M01

Date: 07/09/2021

Version: 1

Prepared by: LE
Reviewed by: JC

Hills of Gold Wind Farm

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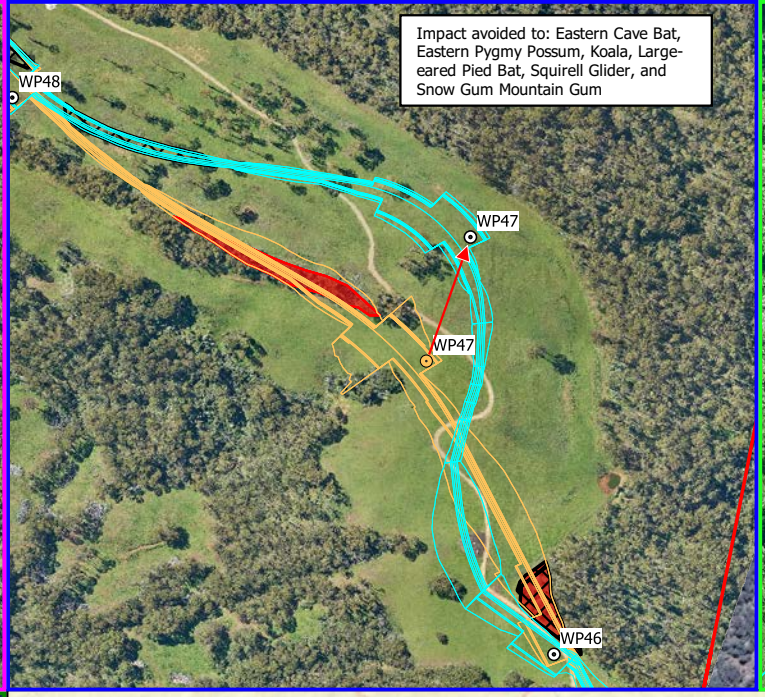

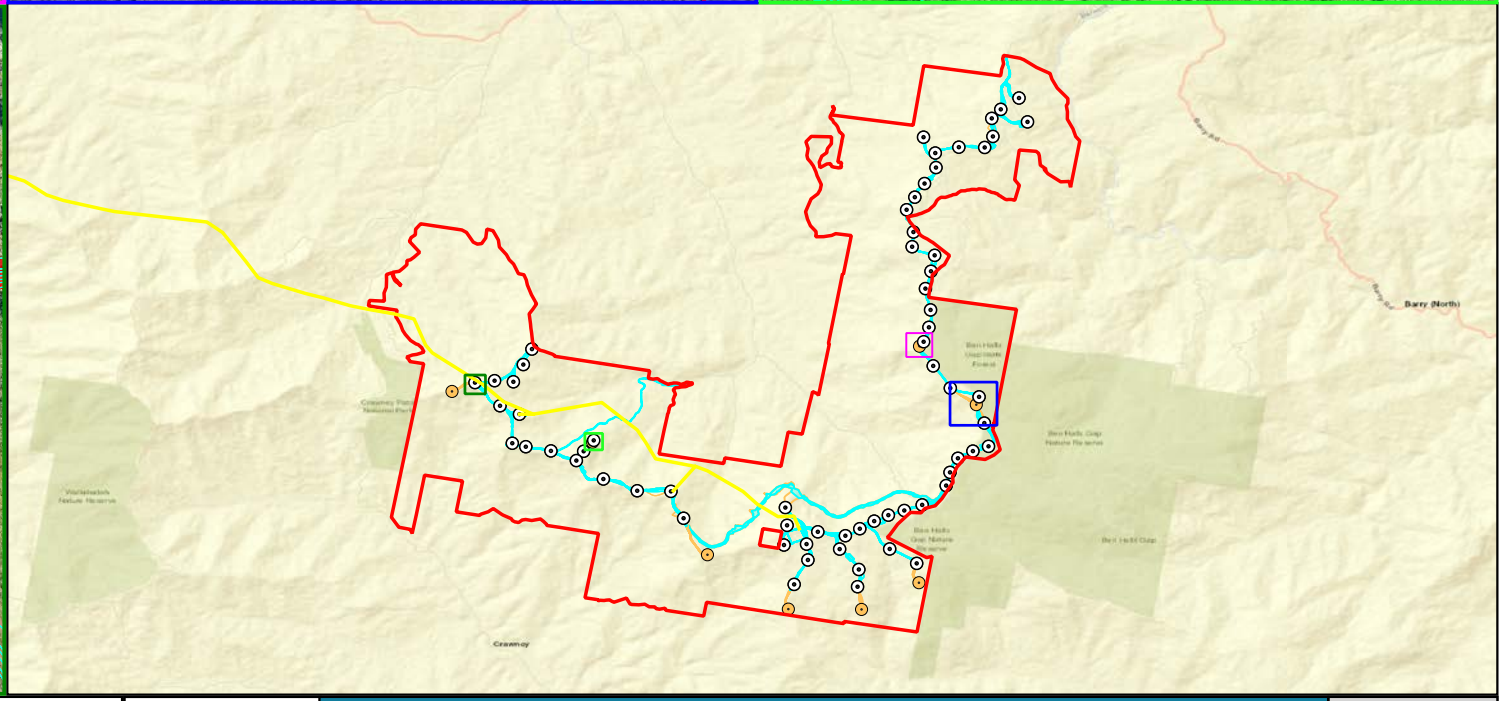

Legend

- 65 WTG Locations
- Removed WTGs
- Transmission Line
- Tracks and Hardstands
- Removed Tracks and Hardstands
- Project Area
- Species

N

Turbine Relocations

0 2.5 5 km

Coordinate System: WGS 84 EPSG 4326

Date: 07/09/2021

Version: 1

Prepared by: LE
Reviewed by: JC

Hills of Gold Wind Farm

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M02

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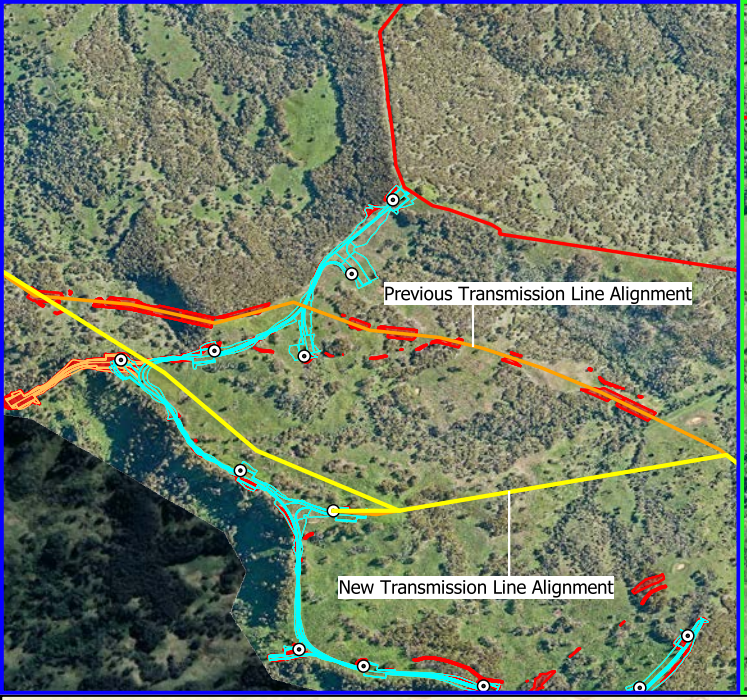

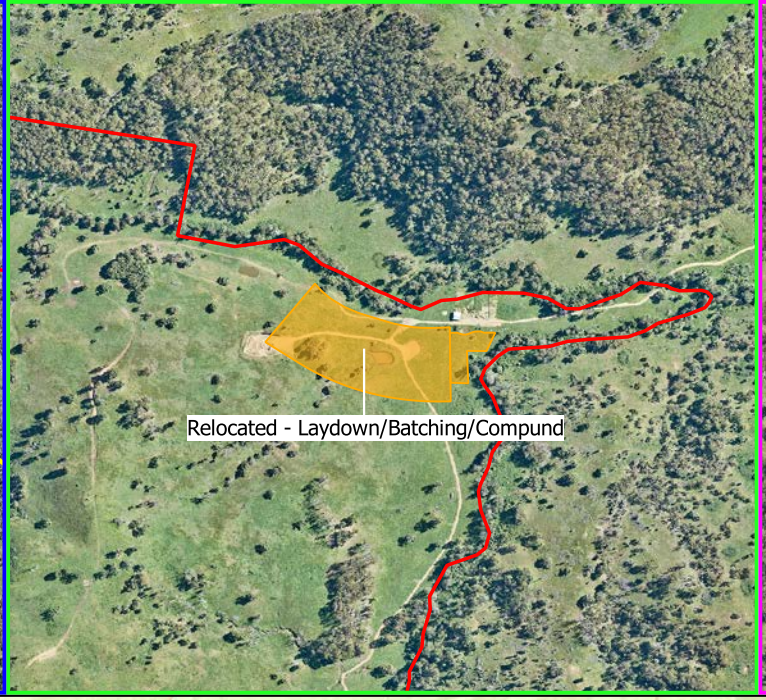

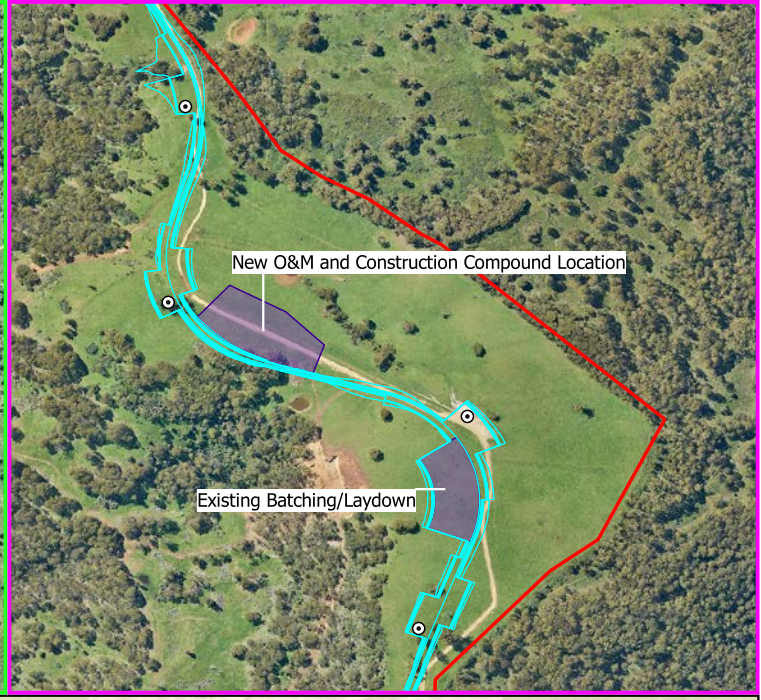

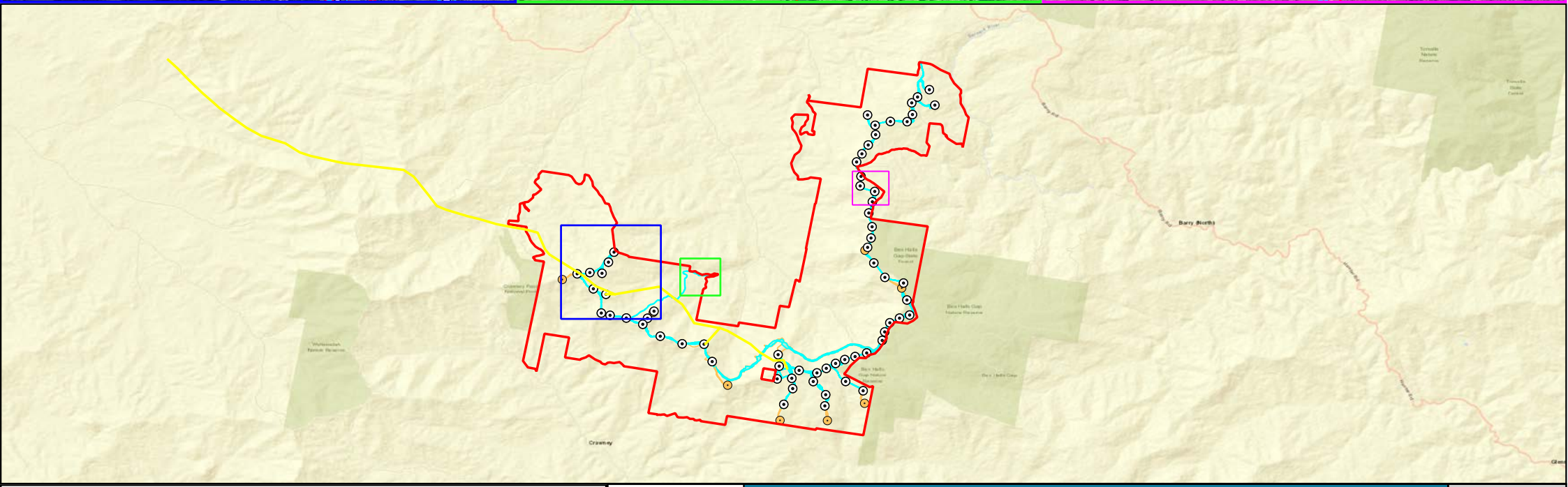

Legend

- 65 WTG Locations
- Tracks and Hardstands
- Removed WTGs
- Removed Tracks and Hardstands
- Transmission Line
- Previous Transmission Line Alignment
- Project Area
- Removed Ancillary Infrastructure
- Species

N

0 2.5 5 km

Coordinate System: WGS 84 EPSG 4326

Ancillary Infrastructure Amendments

Date: 07/09/2021

Version: 1

Prepared by: LE
Reviewed by: JC

Hills of Gold Wind Farm

M03

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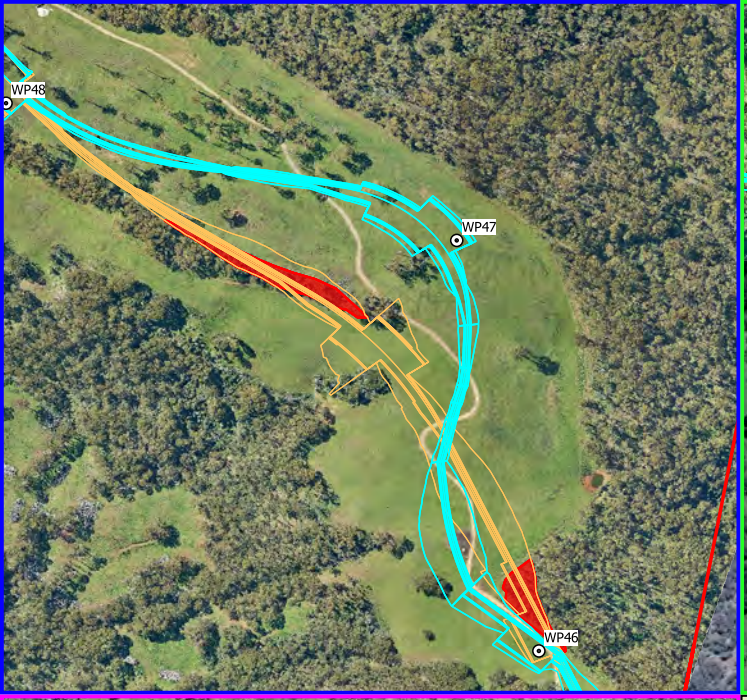

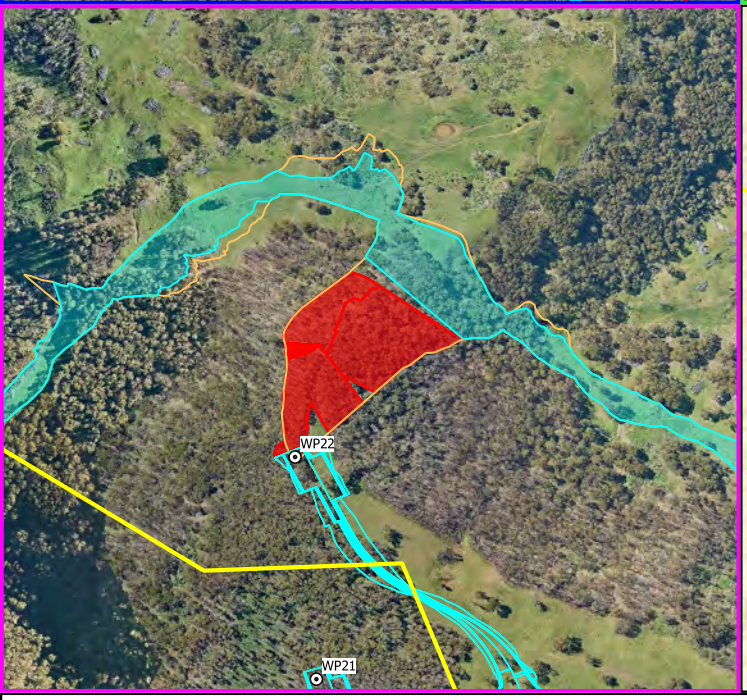

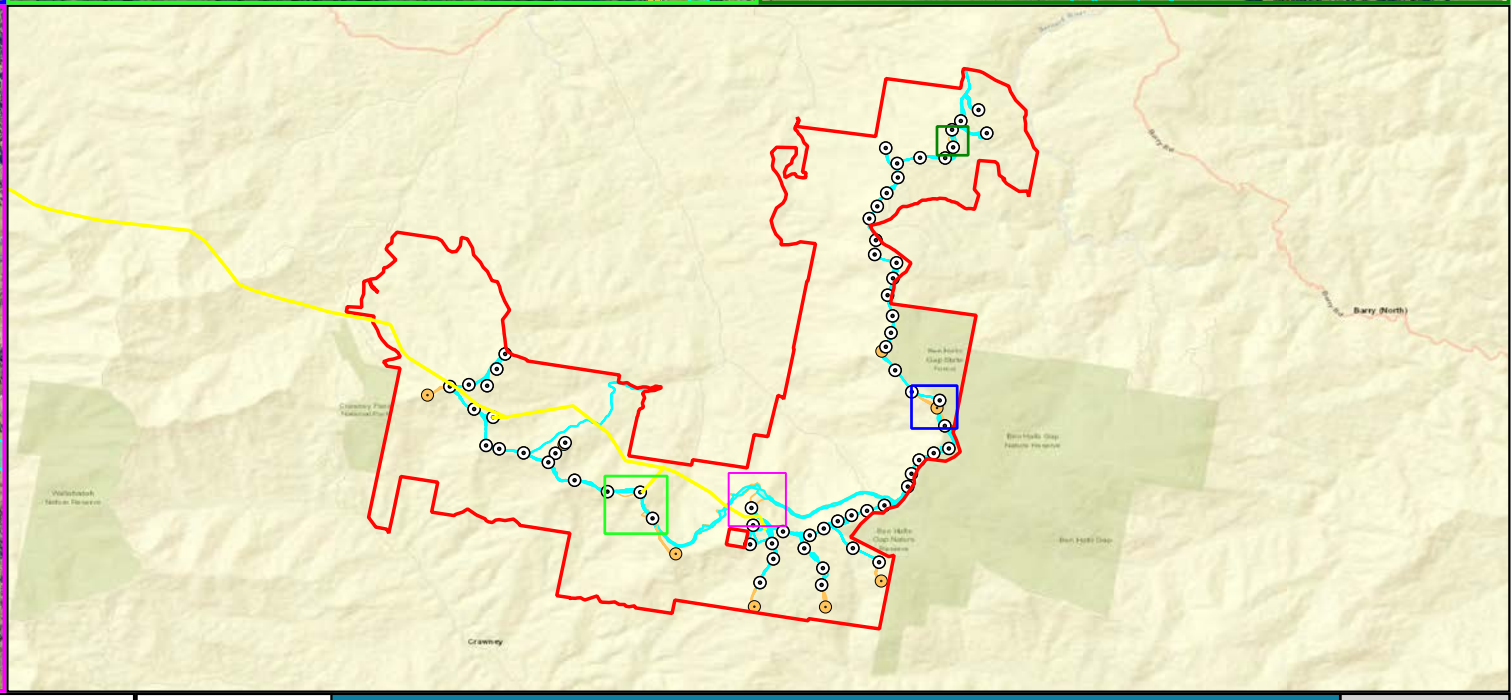

Legend

- 65 WTG Locations
- Removed WTGs
- Transmission Line
- Tracks and Hardstands
- Removed Tracks and Hardstands
- Project Area
- Species Avoided

N

0 2.5 5 km

Coordinate System: WGS 84 EPSG 4326

Internal Road Changes

Date: 07/09/2021

Version: 1

Prepared by: LE
Reviewed by: JC

Hills of Gold Wind Farm

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M04

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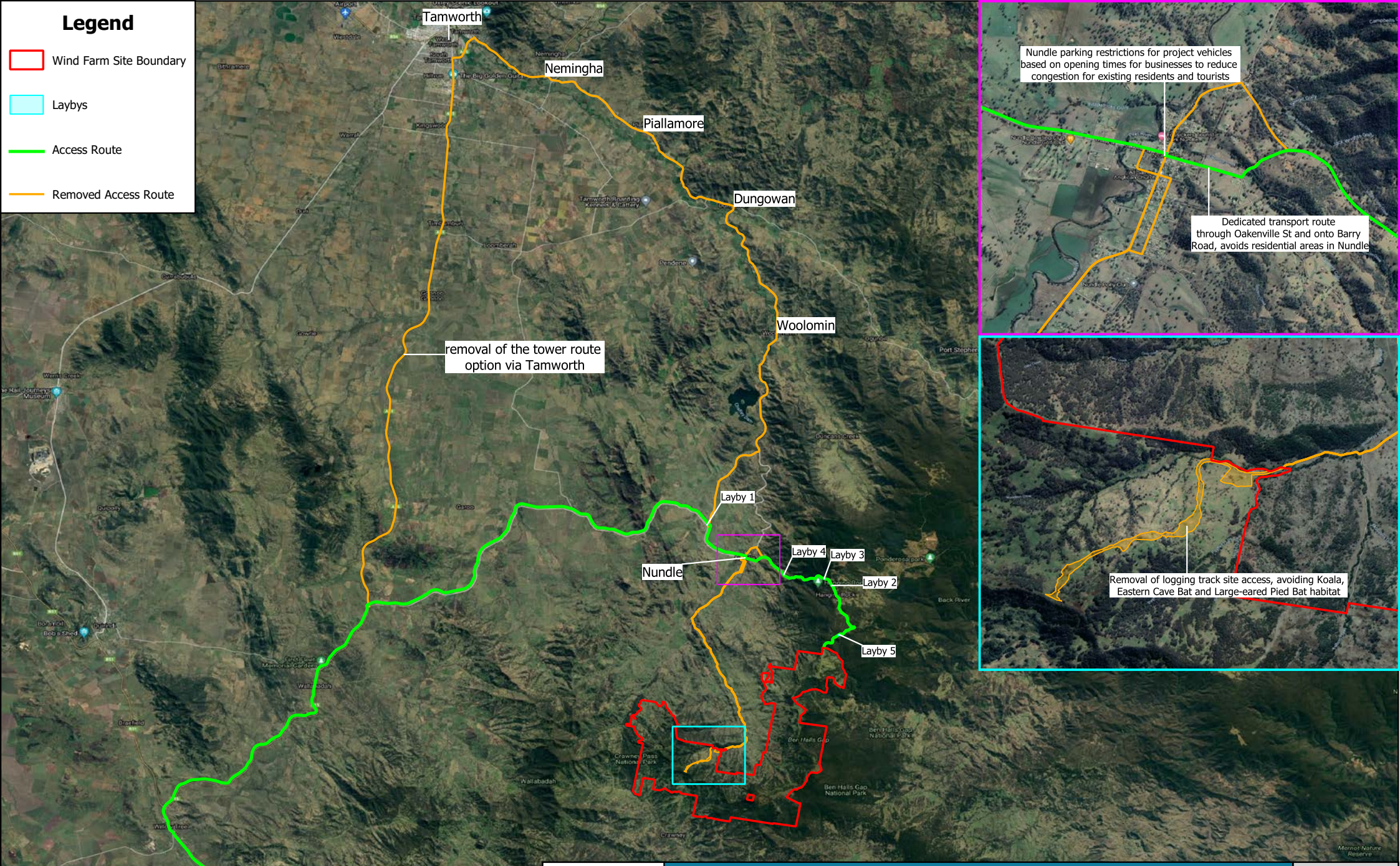

N

0 5 10 km

Coordinate System: WGS 84 EPSG 4326

Route Changes

Date: 07/09/2021

Version: 1

Prepared by: LE
Reviewed by: JC

Hills of Gold Wind Farm

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M05

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Key Updates to BDAR

Additional assessment

The following additional field surveys, desktop assessment and detailed analysis were completed following finalisation of the original BDAR, and previous amended BDAR, to further assess the impacts of the Project, including all proposed amendments in relation to submission comments, and regulator feedback:

- An additional 24 BAM plot were collected in March 2021. This included collection of data to support the design refinements for the then proposed Devil's Elbow bypass and Morrison Gap Road, upgrades as well as additional data to enable improved calculation of vegetation integrity across the development footprint.
- Additional geomorphological assessment was carried to assess the potential for microbat roosts and breeding habitat. In addition, a microbat cave roost inspection was carried out between 29 March 2021 and 1 April 2021. All high priority areas that were identified via desktop as having a sudden changes in elevation (ie potential large caves, and clifflines) were able to be visually inspected from the nearest accessible point.
- An assessment of the prescribed impacts of the updated Project was undertaken in accordance with the BAM, as well as further detailed assessment of indirect impacts to threatened species was completed.
- A qualitative risk assessment was also completed for impacts associated with potential bird and bat turbine blade strike, potential barrier effect impacts, and a turbine specific risk assessment. Additional operational mitigation measures have been provided to manage potential impacts from turbines.
- Further detail has been provided around the BBAMP proposed to be developed, and implemented over the life of the project, including firm commitments for a stringent Tigger Action Response Plan.
- Based on feedback received from BCS which determined that additional potential breeding habitat, as defined by the Threatened Biodiversity Data Collection (TBDC), was required to be mapped for large forest owls (Barking Owl, Powerful Owl, and Masked Owl) and included in the species polygons if the species' presence was to be assumed, additional surveys were undertaken. These additional surveys comprised targeted searches for suitable nest trees, and evidence of use, followed by targeted nocturnal surveys implementing stage-watches over sunset, call-playback surveys, hollow and roost habitat watches, and spotlighting. This additional survey has allowed for a refined quantum of impact to be determined and assessed for these species.
- Serious and irreversible impact (SAII) assessments were completed for Box Gum Woodland TEC and direct impacts to microbat species breeding habitats. Subsequent design refinements made to the Project meant that SAII assessments for direct impacts to microbats were no longer required, however it is considered that a potential SAII may occur as a result of operation impacts to these species. As a result of this consideration a proactive 'smart curtailment' strategy has been committed to by the Proponent, as well as additional efforts being made to avoid impacts through reduction in turbines and increased spacing. The potential for substantial operational impacts are considered to be unlikely as a result of the proactive 'smart curtailment' and reactive (triggered) curtailment strategies committed to be the Proponent.

Residual impacts and their significance

The amended assessment confirms that there is the ability to avoid and minimise impacts through best practise and recognised mitigation measures to mitigate or offset impacts. While there will be an overall ecological impact in delivering the Project, the residual impacts have been minimised through the

amendments made to the Project which were strongly focused on further reducing impacts to biodiversity values. Further reduction of impacts will be sought throughout the detailed design phase and construction and operational impacts will be minimised through the preparation and implementation of a Construction Biodiversity Management Plan and an Operational Bird and Bat Adaptive Management Plan.

The potential for a direct SAII to cave dwelling microbats and their potential breeding habitat have been avoided through the removal and relocation of specific turbines from the project footprint. The potential for an operational SAII is considered to be highly unlikely as a result of the proactive 'smart curtailment' and reactive (triggered) curtailment strategies committed to be the Proponent. The potential for SAII to Box Gum Woodland CEEC is also considered unlikely, and has been further minimised through project design, and it is considered that the current level of proposed impact is a worst case and can be mitigated against, and reduced during future design stages.

Potential significant impacts to EPBC Act listed Koala and Spotted-tailed Quoll are considered likely to occur as a result of the Project, however significant impacts to all other EPBC Act listed entities have been avoided including Box Gum Woodland CEEC, Large-eared Pied Bat, Greater Glider and Booroolong Frog. Impacts to Koala and Spotted-tailed Quoll have been minimised through project design amendments reducing direct impacts to Koala habitat by approximately 4.48 hectares and to Spotted-tailed Quoll by approximately 15 hectares (with the species being associated with all areas of moderate and high condition native vegetation in the development footprint). Impacts will be further minimised through construction and operational mitigation measures targeting these species and through the establishment of local offsets aimed to increase local habitat connectivity between the existing reserve network. Despite the efforts made to reduce impacts, the residual impacts to both species have been conservatively considered significant in accordance with the EPBC Act significant impact guidelines, and as such the species will require direct offsets in accordance with the EPBC Act Offsets Policy (Commonwealth of Australia 2016), secured via the NSW BOS. Required offsets are expected to be achieved via a combination of establishment of local Biodiversity Stewardship Sites and the securing of biodiversity credits.

Residual impacts will be offset in accordance with the NSW Biodiversity Offset Scheme. Once these offsets are applied, no net loss to biodiversity is expected as a result of the Project. In addition, investigation into the establishment of local offset sites as Biodiversity Stewardship Sites has commenced and yielded a number of viable opportunities. Key to establishing local offsets is the aim of improving biodiversity values, and in particular habitat connectivity, at the local scale to mitigate the Project's impacts and improve biodiversity values in the locality. In particular, the potential to create Biodiversity Stewardship Sites on land surrounding the Project to improve the wildlife corridor between Ben Halls Gap Nature Reserve and Crawney Pass National Park, and on to Wallabadah Nature Reserve has been proposed. There have been seven (7) neighbouring landowners identified who could potentially host a biodiversity stewardship site to deliver the wildlife corridor. The Proponent has entered into agreements with a number of these landholders, and is seeking to enter into agreements with a number of others to secure the potential wildlife corridor. Subject to these agreements being successfully concluded and Biodiversity Stewardship Sites established in accordance with legislative requirements, the Proponent commits to delivering improvements to the wildlife corridor between Ben Halls Gap Nature Reserve and Crawney Pass National Park, and on to Wallabadah Nature Reserve as part of the biodiversity offsets required for the Project.

As identified in Section 8.5 of the revised BDAR, there has been an overall reduction in prescribed impacts as a result of the amended Project.

BCS - Request for additional information February 2022 and comments on BBAMP framework

Following submission of the Amended BDAR with the project's Amendments Report, further information on a number of key items was requested by BCS and NPWS. These items have been addressed in the BDAR, and where and how each RFI item has been addressed is detailed in Table 4 below. Additional detail was also

request on the proposed BBAMP, and an updated framework was provided to BSC for consultation. Details of this feedback is provided in Table 5.

Table 4 Summary of February 20220 RFI comments and where/how they are addressed

Item	Agency	Summary of Agency comments	How / where addressed
1	BCS	Not all components of the BAM assessment were included in the BDAR i.e. No % cleared for PCTs provided.	Noted. No further action required.
2	BCS	The methodology used to determine non-native vegetation must be clearly articulated, however was considered adequate.	Noted. No further action required.
3	BCS	The selection of PCTs has not been adequately justified, and further justification should be provided in the BDAR for the selection of all PCTs.	Further justification on why PCTs were selected has been provided. Refer to additional comparison tables providing "Similar PCTs" and "Justification of Best Fit" included for each PCT in Appendix B.
4	BCS	Inclusion of vegetation plots located outside the project footprint must be justified.	Additional justification on the comparison between plots outside of the footprint in relation to the impacted vegetation zones has been added. Additional justification provided in Section 4.1.4 and Table 23.
5	BCS	Separate BOAMs cases are needed for each IBRA subregion. BOAMs cases to be split between IBRA sub-regions, with separate cases for each subregion.	The BAM-C for the project has been updated and split by IBRA region/subregion. A small number of species previously assessed as not relevant to the project, but not detailed in Table 33 and Appendix C, are now included.
6	BCS	Vegetation condition classes be reviewed to ensure that they accurately reflect vegetation integrity scores.	More information around the use of benchmark data artificially increasing VI scores, and how this relates to the ground-validated condition states used to determine vegetation zones has been provided. Additional justification provided in Section 4.2.4.
7	BCS	Permanent and temporary impacts for each vegetation category is adequate.	Noted. No further action required
8	BCS	Ecosystem species have been included in discussions regarding species credit species.	Noted. No further action required
9	BCS	Inconsistencies exist between the field data and the data in the BAM calculator. Explanations be provided for differences in plot data between spreadsheets.	Spreadsheet 1 (as referred to in the RFI document) is an Arup document and Biosis cannot comment on the accuracy of the data included. Since January 2021 Biosis has completed a QA on the floristic plot data and has updated any inconsistencies and/or errors that may have occurred prior to that date. This has included minor adjustments to the location of some BAM plot points that were inaccurately located due to GPS error in the field, for example to move the point

Item	Agency	Summary of Agency comments	How / where addressed
			back under the canopy of the vegetation patch the plot occurred within. Further to the above, discrepancies have now been noted in the large tree count data in Biosis' BAM plot data. The error has been traced back to an issue with the GIS data processing model either creating duplicate values or summing values for >80cm DBH or 50-79cm DBH, depending on the way the data was captured in the field. These issues have now been corrected, without changing the VI scores for any vegetation zones where this error had occurred. Updated data include in the BAM-C and Appendix H
10	BCS	All SAII have been adequately addressed. No further action necessary.	Noted. No further action required.
11	BCS	The potential impact to fauna relating to turbine placement has not been adequately addressed. Discussion regarding the potential for the displacement of home ranges, or the sterilisation of suitable habitat through fauna avoiding turbines, thus disrupting movement patterns is required. Justification be provided for the distance between turbines along ridge lines.	Additional justification and assessment provided in Sections 5.4.2 (Table 46), 8.3.4 and 8.3.5. Section 5.4.2 (Table 46) addresses animal behaviour including forage flight characteristics. Section 8.3.3 "Turbine risk assessment" has been updated to consider the barriers to movement and potential collision with turbine blades on a turbine by turbine basis. Table 72"Qualitative risk assessment for turbines for full 70 turbine layout" provides barrier effect risk. Section 8.3.4 "Barrier Effect Risk Assessment" and Section 8.3.5 "Summary of collision risks and indirect impacts" have been updated with specific regard to potential barrier impacts to threatened species and the risks associated with displacement of home ranges, or the sterilisation of suitable habitat through fauna avoiding turbines, thus disrupting movement patterns. Table 75 provides an updated qualitative risk assessment for potential barrier effect impacts to birds and bats within identified turbine clusters. It has been concluded that "All known or predicted bird and bat species within the subject land have low or negligible risk associated with barrier effects or avoidance behaviour resulting from aerial fauna flying near/within the zone of disturbance or from habitat sterilisation surrounding the operational wind turbines". However, where individual spacing and potential zone of disturbance overlap or become in close proximity to each other, this represents identified turbines clusters that may have a slight increase in an inherent risk associated

Item	Agency	Summary of Agency comments	How / where addressed
			with barrier effects or altered flight behaviour in that area. Additional assessments were undertaken with additional technical input from Biosis' acknowledged avian and microbat ecologist and highly experienced wind farm ecologist Ian Smales and Mark Venosta (see Section 1.9.2 for credentials).
12	BCS	Prescribed impacts relating to wind farms have not been adequately addressed. Options to compensate for unavoidable prescribed impacts, the decision pathway and justification for suggested credit numbers or other compensatory actions, should be clearly documented.	Additional justification and information around residual prescribed impacts and compensatory measures has been provided in Section 8.3.5 "Summary of collision risks and indirect impacts" and 8.10.2 "Bird and Bat Adaptive Management Plan (BBAMP)".
13	BCS	Direct impacts on cave bat roosts needs to be clarified. Additional input be sought from an acknowledged bat ecologist. Monitoring of bats take place prior to construction adjacent to geological features with high bat activity at "fly-out" times to determine if further investigation is warranted to identify potential roost sit.	Additional considerations included in Section 5.4.2 Microbats (at the end of section) based on input from highly experienced wind farm ecologist and Biosis' senior microbat ecologist Mark Venosta (see Section 1.9.2 for credentials). Additional monitoring of bat activity near geological features that may potentially provide roost habitat has been included in Section 8.10.1.
14	BCS	Indirect impacts on microbats have not been adequately addressed. Full details of trigger points and mitigation measures be addressed and presented prior to a final determination of the project rather than in a post-consent BBAMP. Data from ongoing bird and bat monitoring surveys be provided to DPE annually as well as made publicly available on the project's website.	Additional justification and information provided in Section 8.10.2, which includes detailed commitments made by the proponent to a mitigation strategy, to be finalised during the preparation of the BBAMP, and includes trigger points and proposed mitigation measures. Section 8.10.2, contains an overview of the proposed BBAMP, and includes the following: • Framework and objectives. • Baseline information. • Trigger-level and unacceptable impacts for further investigation and adaptive management. • Monitor and report on the effectiveness of impacts and trigger levels. • Operational mitigation measures. • Residual prescribed impacts and compensatory measures. • Compliance management and summary. • Monitoring and adaptive management triggers for barrier effect impacts.
15	BCS	Additional assessment of a locally important population of the Greater Glider has been provided. No significant impact is likely on the local population of Greater Glider. No further	Noted, but refer to point 18.

Item	Agency	Summary of Agency comments	How / where addressed
		action necessary	
16	BCS	Species polygons for some species credit species are unacceptable. Species polygons for Powerful, Barking and Masked Owls are to be reconfigured. Species polygon for Koala, Eastern Pygmy Possum, Squirrel Glider are to be reconfigured to include all suitable habitat.	Additional information has been provided in Section 5.5. Habitat polygons have been developed based on a combination of targeted field surveys, ground-validated habitat assessments, and species' habitat requirements based on published literature and the TBDC. Preparing species polygons in this manner was undertaken to ensure the use of information available for each species, such as PCT associations, habitat parameters where they can be justified based on BioNet or published, peer-reviewed literature, habitat assessments, and targeted surveys, to ensure species polygons are as accurate and meaningful as possible. The approach was undertaken considering Section 6.1.1.2 of the BAM, which specifies that: *'An assessor may use additional information about a threatened species, in BioNet (e.g. the profile of a threatened species) or published, peer reviewed literature, when assessing the habitat suitability of a site'* Koala, Eastern Pygmy Possum, and Squirrel Glider species polygons, were developed based on a combination of on-ground fauna habitat assessment undertaken across the entire wind farm corridor, and the results of targeted surveys undertaken for all three of these species, with reference to BioNet and literature. Owl species polygons were developed using a combination of the Large Forest Owl Recovery Plan (DEC 2006), BioNet and peer reviewed literature.
17	BCS	Stewardship sites should consider proximity to turbine influence.	Acknowledged and included in Section 9.1.3.
18	BCS	Additional information is required for Matters of National Environmental Significance. A credit requirement for the Greater Glider should be calculated under advice from the Commonwealth Department of Agriculture, Water and the Environment.	No further guidance has been provided on this issue, other than the project is not expected to have a significant impact to this species (Item 15). As such no species specific offsets are considered necessary, and any offsetting of impacts to the species' habitat will be included with the project's ecosystem credit offsets and establishment of local Biodiversity Stewardship Sites.
19	NPWS	It is unknown how the proposed adaptive management will mitigate impacts once the turbines are constructed. What options are there for the proposed adaptive management measures once the turbines are in place? A key question is whether a moderate level of risk to threatened species is	Additional justification and information provided in Section 8.10.2, which includes detailed commitments made by the proponent to a mitigation strategy, to be finalised during the preparation of the BBAMP, and includes trigger points and proposed mitigation measures to reduce potential operation impacts associated

Item	Agency	Summary of Agency comments	How / where addressed
		acceptable adjacent to high quality habitat on national park? For these reasons and for potential impacts on NPWS operations, NPWS recommends the removal from the proposal of all turbines adjacent to Ben Halls Gap Nature Reserve.	with the turbines, with particular consideration of turbines adjacent to the Nature Reserve. Section 8.3.3 "Turbine risk assessment" has been updated to consider the barriers to movement and potential collision with turbine blades on a turbine by turbine basis. Table 72 "Qualitative risk assessment for turbines for full 70 turbine layout" provides barrier effect risk. Section 8.3.4 "Barrier Effect Risk Assessment" and Section 8.3.5 "Summary of collision risks and indirect impacts" have been updated with specific regard to potential barrier impacts to threatened species and the risks associated with displacement of home ranges, or the sterilisation of suitable habitat through fauna avoiding turbines, thus disrupting movement patterns. Table 75 provides an updated qualitative risk assessment for potential barrier effect impacts to birds and bats within identified turbine clusters. Each of these assessments gives particular consideration of turbines adjacent to the Nature Reserve.
20	NPWS	BDAR Tables 56 & 59 regarding potential impacts of blade-strike on local populations of several species, lists the risk as moderate but describes impacts as short term. Given that the potential risks of collision will exist for the duration of the project's operation, the impacts are likely to be ongoing and hardly short term.	Terminology used in tables in Section 8.3.1 and 8.3.2 have been updated.
21	NPWS	Proposed ongoing monitoring of impacts and adaptive management is commended. However it's difficult to understand how adaptive management can be implemented once the turbines are constructed -- there is little indication of what this might comprise "after the event" and after its impact.	Additional justification and information provided in Section 8.10.2 and information relating to items 14 and 19 of this table.
22	NPWS	BDAR's mitigation measures include "appropriate setbacks" required from NP estate "where practical", which have not been clearly identified and do not appear to be in place for the turbines immediately adjacent to BHGNR. Also the 30m "minimum safe distance" from nearest vegetation canopy to mitigate blade-strike risks to protected fauna appears inadequate, and inconsistent with the above and other considerations including precedents set for other windfarms which involved more extensive set-backs.	Additional justification for turbine placement along the ridgeline adjacent to Ben Halls Gap Nature Reserve is provided in Section 7.1.1. Details are provided around the different considerations resulting in the current placement of the turbines including wind energy generation, minimisation of biodiversity impacts, residual impacts and potential increases to impacts resulting from changes to layout in that location.

Item	Agency	Summary of Agency comments	How / where addressed
23	NPWS	Proponent would be willing to consider a contribution to wild dog/fox baiting programs if required, and this is both welcomed and recommended.	Additional proposed mitigation measures and information provided in Section 8.9 "Mitigation and Managing Impacts", Table 87, B11 as well as Section 8.10.1 "Biodiversity Management Plan". The proponent has committed to ongoing consultation and participation with NPWS and LLS on their annual vertebrate pest baiting programs including a financial contribution capped at $5k per annum to cover any additional costs of aerial baiting programs as a result of rotary aircraft (as opposed to fixed wing) being required to improve safe operating practice.
24	NPWS	Impacts to Sphagnum Moss and potential TEC listing. Inappropriate fire regimes are regarded as a key threatening process, which has implications for turbines' potential to impact NPWS and other aerial fire management operations.	Additional information provided in Section 4.3.3, Section 8.5and Section 8.9 including that the bushfire strategy developed for the project will include measures to minimise risk of bushfire to the Sphagnum Moss TEC, including: • Increase the accessibility of the ridgeline to fire fighters and improve strategic fire advantages that already exist. • Access to water will be maintained such that existing water resources will remain available at all times to support firefighting activities. • Extension of the strategic fire zone from NHPNR. • Upgrades to the access road network to RFS fire trail standards. • Increased water storage. Further information is updated in projects commitments for bushfire responses provided in the RFI.

Table 5 Summary of March 20220 comments in repsonse to the BBAMP framework

Item	Agency	Summary of Agency comments	How / where addressed
1	BCS	The BBAMP framework could be improved by including objectives to avoid and mitigate impacts to biodiversity during the operation of the wind farm. Where impacts cannot be avoided or mitigated, offsets for these residual impacts will be required.	Updates have been provided throughout Section 8.10.2.
2	BCS	Biodiversity credit quanta for bird and bat strikes be reviewed and fully justified: • Credit quanta should be calculated according to the conservation status of the individual species impacted. • Calculation of credits should be done every twelve months as part of the annual review. • Offsets should be calculated based on the maximum estimated number of fatalities for the preceding twelve months.	Additional detail has been provided in Section 8.10.2. in terms of credit generation, the commitment has been made for "the amount of credits required to be offset would be calculated by the number of actual and modelled impacts in the preceding 12 months, accounting for scavenger impacts, to individual species in a given year, multiplied by the biodiversity risk weighting (BRW) for the relevant species". This method is commensurate with the Equation 3 (Section 10.1.3) of the BAM for calculating species credit requirements for flora species assessed by a count of the number of individuals, which is aligned with the calculation of offsets required for impacts to individual bird and bat strikes. This differs from the approach put forward by BCS, however Biosis believes it captures the relevance of a current threatened listing for a species, and is in accordance with the expectations of BAM implementation for prescribed impacts (Section 8.6 of the BAM).
3	BCS	Actual strike rates be used as triggers rather than percentages of individual species' populations. Additional triggers for corrective action are identified which are focused on actual strikes rates which have been extrapolated and analysed during annual reporting. A detailed monitoring plan will need to be provided to BCS for endorsement should percentage of population number triggers be pursued.	These suggestions have been noted and updated throughout Section 8.10.2, however Biosis has maintained the option for calculation of impacts (and associated triggers) at the population scale, as if this can be determined it will provided more ecologically meaningful targets and ongoing assessment of impacts.
4	BCS	More detail to be included on how turbine risk ratings are to be determined.	Updates have been provided throughout Section 8.10.2 with links to relevant sections of the BDAR to which this refers including Section 8.3.3 Updated turbine risk assessment.
5	BCS	The Tier 1 alert for non-threatened 'at-risk' species and low risk species should be changed to a trigger of two or more carcasses, feather spots or injured individuals of a single species, found under or close to a wind turbine during any mortality	These suggestions have been noted and updated in Section 8.10.2.

Item	Agency	Summary of Agency comments	How / where addressed
		search or incidentally by wind farm personnel. The Tier 2 impact trigger for all non-threatened species should be more than four carcasses, feather spots, or injured individuals of a single species, found under or close to a wind turbine within a two-month cycle.	
6	BCS	Lists of threatened and non-threatened at-risk species be included in the BBMAP framework.	Updates have been provided throughout Section 8.10.2 with links to relevant tables within the BDAR Table 66 and Table 70.
7	BCS	Mitigation implementation protocols be included in the BBAMP framework.	Updates have been provided throughout Section 8.10.2.
8	BCS	Monitoring of all turbines following their commissioning be conducted over twelve months, ensuring all seasons are covered. Monthly carcass searches of turbines should be conducted for the first five years of operation, using trained dogs for at least the first two years. The monitoring program be reviewed at two years.	Updates have been provided in Section 8.10.2, including monthly monitoring for the first six months following commissioning of turbines, however this must include the first spring/summer season following commissioning of turbines, and therefore may be extended in duration, including follow up pulse searches.
9	BCS	The BBAMP framework should include clear links between tiers, triggers, and actions.	Updates have been provided throughout Section 8.10.2.

BCS - Request for additional information April 2022

Following submission of the updated BDAR in March 2022 another RFI was received from BCS, requesting the proponent again provide further information on a number of key items. These items have been addressed in the current version of the BDAR, and where and how each RFI item has been addressed is detailed in Table 6 below.

Table 6 Summary of April 2022 RFI comments and where/how they are addressed

Item	Agency	Summary of Agency comments	How / where addressed
1.1	BCS	Justification for the selection of PCTs in vegetation zones where BAM plots were undertaken is satisfactory.	Noted. No further action required.
1.2	BCS	Where rapid assessment plots were used to determine Plant Community Types this should be clearly stated.	Noted. Updated accordingly within BDAR.
2.1	BCS	Justification has been provided for the use of BAM plots outside the project footprint.	Noted. No further action required.
3.1	BCS	BCS is satisfied that the potential effects of using benchmark plot data have been adequately explained.	Noted. No further action required.
4.1	BCS	Field data has been checked for accuracy and is consistent with that entered into the BOAMs cases.	Noted. No further action required.
5.1	BCS	BCS and NPWS will review the BBAMP once it is developed.	Noted. Following on from the framework provided within the BDAR, ongoing consultation with BCS and NPWS will be undertaken throughout the formalisation of the final Bird and Bat Adaptive Management Plan (BBAMP), which will also be provided to BCS and NPWS for endorsement once completed.
5.2	BCS	The commitment to share all monitoring data with DPE and DAWE annually and make it publicly available on the project's website is noted.	Noted. As provided within the BDAR, this commitment will be detailed further within the BBAMP.
5.3	BCS	The spacing of turbines be revised to a minimum of 400 metres.	The average distance of turbines spacing across the entire site is approximately 423 m (from rotor hub to rotor hub). Of the 29 turbines considered to have an increased inherent risk of operational biodiversity impact based on multiple parameters, and therefore precautionary identified as 'medium' risk, 17 have a spacing below 400m, and between 290m and 392m. Of these 17, consideration and investigation of relocation options has been undertaken, as well as an option to remove one turbine (WP41), allowing shuffling of turbines adjacent to BHGNR (WP39 – WP46) to achieve a minimum 400m spacing minimum in this region of the site. Additionally, this also creates a 1.2 km east-west corridor between WP40 and WP42 immediately adjacent to BHGNR. Relocation and removal of turbines in this location is proposed primarily to reduce potential impacts associated with barrier effects and habitat displacement for

Item	Agency	Summary of Agency comments	How / where addressed
			bird species in a medium risk portion of the site, but will also have a subsequent benefit of reducing impacts associated with blade strike for both birds and bats. To further reduce impacts associated with barrier effects and displacement, and also relevant for item 7.2 and 7.3, it is proposed as a proactive smart curtailment strategy has been committed to and will be included in the BBAMP, where certain turbines be curtailed (have increased cut in speeds consistent with Annexure A) upon commissioning during peak microbat activity season (with seasonal timing to be determined from ongoing baseline microbat monitoring surveys) and monitored during this period and shoulder periods. Trial periods and monitoring would be undertaken for example, during the first two years of operation, to determine if this is continued to be a requirement, and if results are negligible or positive, then this requirement may be removed and monitored as part of the BBAMP. This is in conjunction with other mitigation measures within the framework detailed within Section 8.10.2 the BDAR and BBAMP. Risk assessment for collision risk and barrier effects would be reassessed and revised accordingly within the BDAR if relevant, based on the new locations and spacing's of turbines. The updated risk assessments are included in Section 8.3.
5.4	BCS	Commitments for adaptive management, additional mitigation, and compensatory measures to mitigate impact resulting from displacement and barrier effects be provided in the BBAMP.	Noted. As per 5.1.
6.1	BCS	BCS is satisfied with the mitigation measures proposed for potential microbat roosting sites within the development footprint.	Noted. No further action required.
7.1	BCS	The BBAMP will contain a monitoring plan, trigger points and likely mitigation measures. BCS and NPWS will review the BBAMP once it is developed.	Noted. As per 5.1.
7.2		Additional avoidance and minimisation for impacts to SAII microbats should be considered during the planning and detailed phase of the project	As impacts to microbats, particularly those listed as potential SAII entities, are highly uncertain, and inherent risks to these species still remain, regardless of increased turbine spacing or relocation (as per item 5.3), and in addition to existing reactive mitigation measures proposed in the BDAR, additional proactive mitigation commitments can be investigated in preparation of the BBAMP. Trail periods and monitoring could be undertaken during the first two years of operation to determine

Item	Agency	Summary of Agency comments	How / where addressed
			if this continued to be required, and results are negligible or positive, then this requirement may be removed as part of the BBAMP. Furthermore, commitments will be made to feather rotor blades to prevent the rotor from turning until the rated cut-in wind speed is reached. This curtailment involves no loss of electricity generation. Further information on low wind speed curtailments is provided below this table. A consideration also being undertaken, is to ensure scheduled maintenance of medium risk turbines is conducted as far as practicable and possible during periods of peak months of microbat activity (as determined from ongoing baseline microbat monitoring surveys), increasing and concentrating non-operational periods with times of likely higher bat activity, reducing potential impacts to these species further. Further detail is provided in Section 8.10.2 the BDAR.
7.3		If the deletion of specific turbines is to be proposed, medium risk turbines and turbines adjacent to Ben Halls Gap National Park should be prioritised	Following further investigation, the medium risk turbine, WP41 has been removed, and others adjacent to BHGNR be spaced further apart to a distance >400m. Upon determination of the final turbine supplier, associated technical parameters and layout implications, the risk assessment will be updated in the context of the additional bat monitoring data to reassess the risk rating to turbines committed to be constructed. This may further result in a commensurate reduction of potential blade strike impacts.
7.4	BCS	The approach outlined to calculate the offset requirements for prescribed impacts relating to blade strike should be reviewed annually to determine whether strike rates warrant adjustment of the offset calculations.	Noted. To be included in the BBAMP.
8.1	BCS	BCS will provide advice regarding offset requirements for the Greater Glider once guidance has been received from DAWE.	Noted. Advice regarding this point will be provided by BCS once it is received from DAWE.
9.1	BCS	BCS accepts the species polygons for Koala, Eastern Pygmy Possum and Squirrel Glider.	Noted. No further action required.
9.2	BCS	All potential breeding habitat for the Powerful, Masked and Barking Owls, as defined by the TBDC, be included within the species polygons	Species polygons for Powerful, Masked and Barking Owls have been amended to include the results of additional targeted surveys to be undertaken in June and

Item	Agency	Summary of Agency comments	How / where addressed
			September 2022, and include areas where potential breeding habitat that remains following the completion of surveys. Survey plans for both habitat assessment and targeted nocturnal surveys were developed in consultation with BCS.
9.3	BCS	An upper quantum of impact for Powerful, Masked and Barking Owls be determined	An upper quantum of impacts was determined based on the results of targeted habitat surveys, however this upper quantum was subsequently refined, at the request of BCS, through further targeted nocturnal survey. Detailed in Section 5.4.2 of the BDAR.
9.4	BCS	The proponent liaise with BCS when planning targeted surveys for Powerful, Masked and Barking Owls	A plan was provided for consultation prior to surveys commencing
10.1	BCS	The BOAMs cases are now correctly aligned with relevant IBRA subregions.	Noted.
10.2	BCS	Update Section 3.2.1 of the BDAR to include the calculated vegetation cover for IBRA subregions within each BAM-C case.	Section 3.2.1 has been updated with additional information requested.
10.3	BCS	Clarification and justification of ecosystem species that have been removed as predicted species is required.	Table 32 has been reviewed in context of the BAM-C for ecosystem species per IBRA region. Clarification or justification are provided accordingly.
10.4	BCS	Clarification and justification of exclusion of candidate species credit species for each IBRA subregion is required.	Table 33 and Appendix C have been updated in context of the BAM-C for candidate species per IBRA region. Clarification or justification are provided accordingly.
11.1	BCS	BCS supports the establishment of BSAs where these secure landscape connectivity with existing reserves and would welcome the opportunity to review the Biodiversity Offset Strategy once it is prepared to assess the potential for indirect impacts to potential BSAs.	Biodiversity Offset Strategy will be provided for consultation to BCS when completed
12.1	BCS	Address the potential impacts on all identified EPBC listed threatened entities. If species have been determined as unlikely to occur, justification on their exclusion must be provided.	Section 6 has been updated accordingly.

BCS - Request for additional information August 2022

Following the April 2022 RFI received from BCS a technical memo detailing the updates outlined in Table 6 above was provided to BSC for comment. The technical memo detailed the proposed layout changes aimed to reduce the potential for impacts associated with barrier effect, the results of the targeted owl habitat surveys, and updated SAII assessments for Large-eared Pied Bat, Large Bent-wing Bat and Little Bent-winged Bat, following BSC' concern around the potential for operation impacts to the species. This SAII assessment also provided the details of the proactive 'smart curtailment' strategies that have now been committed to by the Proponent. Further comment of the technical memo was received from BCS in August 2022, which is detailed in Table 7 below. All aspects of this technical memo, and subsequent BCS comment received have now been incorporated into the current version of this BDAR.

Table 7 Summary of April 2022 RFI comments and where/how they are addressed

Item	Agency	Summary of Agency comments	How / where addressed
1.1	BCS	BCS supports the increased hub height from 135 metres to 150 metres and reduced blade length from 85 metres to 82 metres	Noted. This has been accomplished by refinement of turbine supplier and has resulted in a reduction in the potential for blade strike so a range of species.
1.2	BCS	BCS supports the implementation of an adaptive low wind-speed turbine curtailment strategy.	Noted. The details of the strategy are included in Section 7.1 below.
1.3	BCS	BCS notes that further investigation will be undertaken into microbat activity levels as part of the development of the BBAMP.	Noted. This commitment in included in Section 7.1 and Section 8.10.2 below.
1.4	BCS	The commitments made to mitigation measures must be underpinned by a rigorous monitoring program involving at least five years of carcass searches by conservation detection dogs and a robust Trigger Action Response Plan (TARP).	Noted. This commitment in included in Section 8.10.2 below.
2.1	BCS	Provide an analysis and evaluation of options for the location of turbines identified as moderate risk.	Further justification of turbine placement is provided in Section 7.1 below.
2.2	BCS	Where impacts are unable to be avoided through relocation, serious consideration should be given to removing turbines from the array.	Further justification of turbine placement is provided in Section 7.1 below.
2.3	BCS	Where moderate risk turbines are unrelocatable and proposed to be retained detailed justification will be required.	Further justification of turbine placement is provided in Section 7.1 below.
3.1	BCS	Avoid indirect impacts to the biodiversity values and ecosystem function protected by the Ben Halls Gap Nature Reserve.	Further justification of turbine placement is provided in Section 7.1 below, with further assessment of indirect impacts provided in Section 8.3 and Section 8.5.
3.2	BCS	If impacts cannot be completely avoided via relocation of turbines then further turbines should be deleted	Further justification of turbine placement is provided in Section 7.1 below.

Item	Agency	Summary of Agency comments	How / where addressed
		from the array.	
4.1	BCS	BCS is satisfied that the methodology to survey potential owl breeding habitat employed is as agreed.	Noted. Details of method employed are provided in Section 5.3.2.
4.2	BCS	Spatial files of owl polygons and areas surveyed should be provided to BCS to allow confirmation that all potential habitats have been surveyed.	Noted. Spatial files are provided with the BDAR.
5.3	BCS	Any further surveys to refine the quantum of impact to owl breeding habitat and determine the presence/absence of nest trees should be completed prior to project approval.	Further nocturnal survey targeting the presence of breeding owls within areas of potential habitat were undertaken in September 2022. The methods employed, and results of these surveys are provided in Section 5.3.2 and Section 5.4.2 respectively. Analysis of the potential impacts based on the findings of these surveys has been undertaken in Section 8.
4.4	BCS	Further survey work will need to include nocturnal surveys employing call-playback and stag watch surveys.	Surveys as outlined above included call-playback and stag watching, and were developed in consultation with BCS.

Environmental assessment requirements

The below table lists the Secretary's environmental assessment requirements (SEARs) relevant to biodiversity and where they are addressed in this report.

Table 8 SEARs relevant to biodiversity

SEARs No.	Secretary's requirement	Where addressed
Key issues – Biodiversity (1)	The EIS must assess biodiversity values and the likely biodiversity impacts of the development including impacts associated with transport route road upgrades in accordance with the *Biodiversity Conservation Act 2016* (NSW), including a detailed description of the proposed regime for minimising, managing and reporting on the biodiversity impacts of the development over time, and a strategy to offset any residual impacts of the development in accordance with the *Biodiversity Conservation Act 2016* (NSW).	All sections of this BDAR.
Key issues – Biodiversity (2)	The EIS must assess the impact of the development on the National Estate in accordance with the Guidelines for Development Adjoining Land and Water Managed by DECCW (OEH, 2010).	Section 4, 5, 7 and 8 of this BDAR.
Key issues – Biodiversity (3)	The EIS must assess the impact of the project on birds and bats from blade strikes, low air pressure zones at the blade tips (barotrauma), and alteration to movement patterns resulting from the turbines and considering cumulative effects of other wind farms in the vicinity.	Section 4, 5, 7 and 8 of this BDAR.

Relevant agency SEARs requirements are also provided in Table 9.

Table 9 Agency SEARs requirements relevant to the project

Assessment requirements	How addressed
DPI Fisheries	
Assess the impact of the design, construction and operation of waterway crossings on access roads across the site in accordance with NSW Fisheries (2013) Fisheries Policy and Guidelines Fish Habitat Conservation and Management (2013 update) and Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings.	Section 8.4 and 8.5 of the BDAR.
Department of Planning, Industry and Environment	
Biodiversity impacts related to the proposed development are to be assessed in accordance with Section 7.9 of the Biodiversity Conservation Act 2017 the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the Biodiversity Conservation Act 2016 (s6.12), Biodiversity Conservation Regulation 2017 (s6.8) and Biodiversity Assessment Method, unless OEH and DPE determine that the proposed development is not likely to have any significant impacts on biodiversity values.	Addressed throughout this document.

Assessment requirements	How addressed
The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method.	Section 7, 8 and 9 of this BDAR.
The BDAR must include details of the measures proposed to address the offset obligation as follows. • The total number and classes of biodiversity credits required to be retired for the development/project. • The number and classes of like-for-like biodiversity credits proposed to be retired. • The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules. • Any proposal to fund a biodiversity conservation action. • Any proposal to conduct ecological rehabilitation (if a mining project). • Any proposal to make a payment to the Biodiversity Conservation Fund. If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.	Section 9 of this BDAR.
The BDAR must be submitted with all spatial data associated with the survey and assessment as per Appendix M of the BAM.	All data will be provided upon submission to DPE.
The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2020 under s6.10 of the *Biodiversity Conservation Act 2016*.	Section 1 of this BDAR.
The EIS must map the following features relevant to water and soils including: • Rivers, streams, wetlands, estuaries (as described in s4.2 of the Biodiversity Assessment Method). • Wetlands as described in s4.2 of the Biodiversity Assessment Method.	Section 3 of this BDAR.
Fauna survey is to be conducted in native vegetation adjacent to the development site, including Ben Halls Gap Nature Reserve and Ben Halls Gap State Forest.	Section 4 and 5 of this BDAR.
Assessment of impact is to include all components of the proposal, including any road/track widening to enable transport of turbines to the site.	Sections 4, 5, 7 and 8 of this BDAR.
Hollow-bearing trees are to be quantified on the development site and in adjacent native vegetation.	Sections 4 and 5 of this BDAR.
A candidate list of species that may use the development site as a flyway or migration route must be included in the EIS, including: (a) resident threatened aerial species (b) resident raptor species (c) nomadic and migratory species that are likely to fly over the project area.	Section 5 and 7 of this BDAR. Appendix D of this BDAR.
Bird and bat flight paths are to be identified and assessed. Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site are to be included in the EIS.	Section 5, 7 and 8.5.8 of this BDAR. Appendix D of this BDAR.
The cumulative effect of wind farms in the broader area should be considered in relation to migratory birds.	Section 8.5 and 8.9 of this BDAR.
Copies of all raw data sheets for flora and fauna studies are to be included in the EIS or provided to OEH.	To be provided.
ArcGIS compatible spatial data is to be provided including (but not limited to) vegetation	To be provided

Assessment requirements	How addressed
mapping, plot locations, transect locations and the locations of turbines and other infrastructure.	

On the 23 December 2019, the (now) DCCEEW determined the project was a controlled action under section 75 of the EPBC Act. Controlling provisions for the proposed action are listed threatened species and communities (section 18 and 18A) and listed migratory species (section 20 and 20A). Table 10 details the specific assessment requirements identified by DCCEEW for these matters.

Table 10 DCCEEW assessment requirements for the proposal.

DCCEEW requirement	Assessment requirements	How addressed
General (5)	The Environmental Impact Statement (EIS) must address all matters outlined in Schedule 4 of the EPBC Regulations and all the matters outlined below in relation to the controlling provisions.	This BDAR.
General (10)(a)	The EIS must include an assessment of the relevant impacts of the action on the matters protected by the controlling provisions, including: • A description and detailed assessment of the nature and extent of the likely direct, indirect, and consequential impacts, including short term and long-term relevant impacts.	Section 6 of this BDAR.
General (10)(b)	• A statement whether any relevant impacts are likely to be unknown, unpredictable, or irreversible.	Section 6, 7 and 8 of this BDAR.
General (10)(c)	• Analysis of the significance of relevant impacts.	Section 6 of this BDAR.
General (10)(d)	• Any technical data and other information used or needed to make a detailed assessment of the relevant impacts.	To be provided.
General (11)(a)	For each of the relevant matters protected that are likely to be significantly impacted by the action, the EIS must provide information on proposed avoidance and mitigation measures to manage the relevant impacts of the action including: • A description and an assessment of the expected or predicted effectiveness.	Section 6, 7 and 8 of this BDAR.
General (11)(b)	• Any statutory policy basis for the mitigation measures.	Section 6, 7 and 8 of this BDAR.
General (11)(c)	• The cost of the mitigation measures.	Detailed costs to be prepared as part of future design phases.
General (11)(d)	• An outline of an environmental management plan that sets out the framework for continuing management, mitigation, and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing.	Section 6, 7 and 8 of this BDAR.
General (11)(e)	• The name of the agency responsible for endorsing or approving each mitigation measures or monitoring program.	NSW DPE and DCCEEW.

DCCEEW requirement	Assessment requirements	How addressed
General (12)	Where a significant residual adverse impact to a relevant protected matter is considered likely, the EIS must provide information on the proposed offset strategy, including discussion of the conservation benefit associated with the proposed offset strategy.	Section 9 of this BDAR. Offsets to be delivered under the NSW BOS.
General (13)	For each of the relevant matters likely to be impacted by the action, the EIS must provide reference to and consideration of, relevant Commonwealth guidelines and policy statements including any: • Conservation advice or recovery plan for the species or community. • Relevant threat abatement plan for a process that threatens the species or community. • Wildlife conservation plan for the species. • Any strategic assessment.	Section 6 of this BDAR.
Key Issues – Biodiversity (1)	The EIS must identify each EPBC Act listed threatened species and community and migratory species likely to be impacted by the action. For any species and communities that are likely to be impacted, the Proponent must provide a description of the nature, quantum, and consequences of the impacts. For species and communities potentially located in the project area or in the vicinity that are not likely to be impacted, provide evidence why they are not likely to be impacted.	Section 5 and 6 of this BDAR.
Key Issues – Biodiversity (2)(a)	For each of the EPBC Act listed threatened species and communities and migratory species likely to be impacted by the action, the EIS must provide a separate: • Description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of and reference to any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans.	Section 5 and 6 of this BDAR.
Key Issues – Biodiversity (2)(b)	• Details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements.	Section 5 and 6 of this BDAR.
Key Issues – Biodiversity (2)(c)	• Description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action.	Section 7 of this BDAR
Key Issues – Biodiversity (2)(d)	• Identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are considered.	Section 6 of this BDAR.
Key Issues – Biodiversity (2)(e)	• Description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established.	Section 9 of this BDAR.
Key Issues – Biodiversity (2)(f)	• Details of how the current published NSW Biodiversity Assessment Methodology has been applied in accordance with	Section 4, 5, 6 and 7 of this BDAR.

DCCEEW requirement	Assessment requirements	How addressed
	the objects of the EPBC Act to offset significant residual adverse impacts.	
Key Issues – Biodiversity (2)(g)	• Details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the NSW biodiversity Assessment Methodology and/ or mapping and descriptions of the extent and condition of the relevant habitat and/ or threatened communities occur on proposed offset sites. [Note: For the purposes of approval under the EPBC Act, it is a requirement that offsets directly contribute to the ongoing viability of the specific protected matter impacted by a proposed action and deliver an overall conservation outcome that improves or maintains the viability of the MNES i.e. 'like for like'. Like-for-like includes protection of native vegetation that is the same ecological community or habitat being impacted (preferably in the same region where the impact occurs), or funding to provide a direct benefit to the matter being impacted e.g. threat abatement, breeding and propagation programs or other relevant conservation measures.]	Section 9 of this BDAR.
Key Issues – Biodiversity (2)(h)	• Any significant residual impacts not addressed by the NSW Biodiversity Assessment Methodology may need to be addressed in accordance with the EPBC Act Environmental Offsets Policy.	Section 9 of this BDAR.

The following table summarises key submission issues raised by agencies and organisations and where they have been addressed in the amended BDAR.

Table 11 Biodiversity-related submission comments

Issue raised	Project response
BCS (Biodiversity, Conservation and Science Directorate	
Given the nature of the project, the Proponent may wish to stage construction.	• Section 1.6 of the Updated BDAR provides a description of the proposed project staging.
Not all components of the BAM assessment were included in the BDAR. The BDAR should be updated to fulfil the requirements of the BAM as described in Appendix L of the BAM.	• Section 1.9 includes an update to report structure and overall BAM assessment.
The field data sheets should be provided as an appendix to the BDAR for a more complete BAM assessment.	• Appendix H includes the field data that was collected electronically.
The method used to determine non-native vegetation must be clearly articulated. Justification for areas of non-native vegetation must be clearly provided in the BDAR. The selection of PCTs has not been adequately justified. Justification should be provided in the BDAR for the selection of all PCTs. All vegetation zones must be clearly mapped.	• Section 4.1.3 provides criteria used to assign PCTs, vegetation condition class, and determination of non-native vegetation. • PCT justification, based on plot data, descriptions and photographs are provided in Appendix B. • Section 4.1.4 provides information about the existing and additional 24 BAM plots and justification for

Issue raised	Project response
Inclusion of vegetation plots located outside the project footprint must be justified. Where vegetation plots are not located in the project footprint, justification must be provided, including evidence that the plot is in the correct PCT and vegetation zone, and that the plot data are consistent with other plot data collected in that vegetation zone.	existing plots being located outside of Development Footprint (but within representative vegetation zones). Plot data was interrogated and used to justify PCT selection. • Figure 7 provides vegetation zone mapping. • Section 4.2 Vegetation Communities has been updated.
Permanent and temporary impacts for each vegetation category should be presented. A table should be created that states the permanent and temporary impacts for each vegetation category: exotic grassland, planted vegetation, cleared land and each PCT to clearly reconcile impacts across the development footprint.	• Table 27 summarises the PCTs, vegetation zones, extent, integrity score, and associated TECs for the total combined development footprint. This data has been used to reassess the project's overall impacts. • Table 12 provides a summary of permanent and temporary impacts of the project.
Ecosystem species have been included in discussions regarding species credit species. Table 21 of the BDAR should contain only species credit species.	• Table has been updated.
Inconsistencies exist between the field data and the data in the BAM calculator. Ensure that all data entered in the BAM-C is consistent with the field data.	• The BAM Calculator has been revised and submitted with this updated BDAR.
Serious and Irreversible Impacts (SAII) have not been addressed. A standalone section addressing serious and irreversible impacts as required by sections 9.1.2 and 9.1.3 of the BAM for all listed entities known or likely to occur in the assessment area is required.	• Section 8.6 has been updated and provides a summary of the detailed assessment. Appendix E provides detailed SAII assessments.
The potential impact to fauna relating to turbine placement has not been adequately addressed. The potential impacts of turbine spacing should be addressed as prescribed impacts.	• Section 8.3.2, 8.3.3 and 8.5 have been updated to include a qualitative risk assessment of turbine strike and to address impacts prescribed by the BAM.
Prescribed impacts relating to wind farms have not been adequately addressed: • Further assessment of the potential for blade strike on fauna, particularly microbats, is required. • Proposed mitigation measures for prescribed impacts such as blade strike and barotrauma should be presented in the BDAR. • Options to compensate for unavoidable prescribed impacts, and the decision pathway and justification for suggested credit numbers or other compensatory actions, should be clearly documented in the BDAR.	• Section 8.3.2 and Section 8.3.3 have been updated to include a qualitative risk assessment of turbine bird and bat strike. • Section 8.5 has been included to assess prescribed impacts. • Section 8.9 describes mitigation measures for prescribed and indirect fauna impacts. • Local offset feasibly has been assessed through in a biodiversity offset strategy including a combination of field surveys and desktop analysis or target properties. Information on the estimated available local credits is provided in Section 9.1.2. This is expected to provide further options to compensate for unavoidable impacts.
Direct impacts on cave bat roosts needs to be clarified. Justification is required for the placement of turbines within cave bat roosting habitat buffers.	• The project will not result in any direct impacts to cave bat roosts, nor will any project infrastructure occur within cave bat roosting habitat buffers, based on both field assessment and design revisions.

Issue raised	Project response
	• Section 5.4.2 includes the detailed findings of additional desktop assessment, ground-truthing surveys, and geomorphological assessment of potential microbat roots surrounding the development footprint. • Figure 15 provides the updated mapped microbat roosting habitat areas. • Appendix E provides details associated with assessments undertaken in accordance with serious and irreversible impact assessment, providing further assessment of impacts to cave roosting bats. • Section 8.5 provides an assessment of the prescribed impacts of the project to bats. • Appendix F includes advice regarding the presence of geological features of significance within the assessment area and in the broader landscape. Section 3.1.6 summarises this information.
Indirect impacts on microbats have not been adequately addressed. Further study to determine the size, extent and nature of the local bat population is required.	• Section 5.4.2 includes updated additional assessment of the microbat local microbat population. • Section 8.3.1 includes a qualitative risk assessment for indirect impacts to the local microbat population. • Section 8.5 has been included to assess prescribed impacts, many of which are indirect impacts to microbats. • Section 8.9 describes mitigation measures for prescribed and indirect fauna impacts. Appendix E provides details associated with assessments undertaken in accordance with serious and irreversible impact assessment, providing further assessment of impacts to cave roosting bats.
Additional assessment of a locally important population of the greater glider is required. Further justification should be provided as to why the local population of the greater glider is not considered an important population.	• Section 8.8.5 and Table 85 includes an updated EPBC Act significant impact assessment for Greater Glider and provides evidence population does not constitute an important population.
The surveys completed for large forest owls are inadequate. Either additional surveys for large forest owls (equating to that required for a 90 percent probability of detection) be conducted, or an expert report be obtained, to confirm the presence or absence of large forest owls.	• See above. • The approach to mapping breeding habitat species credit polygons is provided in Section 5.5. • Figure 21 provides updated habitat mapping. • Table 70 provides a qualitative risk assessment for potential blade strike to birds including assessed owl species. • It should be noted that WP31 previously intersected with what has now been modelled to be owl breeding habitat, and was subsequently removed from the design.
NPWS	
In response to Appendix D, p. 3 | 1.5 km buffer around footprint includes a significant	• The 1.5 km buffer exists only for assessment of landscape context and connectivity around the

Issue raised	Project response
portion of both BHGNR and CPNP, yet very few survey points were undertaken within this buffer, and only 100 metres into BHGNR. NPWS recommends a robust survey be conducted within the 1.5 km buffer.	development footprint. It is a standard requirement of the BAM, and only requires desktop analysis and mapping of specific landscape features. There is no requirement to undertake detailed survey within the 1.5 km buffer under the BAM. • Ecological surveys were carried out within the subject land development footprint and within a 100-metre buffer along the project boundary with Ben Halls Gap Nature Refuge. • The abbreviations, glossary and Section 1.5 have been updated to clarify where field surveys were undertaken and the scope of the desktop searches required within the landscape assessment buffer.
In response to Appendix D, p. 73-74 | Weather conditions at Quirindi Post Office were used. Murrurundi Gap weather conditions are closer to those experienced in the higher parts of the survey area. The difference in temperature between Quirindi and higher elevations should be noted. Sub-zero temperatures are regularly experienced during winter. Why wasn't data from the Meteorological Masts located at the site used? NPWS recommends a more accurate assessment of weather conditions be conducted at higher elevations during the survey.	• Section 4.1.2 has been updated to include climate details at Murrurundi GAP AWS.
In response to Appendix D, Table 21 | Booroolong Frog – known from Barnard River in BHGNP, Wombramurra Creek (close to CPNP) and a tributary to the Isis River in CPNP. NPWS recommends sediment controls to be in place close to origin of potential sediment to prevent soil movement in the landscape and impacting on streams.	• Section 8.8.6 provides a detailed assessment of Booroolong Frog habitat and impacts in accordance with the EPBC Act requirements. • The Proponent will implement an Erosion and Sediment Control Plan in the Construction Environmental Management Plan. This will include identification of sensitive receivers, such as waterways and adjacent protected areas, with measures provided in Table 87 in Section 8.9 of this BDAR. • Significant impacts to EPBC listed Booroolong Frog have been avoided with project design amendments reducing impact to the Booroolong Frog habitat from 1.59ha to 0.95ha.
In response to Appendix D | Ben Halls Gap Sphagnum Moss Cool Temperate Rainforest EEC occurs adjacent to the proposed project. It is vulnerable to sediment entering the streams due to soil disturbance in track construction. This was identified as an issue in meetings with the Proponent and has not been addressed in the BDAR. NPWS recommends incorporating Ben Halls Gap Sphagnum Moss Cool Temperate Rainforest EEC in the BDAR assessment, with appropriate mitigating measures.	• Section 4.3 of the Updated BDAR makes reference to the location of the Sphagnum Moss TEC in the adjacent Ben Halls Gap Nature Refuge, however the location of this TEC is not mapped on Figure 9 to protect its location. • Table 87 in Section 8.9 of the Updated BDAR has also been amended to make reference to management of stormwater and runoff on the Sphagnum Moss TEC. • An updated assessment of site gradients and risk to this community is updated in the Soil and Water report including project commitments to avoid impact in the EIS (Someva 2021)

Issue raised	Project response
Appendix D 5.3.2 | Refers to survey locations being shown on Figure 9. Figure 9 is not included in the document. Supply Figure 9.	• Figure 12 (previously Figure 9) includes all fauna survey locations.
Appendix D | The ridgeline (watershed) is shown in the wrong place. This means O&C and a number of WTGs SW of park drain into park, intersects with headwaters of Brayshaws Creek and Ben Halls Gap Nature Reserve Sphagnum Moss Cool Temperate Rainforest EEC. Based on this information, there is potential for sedimentation to impact on these creek lines. With correct information, the project area impacts on the Brayshaws Creek catchment, as discussed with the Proponent prior to release of the EIS. Correct the map and develop mitigating measures to prevent sediment impacting Brayshaws Creek and Ben Halls Gap Nature Reserve Sphagnum Moss Cool Temperate Rainforest EEC.	• The ridgeline shown on the site maps and the location maps has not been drawn to represent the boundary of the watershed, rather it shows indicative fauna movement corridors across the ridgeline. The BAM requires fauna corridors to be identified and mapped by the accredited assessor.
Appendix D | Site maps reference DPIE, 2020. This is not included in reference list.	• This reference has been included in the reference list of the Updated BDAR to make reference to the DPIE (2020) Biodiversity Values Map.
Hills of Gold Preservation Inc (HOGPI)	
List significant species in, and protection measures required for Ben Halls Gap Nature Reserve and Crawney Pass National Park. Take into consideration TEC including Ben Halls Gap National Park Sphagnum Moss Cool Temperate Rainforest located adjacent to the project area.	• Section 4.3 of the Updated BDAR makes reference to the location of the Sphagnum Moss TEC in the adjacent Ben Halls Gap Nature Refuge, however the location of this TEC is not mapped on Figure 9 to protect its location. • Table 87 in Section 8.9 of the Updated BDAR has also been amended to make reference to management of stormwater and runoff on the Sphagnum Moss TEC.
Assess and mitigate the cluttering effect on bird and bat strike of the southern cluster of turbines forming three fingers in an overlapping barrier of 27 turbines, placed unusually close together.	• This has been addressed in the updated Section 8.3 (specifically within Table 76) and Section 8.10.
State the duration of the five field studies in November 2018, August 2019, November 2019, February 2020, and August 2020.	• Section 4.1 details the vegetation and flora survey effort and duration • Section 5.3 details the threatened fauna survey effort and duration.
Provide a more in-depth study of the north eastern section of the wind farm project area. Local knowledge suggests Threatened Fragrant Pepperbush (*Tasmannia glaucifolia*) is extensive between the northern project area and Morrisons Gap Road and could potentially be impacted by roadside clearing to enable access.	• Table 35 provides survey efforts for the Fragrant Pepperbush. • It is assessed and acknowledged that the species occurs within eucalypt forest within PCT 934, 931 and 927. However, no individuals or populations were recorded within the development footprint during field surveys.

Issue raised	Project response
	• Preconstruction surveys will be undertaken to determine whether this is present on any modified final development footprint.
Conduct a thorough search for *Eucalyptus oresbia*, listed as vulnerable in NSW, which has been observed neighbouring the proposed project area, and can sometimes look like Mountain Gum.	• Habitat suitability within the majority of the subject land for *Eucalyptus oresbia* was assessed. It was concluded that the development footprint is not suitable to support this species due to the lack of 'very steep valleys and deeply incised creek lines with primarily south to southwest exposure' (NSW BioNet, DPIE 2021). Due to this habitat limitation, the species was excluded from assessment under the BAM. • Notwithstanding the habitat suitability constraints, the survey effort employed would have detected *Eucalyptus oresbia*. • Surveys for *Eucalyptus oresbia* were concentrated around Devil's Elbow and although found in the broader area, the species was not found to be present in the previous footprint, nor was it found to occur in the small areas to be impacted by the current footprint.
The impact on biodiversity and the effect of those impacts on the Peel River (and Chaffey Dam) and the Barnard River and Pages Creek and catchments.	• Section 3.1.3 describes the reduced impact to waterway crossings that has resulted from the project design changes described.
Concerns about the intent to clear some 487 hectares of vegetation – native and introduced – as well as direct and indirect impacts on the nearby Timor Caves and other geological features and also bats which roost in, and in forest around, the caves which they forage in the area proposed for the wind farm. The proximity to caves means clearing and erosion will be part of the impact in the hydrological process associated with caves and karst let alone the loss of flora for all animals and the insects which are the food source of microbats whether they be forest dependant or cave dependant species.	• The project has reduced the impact to native vegetation by 12% in this revised design and updated BDAR. This includes a reduction of 16% to high condition native vegetation. A total of 16 ha of native vegetation has been assessed as avoided in this updated layout and BDAR. There is now 190.54 ha of proposed impact to native vegetation, mostly in low to moderate condition. • Section 7 provides detail on the assessment and design process that was included to avoid and minimise impacts on biodiversity, including measures to reduce and avoid all direct impacts on cave bat roosts. • The project will not result in any direct impacts to cave bat roosts and indirect impacts have been minimised through turbine relocation and removal. • Section 5.4.2 includes the detailed findings of additional desktop assessment, ground-truthing surveys, and geomorphological assessment of potential microbat roots surrounding the development footprint. • Sections 5.4.2 and 5.5 includes the updated maps illustrating microbat habitat throughout the project area. • Section 8.3.1 provides a qualitative risk assessment for bat species.

Issue raised	Project response
	• Section 8.5 provides an assessment of the prescribed impacts of the project to bats. • Appendix E provides details associated with assessments undertaken in accordance with serious and irreversible impact assessment, providing further assessment of impacts to cave roosting bats. • Appendix F includes advice regarding the presence of geological features of significance within the assessment area and in the broader landscape. Section 3.1.6 summarises this information. • Section 8.5 provide additional assessment of the indirect impacts associated with bat strike. • Impacts associated with blade strike will be managed by the preparation and implementation of a Bird and Bat Adaptive Management Plan (BBAMP). The plan will be prepared prior to operation of the wind farm and implemented over the life of the project. Details are provided in Section 8.10.2.
Concern that the study undertaken to collect data on threatened species was only taken over a couple of short periods and is most likely considerably lacking in providing a holistic picture of species and their movements.	• Surveys were undertaken over a total of six separate seasonal survey events between spring 2018 to autumn 2021. This is considered a comprehensive survey effort and sufficient to capture seasonal variation in the biodiversity values present within the project area. • Table 34 provides the survey design employed and survey effort for each candidate species and demonstrates how survey effort is sufficient to meet the requirements of the BAM. Where survey effort was not sufficient and habitat for the species is present on the site, areas of habitat for these species has been mapped.
Tamworth Regional Council	
Lack of information in relation to Collision Risk for Bats and Birds. Appendix D contains data and modelling in relation to the collision risk for birds but does not include any modelling in relation to bats or nocturnal bird species such as owls. The report states that of the fifty-one (51) species of birds present in the development footprint, all of these have the capacity to fly at the same height as the turbine blades but only eighteen (18) bird species were recorded as doing so. The report goes on to state the risk of collision is estimated as being very low. The report includes little evidence to support this conclusion.	• Section 8.3.2 and Section 8.3.3 have been updated to include a qualitative risk assessment of turbine bird strike, including on the assumption that large owl species are present in the Project Area. • Section 8.5 has been included to assess prescribed impacts to bats. • Section 8.9 and 8.10 describe mitigation measures for prescribed and indirect fauna impacts. • Appendix E provides details associated with assessments undertaken in accordance with serious and irreversible impact assessment, providing further assessment of impacts to cave roosting bats.
Section 8.3 does address the potential impact of the wind turbines on threatened bat species within the development footprint and basically concludes that there is limited data on the heights that the bats will fly and forage. It states that the spacing between the turbines	• Section 8.3 has been updated provide a more detailed assessment of the risk of bat species and each turbine. • Section 8.5 provides prescribed impacts to the bats.

Issue raised	Project response
(ranging from 300m to 500m) will allow substantial locations for migrating and foraging bats to pass through the landscape. The report provides insufficient data/modelling to support this conclusion.	• Section 3.1.6 provides an updated area of geological significance for suitable habitat. • Section 8.10.2 and Appendix E provide further information. • Section 8.9 and 8.10 describe mitigation measures for prescribed and indirect fauna impacts. • Appendix E provides details associated with assessments undertaken in accordance with serious and irreversible impact assessment, providing further assessment of impacts to cave roosting bats.
Lack of information in relation to impact on fauna (particularly aerial fauna) located in the adjoining Ben's Hall Gap Nature Reserve (2,500 Ha) and Crawney National Park (310 hectare). It is strongly recommended that the indirect impacts from the wind turbines be examined within a 10 km buffer from the development footprint.	• Indirect impacts are assessed under chapter 8.3 including updates to chapter 8.3.2 Collision risk (birds). • The Collision Risk Modelling presented in the Updated BDAR and in Appendix D was supported by three seasons of field survey across the subject land.
Like the Biodiversity Offset Strategy, the BDAR states that a BBAMP will not be developed until after the wind farm is approved. It is strongly recommended that a BBAMP be submitted prior to final determination of the project.	• Section 8.10 provides more detail on the contents of a BBAMP including sections on the adaptive management recommendations and further project commitments. The final BBAMP will need to respond to the detailed design layout, operational requirements and additional baseline bird and bat monitoring data. • It is standard that a BBAMP is developed once detailed design of the project is further progressed following development consent being granted and prior to any turbines becoming operational. Nonetheless major components of the BBAMP are outlined in Section 8.10.2 and have been committed to be the Proponent.
Council officers have noted during site inspections, the presence of wombat holes across the development site. In this respect Council requires further expert information outlining the assessment of the impact of construction on these mammals and details of the proposed management, protection, and preservation of these mammals during the construction phase of the project.	• Table 87 in Section 8.9 of the Updated BDAR has been updated to make reference to wombat burrows and management as part of the Biodiversity Management Plan. • Section 8.10.1 provides details of occupation surveys for wombats as part of the measures outlined in the Biodiversity Management Plan. This includes: – Pre-clearing protocols, including pre-clearing inspections, establishment of exclusion zones and on-ground identification of specific habitat features to be retained and/ or relocated. – For example, occupation surveys for wombat burrows, application of exclusion measures/ deterrents prior to vegetation clearing/ earthworks, works undertaken in presence of spotter/ catcher.
Australasian Cave and Karst Management Association	
Concerns about the intent to clear some 487 hectares of vegetation – native and introduced – as well as direct and	• Section 3.1.6 provides an updated area of geological significance for suitable habitat.

Issue raised	Project response
indirect impacts on the nearby Timor Caves and other geological features and also bats which roost in, and in forest around, the caves which they forage in the area proposed for the wind farm. The proximity to caves means clearing and erosion will be part of the impact in the hydrological process associated with caves and karst let alone the loss of flora for all animals and the insects which are the food source of microbats whether they be forest dependant or cave dependant species.	• Section 7 provides detail on the assessment and design process that was included to avoid and minimise impacts on biodiversity, including measures to reduce and avoid all direct impacts on cave bat roosts. • Section 8.3 and Section 8.5 provide additional assessment of the indirect impacts associated with bird and bat strike. • Impacts associated with blade strike will be managed by the preparation and implementation of a Bird and Bat Adaptive Management Plan (BBAMP). The plan will be prepared prior to operation of the wind farm. Further detail is provided in Section 8.10.2.
Newcastle and Hunter Valley Speleological Society	
Concern that the study undertaken to collect data on threatened species was only taken over a couple of short periods and is most likely considerably lacking in providing a holistic picture of species and their movements.	• Surveys were undertaken over a total of six separate seasonal survey events between spring 2018 to autumn 2021. This is considered a comprehensive survey effort and sufficient to capture seasonal variation in the biodiversity values present within the project area. • Table 34 provides the survey design employed and survey effort for each candidate species and demonstrates how survey effort is sufficient to meet the requirements of the BAM. Where survey effort was not sufficient and habitat for the species is present on the site, they were assumed to be present and areas of habitat mapped.
Impacts to threatened ecological communities and species with reference to white box-yellow box-Blakely's red gum grassy woodland, koala, large-eared pied and the spotted-tailed quoll.	• Threatened species and ecological communities with the potential to be impacted by the project have been surveyed, identified and mapped in accordance with the NSW BAM and EPBC Act requirements. • Section 8 of this BDAR presents a detailed impact assessment, quantifying direct impacts and describing potential indirect impacts.
Upper Peel Landcare Group, Yass Landcare Guardians and Timor Community	
Concerns about the land clearing needed for the project and the impact this will have on the biodiversity of the area.	• Threatened species and ecological communities with the potential to be impacted by the project have been surveyed, identified and mapped in accordance with the NSW BAM and EPBC Act requirements. • Section 8 of this BDAR presents a detailed impact assessment, quantifying direct impacts and describing potential indirect impacts. • The project has reduced direct clearing impacts by 8% from the exhibited EIS.

1 Introduction

1.1 Project description

The Project involves the construction, operation and commissioning of a wind farm with up to 65 wind turbine generators (WTG), together with associated and ancillary infrastructure.

The Project consists of the following key permanent components:

- Up to 64 WTGs with a generating capacity of approximately 6MW. Each WTG has:
  - Three blades mounted to a rotor hub on a tubular steel tower, with a combined height of blade and tower limited to a maximum tip height of 232 m AGL.
  - A gearbox and generator assembly housed in a nacelle.
  - Adjacent hardstands for use as crane pads and assembly and laydown areas.
- Decommissioning of three operational meteorological monitoring masts and the installation of up to five temporary and five permanent masts to monitor the power of the wind. Up to five of the 10 masts will be permanently installed near one of the WTGs. The other five will be temporarily installed at the location of one of the WTGs and removed after initial testing. All 10 masts will be approximately 150 metres tall; equivalent to the hub height of the installed WTGs. The exact number and location of the 10 masts will be confirmed during detailed design.
- A 330 kilovolt (kV) electrical substation located centrally within the project site and an option to locate this north-west of WP5 and WP6. The substation will include transformers, insulators, switchyard, and other ancillary equipment.
- An operations and maintenance facility.
- A battery energy storage system of 100 to 400 Mwh co-located with the substation.
- Aboveground and underground 33 kV electrical reticulation and fibre optic cabling connecting the WTGs to the onsite substation (following site access tracks where practicable).
- A 330kV high-voltage overhead transmission line to connect the onsite substation to the existing 330 kV TransGrid Liddell to Tamworth overhead transmission line network.
- Locating the substation near WP20 and WP26 will require a 330 kV 21km west of the substation with parallel 33kV for 8.5 kilometres. Locating infrastructure near WP5 and WP6 will require approximately 8 kilometres of 33 kV overhead lines, which are lower than 330 kV lines, and do not allow for the same span over vegetation and gully areas, however would reduce the amount of 330kV line by 9 km.
- A switching station to connect the Project to the 330 kV TransGrid Liddell to Tamworth line.
- An internal private access road network (up to a combined total length of approximately 40 km) connecting the WTGs and other Project infrastructure to the public road network.
- Upgrades to local roads and waterway crossings, as required for the delivery, installation and maintenance of WTG components and other associated materials and structures.

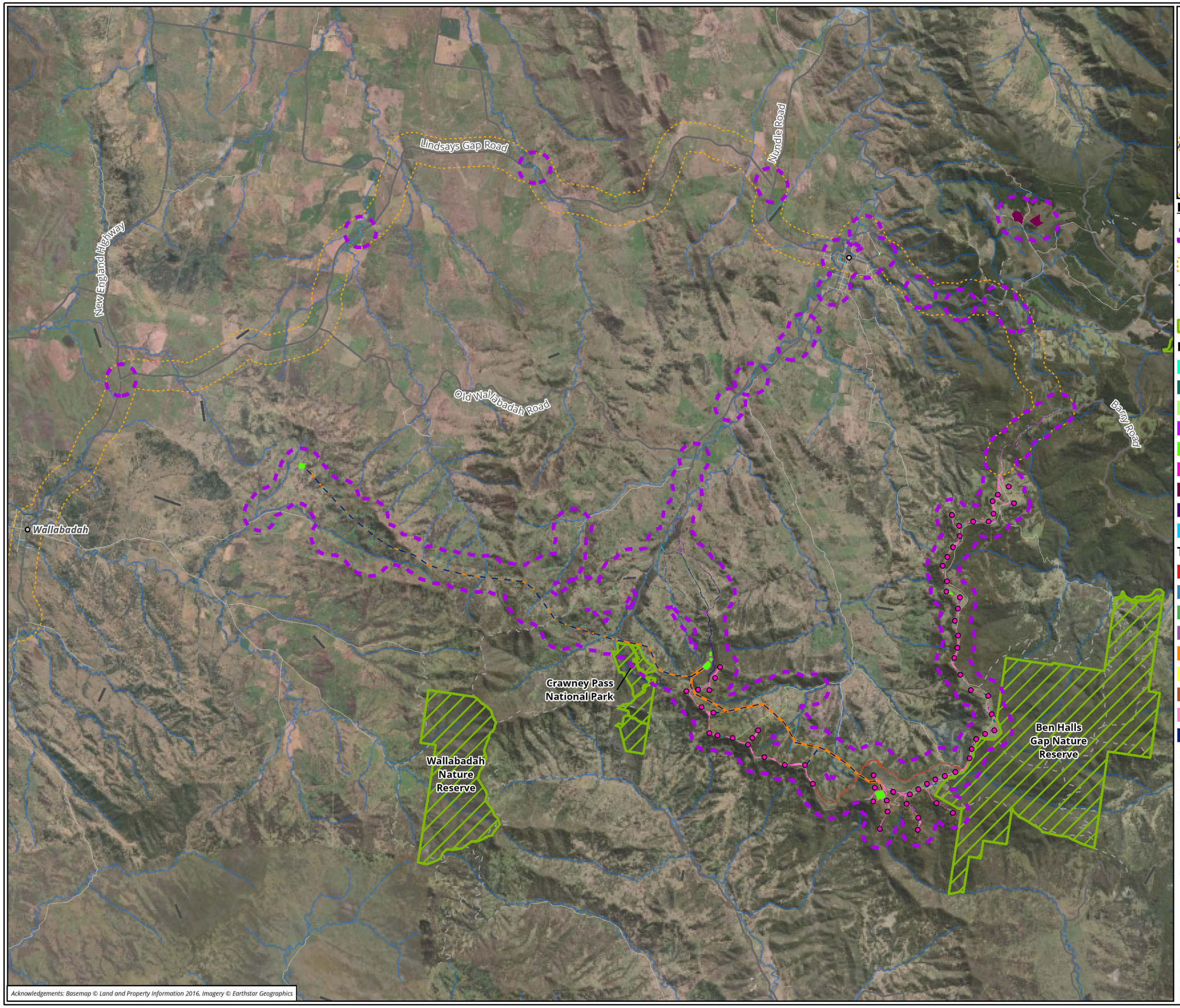
The following temporary elements will be required during construction of the Project:

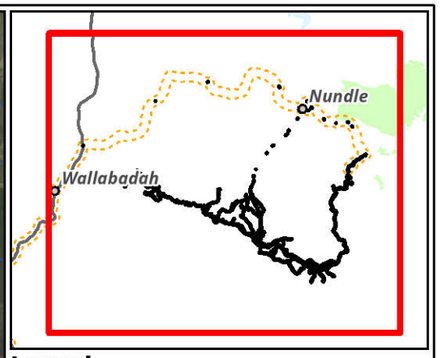
- Temporary site buildings and facilities for construction contractors / equipment, including site offices, car parking and amenities for the construction workforce.

- Two temporary concrete batching plants to supply concrete for WTG footings and substation construction works.
- Earthworks, including cut and fill, for constructing access roads, WTG platforms and foundations.
- Potentially rock crushing facilities for the generation of suitable aggregates for concrete batching or sized rock for access road and hardstand construction.
- Opportunity to expand an existing Forestry Corporation of New South Wales (FCNSW) quarry 9 km north of WTG 69 within the Nundle State Forest, along Verden Road.
- Up to eight additional hardstand laydown areas for the temporary storage of construction materials, plant, and equipment construction.

The indicative Project layout for the wind farm infrastructure, including the WTGs, internal access roads and supporting infrastructure are shown in Figure 2 and the biodiversity impacts have been assessed based on this development footprint. In order to facilitate refinement of the layout during the detailed design process, an allowance for micro siting of WTGs and infrastructure within the subject land from the locations identified in the RTS and Amendment Reports is proposed, while all other infrastructure may be relocated within the subject land and subject to a modification. Figure 2 shows the layout of all components, and provides more detail on the wind farm and internal roads layout, as well as the transmission line corridor and construction access tracks.

In addition to the wind farm infrastructure, the Project will require minor upgrades to the highway and local road network to facilitate haulage of the turbine components from Port of Newcastle to the subject land (Figure 3). Some of these works will require modifications to the curve radii of intersections that will involve clearing of vegetation. Where clearing of vegetation is required, these areas along the haul route have also been subject to assessment in this BDAR and form part of the development footprint. This assessment included fieldwork to verify vegetation communities and habitat condition for suitability to support threatened species.





Legend

- Landscape assessment buffer (study area)
- Transport haul routes
- Transmission line
- Wind turbine locations
- NPWS reserve

Permanent infrastructure

- Access tracks
- Turbine hardstands
- Logging track, fire track
- Morrison's gap road
- Ancillary infrastructure
- Roads
- Quarry
- Transmission line structures
- Turbine hardstands

Temporary infrastructure

- Access tracks
- Blade laydowns
- T65 WTG Coordinates 35m buffer
- Ancillary infrastructure
- Transmission line structures
- Transport swept path
- Transverse cut fill extents
- Temporary construction footprint
- Western access

Figure 2 Wind farm and transmission line infrastructure project overview, Page 1

0 1,000 2,000 3,000 4,000

Meters

Scale: 1:120,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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Matter: 34963,
Date: 21 October 2022 ,
Prepared for: CW, Prepared by: AM, Last edited by: amackegard
Layout: 34963_F2_Overview
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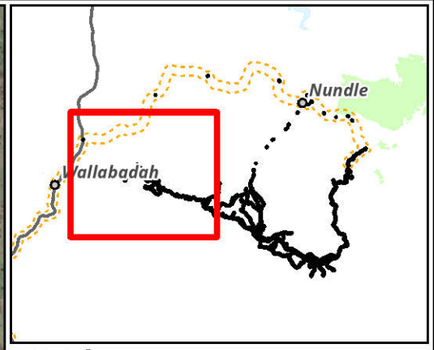

Legend

- Landscape assessment buffer (study area)
- Transport haul routes
- Transmission line
- NPWS reserve

Permanent infrastructure

- Access tracks
- Ancillary infrastructure
- Transmission line structures
- Turbine hardstands

Temporary infrastructure

- Access tracks
- Ancillary infrastructure
- Transmission line structures
- Transport swept path

Figure 2 Wind farm and transmission line infrastructure project overview, Page 2

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Meters
Scale: 1:50,000 @ A3
Coordinate System: GDA 1994 MGA Zone 56

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Matter: 34963,
Date: 21 October 2022 ,
Prepared for: CW, Prepared by: AM, Last edited by: amackegard
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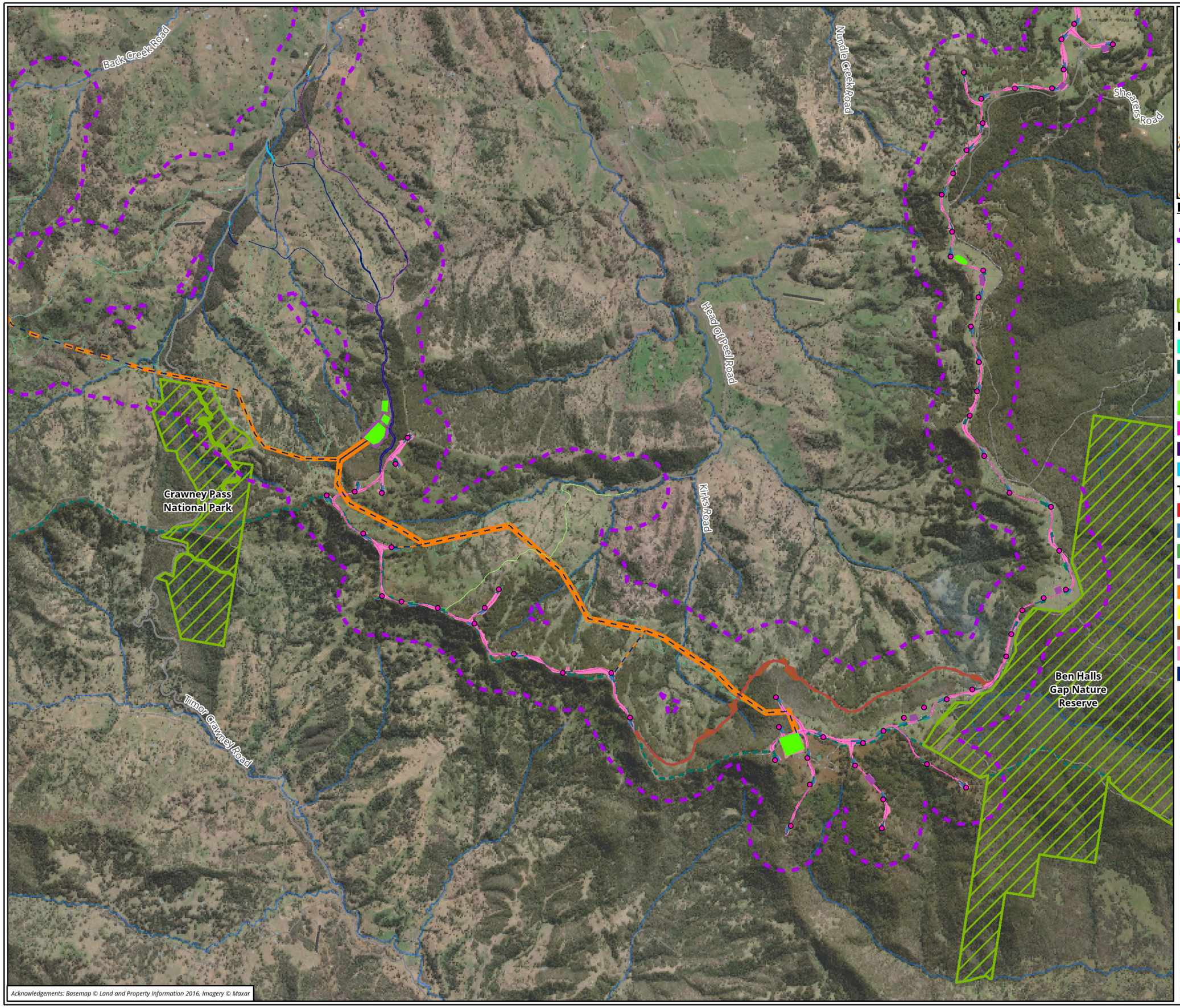

Figure 2 Wind farm and transmission line infrastructure project overview, Page 3

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Date: 21 October 2022 ,
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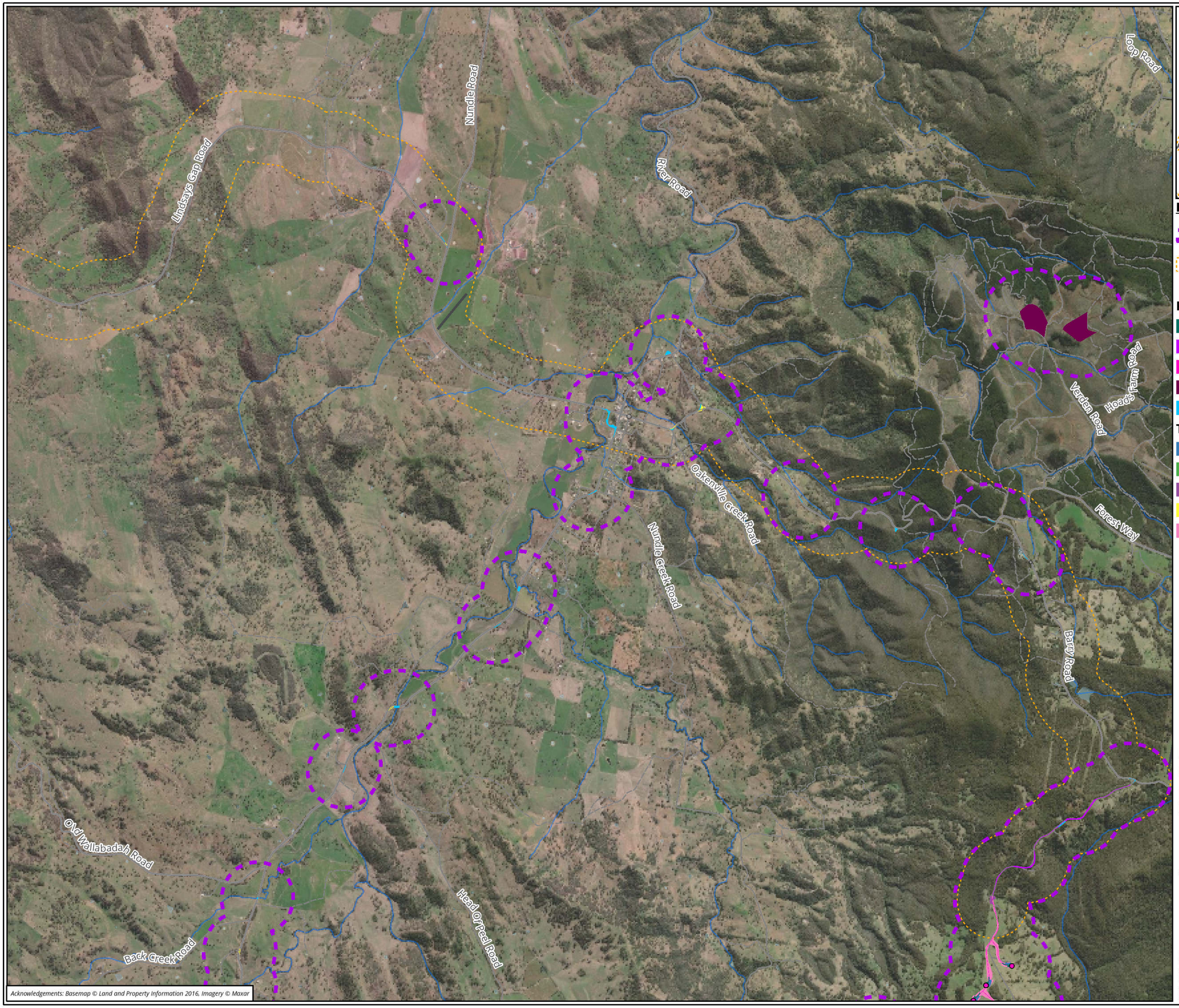

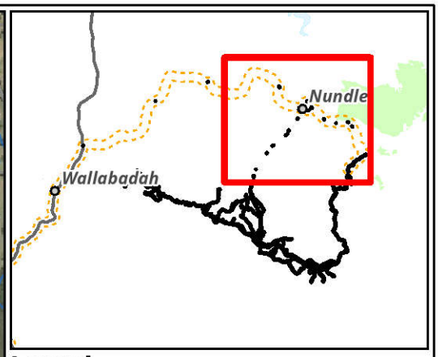

Legend

- Landscape assessment buffer (study area)
- Transport haul routes
- Wind turbine locations

Permanent infrastructure

- Turbine hardstands
- Morrison's gap road
- Roads
- Quarry
- Turbine hardstands

Temporary infrastructure

- Blade laydowns
- T65 WTG Coordinates 35m buffer
- Ancillary infrastructure
- Transport swept path
- Temporary construction footprint

Figure 2 Wind farm and transmission line infrastructure project overview, Page 4

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Meters

Scale: 1:50,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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Date: 21 October 2022 ,
Prepared for: CW. Prepared by: AM, Last edited by: amackegard
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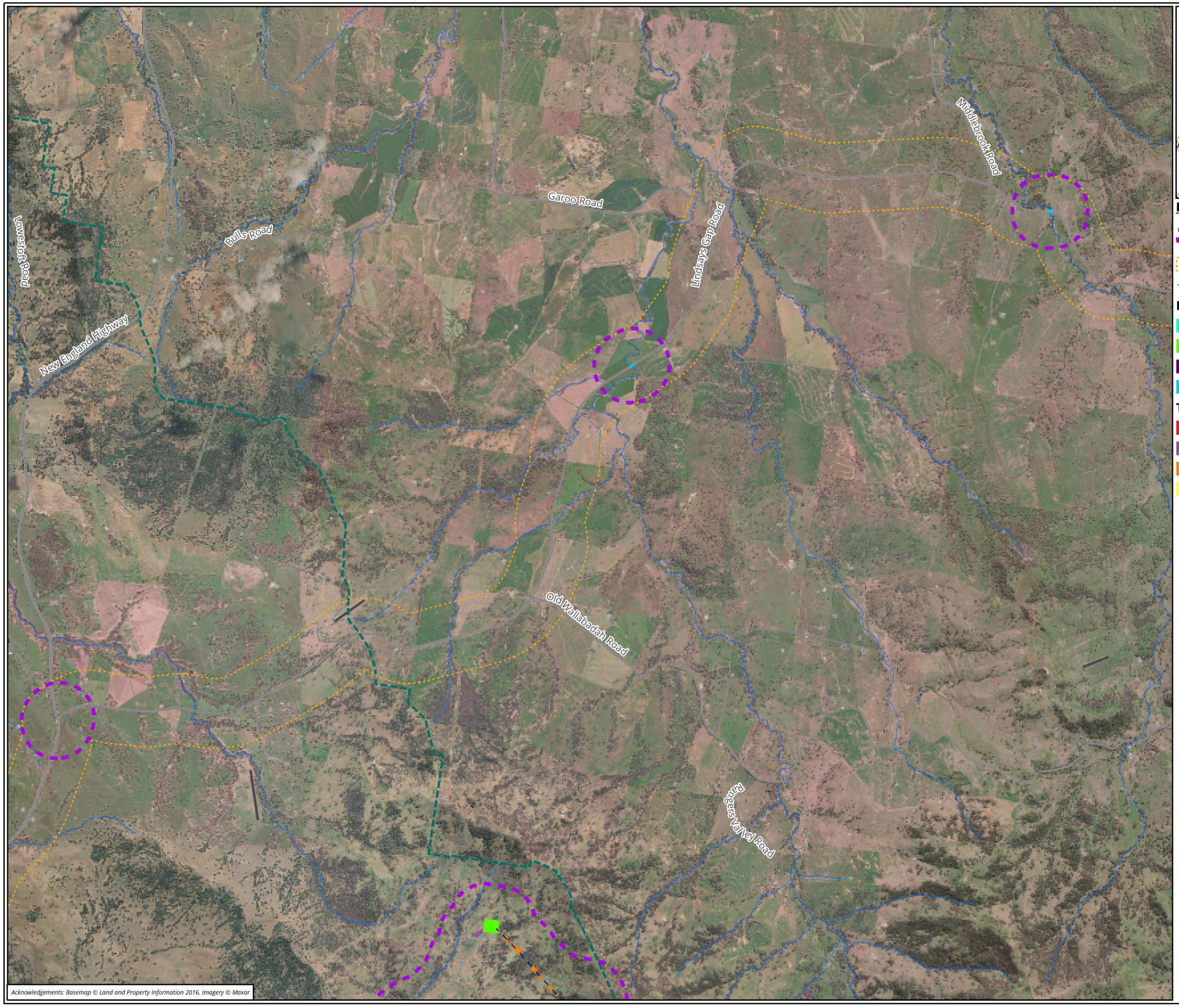

Legend

- Landscape assessment buffer (study area)
- Transport haul routes
- Transmission line

Permanent infrastructure

- Access tracks
- Ancillary infrastructure
- Transmission line structures
- Turbine hardstands

Temporary infrastructure

- Access tracks
- Ancillary infrastructure
- Transmission line structures
- Transport swept path

Figure 2 Wind farm and transmission line infrastructure project overview, Page 5

0 500 1,000 1,500 2,000

Meters
Scale: 1:50,000 @ A3
Coordinate System: GDA 1994 MGA Zone 56

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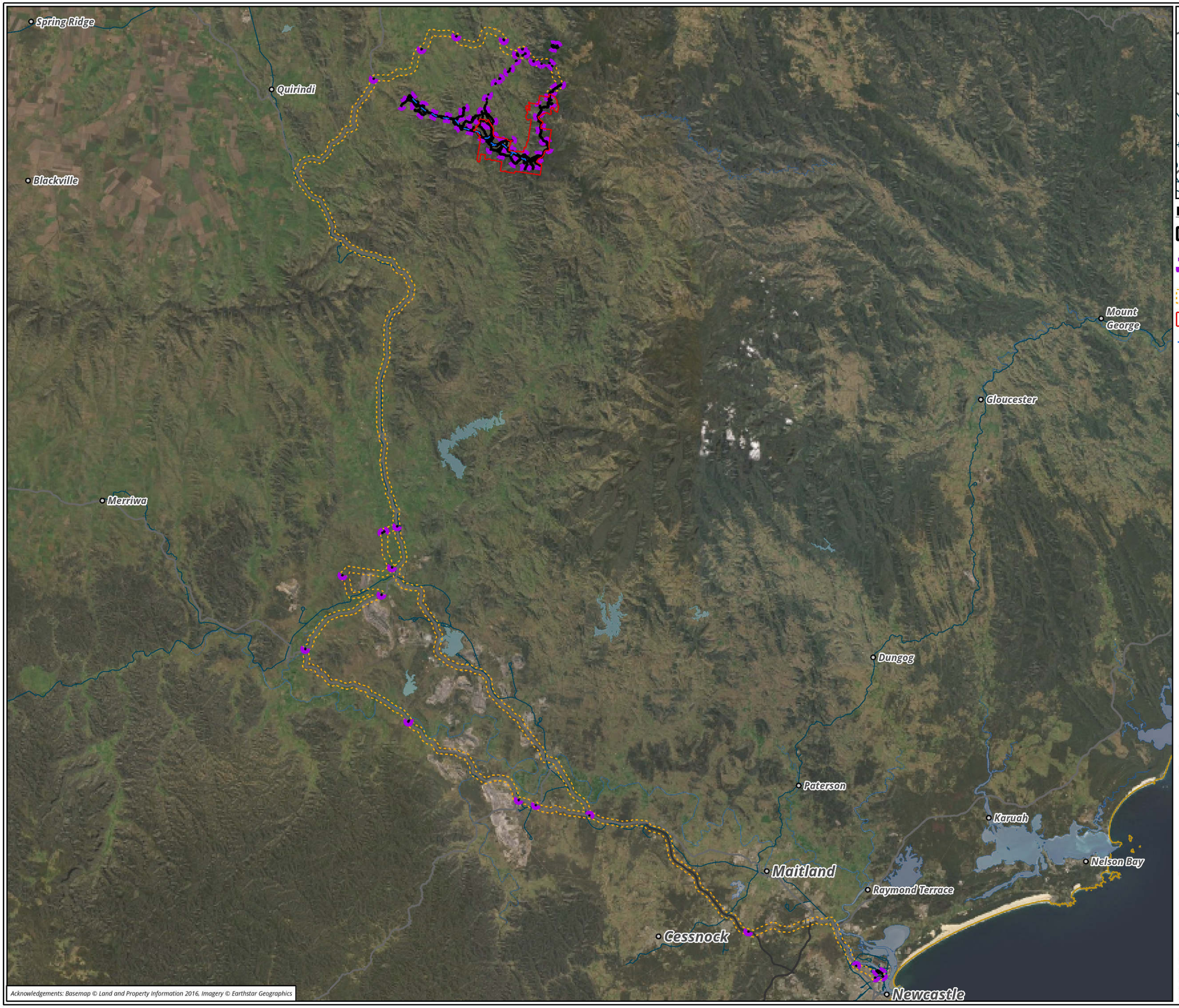

Figure 3 Haul route project overview

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1.2 Project location

The Project is located approximately 4 kilometres south of Hanging Rock, 8 kilometres south east of the Nundle and 60 kilometres south east of Tamworth, within the Tamworth Regional Local Government Area (LGA), Upper Hunter Shire LGA and Liverpool Plains LGA. The eastern boundary of the site is adjacent to Ben Halls Gap Nature Reserve (BHGNR). Crawney Pass National Park is situated to the west of the project.

The development footprint predominately supports agricultural land on flatter topographies that are dominated by exotic grasslands created as part of cattle grazing activities. There is a higher percentage of overstorey native vegetation within steeper terrain and situated adjacent to the development footprint associated with the wind farm infrastructure. The development footprint is primarily classified as primary production land zone and lies adjacent to forestry, National Parks and Nature Reserves zones.

1.3 Development corridor

During early planning phases of the Project, a wind farm development corridor was designated, based on property boundaries and a broader area of investigation for the placement of wind farm infrastructure and location of access routes. This development corridor should also be considered the 'subject land', as defined by the BAM, and has undergone ground-validated assessment as described in the following chapters of this BDAR.

Preliminary ecological surveys were completed across the subject land in 2019, with a vegetation zone and habitat constraints map prepared to inform layout decisions. Fieldwork was also carried out over the broader area referred to as the development corridor, however much of the focus on the BAM assessment refer to the direct and indirect impacts associated with the development footprint.

1.4 Development footprint

For the purpose of assessing impacts to biodiversity, a single development footprint has been assessed covering the five project elements that comprise the overall project infrastructure described in Section 1.5.1 and Table 12. This development footprint has been prepared based on the current design developed to date to understand the maximum impacts associated with the construction and operation of the Project.

The proposed design is advanced, however it still remains indicative and subject to further detailed design which will occur in tandem with construction contracting requirements and further detailed geotechnical investigations and the selection of the final wind turbine model. The development footprint design has been significantly updated since that exhibited with the EIS so as to materially reduce the biodiversity impacts of the Project.

In order to continue to reduce impacts to the assessed worst case in this BDAR, the Proponent will continue to refine the layout during the detailed design process in order to achieve reduced biodiversity impacts. The Proponent commits to undertaking pre-clearing surveys and micro-siting of wind turbines and ancillary infrastructure during the detailed design stage of the project to further avoid impacts to any previously unrecorded threatened species and ecologically sensitive areas, as far as practicable.

To permit this allowance, micro siting of infrastructure within the subject land from the locations identified in the Amendment Reports is sought. Micro siting in areas outside of the subject land may require additional survey. Other project infrastructure components may also be relocated within the subject land, subject to ensuring that change in location does not result in greater impacts than assessed in this BDAR and complies with all conditions imposed on any development consent granted for the Project.

Modifications would be sought only to re-determine associated residual impacts and credit liabilities if micro siting results in increased impacts and associated credit requirement. Reduction in impacts would not require a modification, however an addendum to the BDAR outlining the re-assessment of impacts and credit liabilities would be required if a reduction in credit requirements is sought.

Final layout documentation will be prepared and submitted to DPE prior to commencement of construction along with updated vegetation integrity surveys and required BAM plots to confirm biodiversity impact is no greater than this assessment.

1.5 Assessment Area

The assessment area for this BDAR includes the development footprint, as defined in Section 1.4 and Section 1.5.1, as well as a 500 metre buffer from the centreline of the development footprint for the landscape assessment (Figure 2 and Figure 3). This buffer has been applied in accordance with Section 3.1 of the BAM, which requires landscape attributes to be assessed for a 500 metre buffer for linear projects.

Detailed field surveys were carried out within the subject land and development footprint, as defined below, and desktop information was used to assess landscape attributes within the 500 metre buffer area.

1.5.1 Project infrastructure

Lands within the development footprint will be subject to direct impacts as a result of the project. This includes the permanent and temporary elements outlined in Table 12, and includes:

1. Wind turbine infrastructure, consisting of wind turbine generators and hardstands for construction.
2. Ancillary infrastructure including operations and maintenance buildings, substation, battery energy storage system, switching station and parking/storage/laydown areas.
3. Internal roads connecting wind farm infrastructure.
4. Internal and External transmission line and switching station.
5. Transmission line access tracks.
6. Transport haul route from Port of Newcastle to the wind farm site.

Concept design work was completed to confirm a conservative maximum development footprint to be assessed in this BDAR. The concept design was developed by the project team, which included wind farm designers and civil designers, with input from ecologists and other specialists to minimise impacts as much as practicable.

The concept design has also considered temporary construction phase impacts associated with ancillary sites, access routes, hardstand and laydown areas, storage, stockpile and site office facilities. This development footprint is considered to be a maximum footprint based on the current level of concept design, with refinements and reductions expected during detailed design.

The development footprint for the assessment of biodiversity impacts has also considered a network of access tracks for the construction of the transmission line. As much as possible these tracks have been mapped using the existing farm track network to minimise impacts to areas of native vegetation. A 5 - 10 metre corridor on each of these tracks has been included in the development footprint to capture any potential vegetation clearing required to use these tracks. The intent of including these areas in the biodiversity impact assessment is to understand the potential maximum development footprint that will be subject to assessment under the BAM.

The majority of the impacted areas associated with the transport route upgrades are required to enable the over mass and oversize construction vehicles required to transport project components are also included in Table 12. The majority of these areas are developed or modified areas that are not required to be assessed under the BAM. A detailed desktop assessment of all works areas along the haul route was carried out to

identify areas that contain biodiversity features and required field survey to identify vegetation communities, condition and habitat suitability for threatened species (Appendix A).

From the desktop assessment, a total of 25 sites along the haul route were confirmed to have biodiversity values that required assessment under the BAM. These areas were included in the development footprint and ecological fieldwork was carried out to confirm Plant Community Type (PCT) and habitat value for threatened fauna. Where changes to the haul route have been required as a result of the updates to site access from Barry Road / Morrisons Gap Road to Crawney Road, any newly impacted areas were assessed in September 2022.

Table 12 Wind farm infrastructure project elements for biodiversity assessment

Project Component		Permanent (ha)[1]	Temporary (ha)[2]	Total (ha)
Wind Farm (WF)	WTGs including crane pad assembly areas and asset protection zones	27.88	17.81	45.69
	Internal access roads [3,4]	23.91	29.25	53.16
	Ancillary infrastructure including[5]: • Operations and maintenance building • Substation • BESS • Temporary facilities (Parking, storage, laydown areas and batching plants)	21.75	14.66	36.42
	Temporary construction footprint[6]	-	92.23	92.23
	Quarry	21.39	-	21.39
Total WF		**94.93**	**153.95**	**248.89**
Transmission Line (TL)	Transmission line [8]	0.15	120.90	121.05
	Transmission line access roads	24.28	6.05	30.33
Total TL		**24.43**	**126.95**	**151.38**
Transport Route (TR)	Transport route upgrades	25.26	21.56	46.83
Total TR		**25.26**	**21.56**	**46.83**
Total WF + TL + TR		**144.62**	**302.46**	**447.11**

[1] Estimated permanent footprint does not allow for rehabilitation. In areas where existing permanent disturbance from farm tracks are utilised for wind farm infrastructure, this does not contribute to impact calculations where no native vegetation has been mapped.

[2] Temporary footprint areas are areas that will be rehabilitated after completion of construction.

[3] Internal access road calculation includes internal roads between hardstands, emergency access track from Head of the Peel Road to Project Area, all three site access options of Crawney Road and transverse track.

[4] Calculation based on Turnbull Engineering designs assuming inclusion of cut/fill batters, 33 kV cable runs, and drainage

[5] Ancillary infrastructure calculations include two options for substation and BESS facilities, and three options for operations and maintenance buildings, of which only one options will be built.

[6] Underground 33 kV electrical reticulation network will generally be located within the disturbance footprint of the access road network where possible, to the side of the trafficable pavement, unless design or construction optimisations do not allow this.

[7] Temporary areas to be rehabilitated include cut and fill batters (where possible), non-permanent roads, Asset Protection Zones (APZ), non-permanent ancillary infrastructure, and transmission line easement.
[8] 330kV transmission line is 15 km of 60 m easement and 9 km of 33 kV aboveground power line of 90m easement.
[9] It has been estimated that 90% of the 330kV easement can be rehabilitated using native grasses. Spans that would not impact the existing vegetation underneath were determined based on further design work and were not included as part of the project footprint.
[10] Access tracks for the transmission line have been developed at a concept level only to provide for a worst-case scenario for biodiversity impacts. The concept alignment of these tracks has followed existing tracks as much as practicable.
[11] It is estimated that 50% of the transport route upgrades will be rehabilitated with native grass.

For all project elements, a maximum development footprint has been proposed for assessment in this BDAR and it is expected to be refined and reduced during detailed design phases. Most notably the accumulated impact of options have been included such that worst case impact is presented to species impact. Accumulated infrastructure effectively double counted in the impacts include those associated with three options for O&M facility, two options for substation and BESS and flexibility for transmission line easement depending on final substation location and operational requirements of either Transgrid or other private transmission line owners.

The amendments to this updated BDAR to reduce impacts to the development footprint and associated biodiversity is summarised in Table 13. Details on each project element change is provided in Table 1.

Table 13 Total Development Footprint changes in this amendment

Project Component	BDAR Nov 2020 (ha)	Updated BDAR Oct 2022 (ha)	Change (ha)
Wind Farm (WF) including: • WTGs including crane pad assembly areas and asset protection zones. • Internal access roads. • Operations and maintenance building. • Substation. • BESS. • Temporary facilities (Parking, storage, laydown areas and batching plants). • Wind monitoring masts. • Quarry.	261	248.89	-12.10
Transmission Line (TL) including: • Transmission line. • Switching station. • Transmission line access roads.	196	151.38	-44.62
Transport route (TR) including: • Transport route upgrades.	56	46.83	-9.17
Total WF + TL + TR	**513**	**447.10**	**-65.90**

1.6 Project staging plan

The Project proposes to stage the construction to ensure ongoing avoidance and minimisation of impact can be achieved as the detailed design of the project progresses, as well as staged retirement of biodiversity

credit liabilities. A detailed staging plan will be based on final turbine and balance of plant contractor selected and associated construction plan preferences.

Prior to works commencing for each of the construction stages listed below, the biodiversity offset required associated with each stage will be secured through the creation and/or transfer, followed by the retirement of biodiversity credits, or via payment to the Biodiversity Offset Fund. Further detail is provided in Section 9.1.

The following set of example construction stages (or components) provided in Table 14 has been considered possible to be discrete packages of work for which staging of offset obligations is feasible, resultant offset credit liabilities for each of these stages is provided in Section 9.1.

Table 14 Construction Staging Concept Scope of Works

Scope of Work	Description
Haulage and External Route Upgrades	Required public road upgrades associated with bringing in materials and commencing construction on site.
Construction Compound and Internal Roads, Turbine Hardstands and Foundations	Establishment of construction facility and temporary laydown areas and commencement of internal road upgrades. This may be further broken up in stages by area of the project.
Ancillary Infrastructure	Substation, batching plant, O&M Facility and temporary laydown areas.
Transmission Line	External Transmission line construction.
Switching Station	This is located 20km from the wind farm Project Site and may be staged separately.

The Proponent will provide a final project staging plan to DPE with final detailed layout plan, updated surveys (if required and outside of the current subject land) and BAM calculations during detailed design and prior to the commencement of construction.

1.7 Report purpose

This BDAR has been prepared in accordance with the requirements of the BC Act to address the Secretary's Environmental Assessment Requirements (SEARs) for the proposed Hills of Gold Wind Farm.

Specifically, this report assesses:

- Impacts to native vegetation, including threatened ecological communities listed under the BC Act and the EPBC Act.
- Impacts to listed threatened species under the BC Act and the EPBC Act.
- Impacts of blade strike on birds and bats, with specific focus on listed threatened bats and raptors observed.
- Impacts associated with development near to National Parks or State Reserves, including the adjacent Ben Halls Gap Nature Reserve.
- Measures to manage identified impacts (including details of adaptive management protocols and ability to obtain achievable offsets).

- Measures to avoid, mitigate and offset impacts, with the objective of achieving an overall 'improve or maintain' environmental outcome for the project.

1.8 Sources of information

The following information sources were used in the preparation of this BDAR:

- Project spatial information provided by Hills of Gold Wind Farm Pty Limited (Formerly Wind Energy Partners).
- Preliminary Environmental Assessment (PEA), Hills of Gold Wind Energy Project (NGH Environmental 2018).
- Hills of Gold Wind Farm Preliminary Biodiversity and EPBC Act Significant Impact Assessment ('EPBC Assessment') (Arup 2019).
- DCCEEW EPBC Protected Matters Search Tool (PMST).
- DCCEEW Species Profiles and Threats (SPRAT) database.
- DCCEEW Interim Biogeographic Regionalisation for Australia (IBRA) mapping.
- NSW Mitchell Landscapes mapping, version 3.1.
- DPI Key Fish Habitat mapping.
- DPE BioNet Atlas of NSW database.
- DPE Threatened Biodiversity Data Collection (formerly known as the Threatened Species Profiles database).
- State Vegetation Type Map: Border Rivers Gwydir / Namoi Region Version 2.0. VIS_ID 4467 (OEH, 2020a).
- State Vegetation Type Map: Upper Hunter Version 1.0. VIS_ID 4894 (OEH, 2020b).
- Greater Hunter Native Vegetation Mapping Version 4.0. VIS_ID 3855 (DPIE, 2015).
- DPE BioNet Vegetation Classification Database.
- DPE online BAM calculator.
- Biodiversity Assessment Method (DPIE 2020).
- Groundwater Dependent Ecosystems Atlas (Bureau of Meteorology (BOM), 2020).
- LiDAR Survey data was used to assess areas of steep cliffs and rocky outcrops for cave-dwelling bat roost habitats.
- Relevant published literature on threatened biota.
- Submissions received through the Major Projects Website relevant to the BDAR update.

1.9 Report structure

In accordance with the requirements of the BAM, the assessed development footprint includes the area of land that may be directly and indirectly impacted by the Project. This updated BDAR also includes all information as outlined in Appendix K of the BAM (2020) Table 15 provides a summary of where the required information for a BDAR is located, to demonstrate compliance with the BAM.

Table 15 Minimum information requirements for BDAR from Appendix K of BAM

Required report section	Required information	Required maps, tables and data	Section of this BDAR
Introduction	Introduction to the biodiversity assessment including: brief description of the proposal identification of subject land boundary, including: • Operational footprint (if BDAR) • Construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure (if BDAR) • General description of the subject land Sources of information used in the assessment, including reports and spatial data	• Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure (if BDAR)	Section 1 provides a description of the project elements, the project location, the development footprints and the subject land. Project overview figures are provided as Figure 2 and Figure 3.
Landscape Context	Identification of site context components and landscape features, including: • General description of subject land topographic and hydrological setting, geology and soils • Percent native vegetation cover in the assessment area (as described in BAM Section 3.2) • IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.)) • Rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E) • Wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.)) • Connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.)) • Karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.)	• Site Map – Boundary of subject land – Cadastre of subject land – Landscape features identified in BAM Subsection 3.1.3 • Location Map – Digital aerial photography at 1:1,000 scale or finer – Boundary of subject land – Assessment area, (i.e. the subject land and 500 m buffer for linear development • Landscape features identified in BAM Subsection 3.1.3 • Additional detail (e.g. local government area boundaries) relevant at this scale Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location map	Section 3 provides all of the required landscape features identified within the 500m landscape assessment buffer. The required elements for the Location Map are shown on the series of maps in Figure 4 and the native vegetation extent is shown on the series of maps in Figure 5.

Required report section	Required information	Required maps, tables and data	Section of this BDAR
	• Areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.)) • Any additional landscape features identified in any SEARs for the proposal • NSW (Mitchell) landscape on which the subject land occurs	include: • IBRA bioregions and subregions • Rivers, streams and estuaries • Wetlands and important wetlands • Connectivity of different areas of habitat • Karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features • Areas of outstanding biodiversity value occurring on the subject land and assessment area • Any additional landscape features identified in any SEARs for the proposal • NSW (Mitchell) landscape on which the subject land occurs	
Native vegetation	• Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1). • Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2). • Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1) • Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	• Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2). • Map of PCTs within the subject land (as described in BAM Section 4.2(1.)). • Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1).	The native vegetation extent within the development footprint is described in detail in Section 4 of the Updated BDAR. Section 4.2 and Table 27 provides a list of the PCTs, vegetation class and vegetation type, as well as the area of each PCT within the development footprint. Appendix B provides the detailed PCT descriptions and the list of species used for identification. The field data sheets for the BAM plots include evidence of the

Required report section	Required information	Required maps, tables and data	Section of this BDAR
	• Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A). For each PCT within the subject land, describe: • Vegetation class. • Extent (ha) within subject land. • Evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.)). • Plant species relied upon for identification of the PCT and relative abundance of each species. • If relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.)). • Estimate of percent cleared value of PCT (BAM Subsection 4.2.1(5.)). Describe the vegetation integrity assessment of the subject land, including: • Identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1). • Assessment of patch size (as described in BAM Subsection 4.3.2). • Survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.). • Use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.)).	• Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCTs boundaries. • Map of TEC distribution on the subject land and table of TEC listing, status and area (ha). • Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2). Table of current vegetation integrity scores for each vegetation zone within the site and including: • Composition condition score. • Structure condition score. • Function condition score. • Presence of hollow bearing trees.	quantitative information used to allocate PCTs. This information also includes details on the vegetation class, type and percent cleared for each PCT. This information is available in Appendix H (and in electronic form). Vegetation zones are presented in Table 22 and mapped in Figure 7. The patch size assessment for the development footprint is presented in Section 3.2.2 and mapped on Figure 8. The number of BAM plots surveyed and where benchmark data was used is presented in Section 4.1.4 and Table 22. TEC status of the PCTs and vegetation zones are provided in Table 28, with additional description of TECs in Section 4.3. Maps of TECs are provided in Figure 9. The current vegetation integrity scores for the development footprint area provided in Table 27.
Threatened species	Identify ecosystem credit species likely to occur on the subject land, including:	Table showing ecosystem credit species in accordance with BAM	Ecosystem credit species on the development footprint, as identified in the

Required report section	Required information	Required maps, tables and data	Section of this BDAR
	• list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.)) • justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2) • justification for addition of any ecosystem credit species to the list Identify species credit species likely to occur on the subject land, including: • list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1) • justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2) • justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2) • justification for addition of any species credit species to the list From the list of candidate species credit species, identify: • species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.)) • species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.)) • species for which targeted surveys are to be completed to determine species presence (Subsection 5.2.4(2.b.)) • species for which an expert report is to be used to determine species presence (Subsection 5.2.4(2.c.))	Section 5.1.1, and identifying: • the ecosystem credit species removed from the list • the sensitivity to gain class of each species Table detailing species credit species in accordance with BAM section 5.2 and identifying: • the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or micro habitat features are not present • the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4) • Map indicating the GPS coordinates of all individuals of each species recorded within the	BAM Calculator are provided in Table 32. A list of species credit species and justification for their inclusion or exclusions based on habitat features is provided in Table 33, with more detailed analysis provided in Appendix C. Field survey methods, including technique, effort, timing and weather conditions are provided in Section 5.3. These are summarised in Table 34. The location of field surveys is provided in Figure 10 showing flora survey tracks and Figure 12 for the targeted fauna surveys. Threatened species survey results are provided in Section 5.4. The methodology for developing species habitat polygons is provided in Section 5.5, with detailed descriptions of the habitat features used provided in Table 49. No expert reports were used to include or exclude candidate species. The list of candidate species to be assessed was identified from assessment of habitat suitability and targeted surveys.

Required report section	Required information	Required maps, tables and data	Section of this BDAR
	Present the outcomes of species credit species assessments from: • threatened species survey (as described in BAM Section 5.2.4) • expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Section 5.2.4 and 5.3, Box 3) Where survey has been undertaken include detailed information on: • survey method and effort, (as described in BAM Section 5.3) • justification of survey method and effort (e.g. citation of peer-reviewed literature) if approach differs from the Department's taxa-specific survey guides or where no relevant guideline has been published • timing of survey in relation to requirements in the TBDC or the Department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys • survey personnel and relevant experience • describe any limitations to surveys and how these were addressed/overcome Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that: • the unit of measure for each species is documented • for species assessed by area: – the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5)	subject land and the species polygon for each species (as described in BAM Subsection 5.2.5)	

Required report section	Required information	Required maps, tables and data	Section of this BDAR
	– a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied • for species assessed by counts of individuals: – the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.)) – the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken – the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)		
Prescribed impacts	Identify potential prescribed biodiversity impacts on threatened entities, including: • Karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1). • Occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2). • Corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3). • Water bodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4).	• Map showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.). • Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only).	Prescribed impacts are addressed in Section 8.5 with some aspects addressed as part of the assessment of Indirect Impacts in Section 8.3. Requirements for wind farm developments are specifically addressed in these two Sections. The results of three seasons worth of bird utilisation surveys did not identify any habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened

Required report section	Required information	Required maps, tables and data	Section of this BDAR
	• Protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5). • Where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6). Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts. Describe the importance of habitat features to the species including, where relevant, impacts on life-cycle or movement patterns (e.g. Subsection 6.1.3). Where the proposed development is for a wind farm: • Identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5). • Provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.). • Predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.)).		aerial species resident on the site. Location of prescribed impacts are mapped on Figure 28.
Avoid and minimise impacts	Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative:	• Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility.	Section 7 provides a detailed summary of the design phase measures to avoid and minimise impacts. A table of mitigation and management measures is summarised in Section 8.9 and

Required report section	Required information	Required maps, tables and data	Section of this BDAR
	• Modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology • Routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route. • Alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location. • Alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site. Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Sections 7.1 and 7.2). Identification of any other site constraints that the Proponent has considered in determining the location and design of the proposal (as described in BAM Section 7.2.1(3.)).	• Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation. • Maps demonstrating indirect impact zones where applicable.	Table 87. Maps of the assessed development footprint include areas that will be impacted by construction and operation of the project. Figure 23 presents alternative development footprints considered, and Figure 26 shows the area of indirect impact from the operation of the wind turbines.
Assessment of Impacts	Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1). Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2): • Description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal.	• Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	Direct impacts associated with the project are outlined in Section 8.2. Indirect impacts associated with the project area outlined in Section 8.3. Prescribed impacts associated with the project area outlined in Section 8.5. Changes in vegetation integrity scores are presented in Appendix G.

Required report section	Required information	Required maps, tables and data	Section of this BDAR
	• Documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications. • Reporting any limitations or assumptions, etc. made during the assessment. • Identification of the threatened entities and their habitat likely to be affected. Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including the assessment of the nature, extent and duration of impacts on the habitat of threatened species or ecological communities associated with: • Karst, caves, crevices, cliffs, rocks and other features of geological significance. • Human-made structures. • Non-native vegetation. • Connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range. • Movement of threatened species that maintains their life cycle. • Water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities. • Assessment of the impacts of wind turbine strikes on protected animals. • Assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC.		
Mitigation and Management of Impacts	Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.5 and 8.5 including:	Table of measures to be implemented to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility.	Section 8.9 provides a detailed summary of the measures to be implemented to mitigate and manage impacts of the proposal.

Required report section	Required information	Required maps, tables and data	Section of this BDAR
	• Techniques, timing, frequency and responsibility. • Identify measures for which there is risk of failure. • Evaluate the risk and consequence of any residual impacts. • Document any adaptive management strategy proposed. Identification of measures for mitigating impacts related to: • Displacement of resident fauna (as described in BAM Subsection 8.4.1(2.)). • Indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.)). • Mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2). Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5).		Table 87 outlines the mitigation and management measures to be implemented.
Impact Summary	Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including: • Addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land • Addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land. • Documenting assumptions made and/or limitations to information. • Documenting all sources of data, information, references used or consulted. • Clearly justifying why any criteria could not be addressed. Identification of impacts requiring offset in accordance	Map showing the extent of TECs at risk of an SAII within the subject land. Map showing location of threatened species at risk of an SAII within the subject land. Map showing location of: • Impacts requiring offset. • Impacts not requiring offset. • Areas not requiring assessment.	The impact summary is provided in Section 9, with Table 96 showing the direct impacts and the number of offset credits for each vegetation zone and threatened species. Impacts requiring offset, not requiring offset and areas not requiring assessment are provided on Figure 29. SAII entities are addressed in Section 8.6 and Appendix E and mapped on Figure 28. A summary of ecosystem credit and species credits required by the project is provided in Section 9 and Appendix G.

Required report section	Required information	Required maps, tables and data	Section of this BDAR
	with BAM Section 9.2. Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.). Identification of areas not requiring assessment in accordance with BAM Section 9.3.		
	Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including: • Future vegetation integrity score for each vegetation zone within the subject land (Equation 25 and Equation 26 in BAM Appendix H). • Change in vegetation integrity score (BAM Subsection 8.1.1). • Number of required ecosystem credits for the direct impacts of the proposal on each vegetation zone within the subject land (BAM Subsection 9). • Number of required species credits for each candidate threatened species that is directly impacted on by the proposal (BAM Subsection 10.1.3).	• Table of PCTs requiring offset and the number of ecosystem credits required. • Table of threatened species requiring offset and the number of species credits required.	
Biodiversity credit report	Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2).	Table of credit class and matching credit profile.	The biodiversity credit report as output from the BAM-Calculator is provided in Appendix G.

1.9.1 Interpretation of maps

Map sets presenting survey effort, survey results, and biodiversity constraints are provided for the total development footprint, in accordance with the requirements of the BAM. Each map set contains an overview map and a set of detailed maps. The overview map shows the order in which the detailed maps are referenced and their location within the assessment area.

When locations are referenced within the report, they are described using the infrastructure elements defined in Section 1.5.1 and Table 12.

1.9.2 Relevant personnel

The BDAR has been prepared in accordance with the BAM (OEH 2017) by Arup and Biosis, followed by updates to meet the requirements of the BAM (DPIE 2020) by Biosis following the end of the 12 month transitional arrangements period for SSD projects. The following accredited biodiversity assessors have prepared, provided input into and reviewed sections of this BDAR in accordance with the BAM:

- Callan Wharfe (BAAS 18138) – Biosis
- Mitchel Palmer (BAAS17051) – Biosis
- Rebecca Dwyer (BAAS 17067) – Biosis
- Matt Davis (BAAS 18090) – Arup
- Chani Wheeler (BAAS 19077) – Arup
- Nicola Trulock (BAAS 19058) – Biosis

Additional personnel contributed to the field survey effort, data analysis, interpretation and mapping, including:

- Caroline Tan – Arup Terrestrial Ecologist
- Andrea McPherson – Arup Aquatic Ecologist
- Tony Cable – Biosis Senior Zoologist
- Paul Price – Biosis Consultant Botanist
- Brooke Corrigan – Biosis Consultant Botanist
- Matthew Hyde - Biosis Consultant Zoologist
- Caragh Heenan – Biosis Zoologist
- Joel Nicholson – Biosis Zoologist
- Kayla Asplet - Biosis Zoologist
- Sarah Allison - Biosis Zoologist
- Byron Dale – Biosis Zoologist
- Adam Baus – Biosis Zoologist (Aquatic)
- Bianca Klein – Biosis Botanist
- Tobias Scheid – Biosis Botanist
- Heather Lee-Kiorgaard – Biosis Botanist

Technical input into the assessment of impacts to microbats and birds has also been provided by Biosis' following technical experts:

- Ian Smales – Principal Zoologist
  - Ian has over forty years of professional experience in wildlife research and natural resource management with the public and private sectors. He has been a long-standing member of recovery teams for two endangered bird species and the scientific advisory panel for the South-west Victorian Brolga project. In 2020 Ian was appointed as a member of the Victorian Government's Scientific Advisory Committee for the Flora and Fauna Guarantee Act. He is also a member of the IUCN Species Survival Commission Reintroduction Specialist Group. Since 2003, he has had a particular involvement with the wind energy sector and has investigated effects on birds and bats at multiple proposed and operating wind farms. He is the author of a number of publications on that field in the international literature. Ian has had a lead role in the development and application of the Biosis bird collision risk model, which has been used in the assessment of many wind energy projects in Australia and the Pacific.
  - Ian's publications relevant to the project's impact assessment include;
    - Lumsden, L.F., Moloney, P. and Smales, I. 2019. *Developing a science-based approach to defining key species of birds and bats of concern for wind farm developments in Victoria*. Arthur Rylah Institute for Environmental Research Technical Report Series No. 301. Department of Environment, Land, Water and Planning, Heidelberg, Victoria.
    - Moloney, P.D., Lumsden, L.F. and Smales, I. 2019. Investigation of existing post-construction mortality monitoring at Victorian wind farms to assess its utility in estimating mortality rates. Arthur Rylah Institute for Environmental Research Technical Report Series No. 302. Department of Environment, Land, Water and Planning, Heidelberg, Victoria.
    - Smales, I. 2017. *Modelling of collision risk and populations.* in M. Perrow (ed) Volume 2 Wildlife and Wind Farms: conflicts and solutions. Pelagic Publishing. UK.
    - Smales, I. 2014. Fauna Collisions with Wind Turbines: Effects and Impacts, Individuals and Populations. What Are We Trying to Assess? Pp 23 – 40 in Hull, C., Bennett, E., Stark, E., Smales, I., Lau, J. & Venosta, M. (eds) Wind and Wildlife: Proceedings from the Conference on Wind Energy and Wildlife Impacts, October 2012,Melbourne, Australia. Springer Dordrecht.
    - Smales, I., Muir, S., Meredith, C. & Baird, R. 2013. *A description of the Biosis model to assess risk of bird collisions with wind turbines.* Wildlife Society Bulletin 37(1): 59–65
    - Hull, C., Bennett, E., Stark, E., Smales, I., Lau, J. & Venosta, M. 2015. Wind and Wildlife. Proceedings from the Conference on Wind Energy and Wildlife Impacts, October 2012, Melbourne, Australia. Springer.
- Mark Venosta – Team - Leader Zoology (Biosis' senior microbat ecologist)
  - Mark contributed the bat assessment components of the Environment Protection and Heritage Council 2010 National Wind Farm Development Guidelines and has been involved in preparing draft bats and wind energy assessment guidelines for the Australasian Bat Society and ccompleted Australian and New Zealand wind farm guidelines for bats and avifauna (federal government). Mark has utilised novel assessment and survey techniques while investigating potential impacts to threatened bats from proposed wind energy facilities, including thermal imaging and the use/applicability of radar techniques. He has also attended the inaugural bats and wind energy workshop hosted by Bat Conservation International as the sole Australian representative, which

provided an excellent forum for discussing current assessment methods and advances in survey technologies. Mark is a member of the Australaisian Bat Society.

  - Mark's publications relevant to the project's impact assessment include;
    - Hull, C., Bennett, E., Stark, E., Smales, I., Lau, J. & Venosta, M. 2015. Wind and Wildlife. Proceedings from the Conference on Wind Energy and Wildlife Impacts, October 2012, Melbourne, Australia. Springer.

- Felicity Williams – Consultant Zoologist (microbat ecologist)
  - Felicity has over eight years' experience in applied ecology and ecological consulting, with specialist skills in microbat acoustic data collection, analysis and assessment. Felicity is a member of the Australasian Bat Society and completed the honours thesis; *Williams, F. (2009) The influence of fire on the foraging activity of insectivorous bats in the Victorian Mallee*.

This amended BDAR has been compiled by various authors from Arup and Biosis, including the accredited assessors listed above. Callan Wharfe (BAAS 18138) completed the attached BAM Calculator to identify offset credit requirements, updated from the previous version established by Matt Davis (BA 18090).

2 Statutory considerations

2.1 NSW legislation and policies

2.1.1 *Environmental Planning and Assessment Act 1979* (EP&A Act)

The Project is State Significant Development (SSD) and development consent is being sought under Section 4 of the NSW EP&A Act. An EIS is a requirement of the development assessment process.

Environmental Assessment Report (now called Scoping Report) was prepared and submitted to the NSW Department of Planning and Environment (DPE)) in October 2018. Secretary's Environmental Assessment Requirements (SEARs) were issued for the Project on 22 November 2018. The SEARs form the basis of the assessment criteria for the Project. Supplementary SEARs were issued on 18 February 2020 in relation to the determination of the Project as a Controlled Action under the Commonwealth EPBC Act.

State Environmental Planning Policy (Koala Habitat Protection) 2020 & State Environmental Planning Policy (Koala Habitat Protection) 2021

State Environmental Planning Policy (Koala Habitat Protection) 2021 (Koala SEPP 2021) applies to identified LGAs in areas not zoned as RU1 Primary Production, RU2 Rural Landscape or RU3 Forestry, and within these rural land zonings, the former State Environmental Planning Policy (Koala Habitat Protection) 2020 (Koala SEPP 2020) continues to apply. Portions of the development footprint occur on both rural zonings and non-rural zoning so both Koala SEPP 2020 and Koala SEPP 2021 are potentially relevant to the project.

However, both SEPPs only apply to development applications where Council is the consent authority, which is not the case for the project that has been designated as SSD under Section 4 of the EP&A Act, neither SEPP is applicable to the project.

However the aims of both Koala SEPP 2020 and Koala SEPP 2021 are to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.

These aims and considerations have been addressed in accordance with the BAM and the NSW *Biodiversity Conservation Act 2016* (BC Act), as well as the Commonwealth EPBC Act, in preparation of this BDAR. Targeted surveys have been undertaken for Koala to ascertain their presence within the subject land, specific measures to avoid and minimise impacts to the species have been employed, detailed impact assessments have been carried out, and like-for-like offsets will be secured for residual impacts that have been unable to be avoided.

2.1.2 *Biodiversity Conservation Act 2016* (BC Act)

The BC Act and Biodiversity Conservation Regulation 2017 (BC Regulation) provide a framework for the assessment of biodiversity and the implementation of the Biodiversity Offset Scheme (BOS) in NSW. The NSW Biodiversity Assessment Method (BAM) supports the implementation of the BOS and establishes a consistent approach to assessing biodiversity values on lands within NSW.

Under the BC Act, impacts to biodiversity, including those associated with land clearing and development, must be assessed by an accredited person to determine proposal requirements for entry into the BOS. Entry into the BOS may be triggered where areas of mapped biodiversity value will be impacted, where land clearing exceeds area thresholds or where impacts to threatened species or ecological communities are likely to be significant. A proposal may also be refused where it is likely to result in serious or irreversible impacts to biodiversity, as defined by the BC Act.

2.2 Commonwealth legislation

2.2.1 *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

The project has also been referred under the EPBC Act (2019/8535) and determined to be a controlled action which is required to be assessed under the Bilateral Agreement made under section 45 of the EPBC Act relating to environmental assessment between the Commonwealth of Australia and the State of New South Wales. The bilateral agreement endorses the BAM and the NSW Biodiversity Offsets Scheme as accredited processes. Guidelines for preparing the EIS under the Bilateral Agreement have been provided by DCCEEW (Supplementary SEARS). This BDAR has been prepared to address approval requirements under the EPBC Act as set out in the Supplementary SEARs.

3 Landscape features

In accordance with Section 3.1 of the BAM, a landscape assessment was completed for the assessment area, as shown in Figure 4. This landscape assessment has been carried out for the 500m buffer on the centreline of the development footprint, as required by Section 3.1 of the BAM. For the purpose of this BDAR, the 1,500m landscape buffer around the development footprint is defined as the assessment area.

This assessment area includes a total 42,315.90 hectares of land comprising the development footprint and the 1,500m buffer around all parts of the development footprint. This section provides a summary of the wider landscape features of the assessment area that contribute to the ecological values within the development footprint.

3.1 Identified features

Section 3.1.3 of the BAM lists the required identified features that need to be mapped in this BDAR. Relevant landscape features identified for the assessment area are shown in Figure 4.

3.1.1 IBRA bioregions and subregions

The assessment area intersects four Interim Biogeographic Regionalisation for Australia (IBRA) subregions, as detailed in Table 16 and shown in Figure 4, and as such in accordance with Section 5.2.1.7 of the BAM, these four subregions have formed the basis for the habitat suitability assessment documented within this BDAR.

At the scale of the development footprint, the majority of the project is located within the Peel sub-region within the Nandewar bioregion.

Table 16 IBRA region and sub-regions in which the subject land is located

IBRA Region	IBRA Sub-region	Extent (ha)	% Assessment area
New England Tablelands	Walcha Plateau	2,727	21%
Nandewar	Peel	6,739	53%
NSW North Coast	Tomalla	1,752	14%
Sydney Basin	Hunter	1,478	12%

3.1.2 NSW landscape regions (Mitchell Landscapes)

The assessment area supports 13 NSW landscapes, as detailed in Table 17.

Table 17 NSW (Mitchell) Landscapes within the assessment area

Landscape	Corresponding Ecosystem Meso Grouping	Extent (ha)	% assessment area
Mount Royal Tops	NNC Barrington - Gloucester	4180	33%
Mount Royal Ridges	NNC Barrington - Gloucester	3926	31%
Manning Great Escarpment Southern Aspects	NNC Barrington - Gloucester	9	<1%
Nundle Hills	NAN Peel	2787	22%
Tamworth- Keepit Slopes and Plains	NAN Peel	279	2%
Central Hunter Alluvial Plains	SB Hunter	0.33	<1%
Central Hunter Foothills	SB Hunter	587	5%
Lower Hunter Channels and Floodplains	SB Hunter	94	<1%
Newcastle Coastal Ramp	SB Hunter	2	<1%
Upper Hunter Channels and Floodplain	SB Hunter	361	3%
Gosford-Cooranbong Coastal Slopes	SB Wyong	108	<1%
Nowendoc- Yarras Serpentinite	NNC Ultramafics	33	<1%
Sydney- Newcastle Barriers and Beaches	SB Coastal Barriers	225	2%

3.1.3 Rivers and streams

There are several waterways and wetland/farm dams in the assessment area, with many being defined as first order streams as per Appendix E of the BAM.

Rivers and streams (classified by stream order and including riparian buffers) are shown on the Site Map and Location Map in Figure 4. The majority of the streams that occur within the assessment area are first-order watercourses, which is characteristic of the location of the project on a ridgeline. The majority of these flow north and west of the ridgeline into the Namoi catchment area. The southern portion of the development footprint for the wind farm and transmission line flows south to the Hunter catchment area. A small portion of the eastern portion of this development footprint flows east to the Manning Catchment Area.

There are 76 named streams within the assessment area for the wind farm and transmission line, the 20 watercourses with the longest mapped extent within the assessment area include:

- Hunter River
- Basin Creek
- Wombramurra Creek
- Oakenville Creek
- Woodleys Creek
- Barnard River
- Wallis Creek
- Happy Valley Creek
- Back Creek
- Peel River
- Talbots Creek
- Ryans Oaky Creek
- Wiles Gully
- Goonoo Goonoo Creek
- Throsby Creek
- Woodleys Gully
- Burrows Creek
- Rosebrook Creek
- Limestone Oaky Creek
- Paynes Gully

A desktop assessment of aquatic habitats impacted as a result of the development are discussed in Section 5, including identification of where works forming part of the development footprint are required within waterways, primarily for site access and transport haul route upgrades.

3.1.4 Wetlands

The assessment area supports 101.58 ha of mapped NSW wetlands, as detailed in Table 18. However, each of these are contained within the 500 metre assessment area none will be impacted by the development footprint.

Mapped wetlands include the Hunter River, Southern Hunter River, Throsby Creek and the Kooragang Nature Reserve associated with the transport route (refer to Figure 4). As outlined above, none of these will be directly or indirectly impacted by the development footprint.

Areas of Coastal Wetlands, and Coastal Wetlands Proximity Areas mapped under the State Environmental Planning Policy (SEPP) (Coastal Management) 2018, also occur within the assessment area, but will not be subject to any direct or indirect impacts associated with the project. These are situated at Newcastle and include the Southern Hunter River and Throsby Creek.

Table 18 NSW (2006) wetlands within the assessment area

Wetland group	Extent within assessment area (ha)
Reservoir/ dam	1.63
Floodplain wetland	0.45
Estuarine wetland	99.27
Non-wetland	0.21
Total	**101.58**

3.1.5 Connectivity features

The wind farm and transmission line is well connected to vegetation both within and outside of the 500 metre landscape assessment area surrounding the subject land, with biodiversity features conserved in reserves, steep slopes and watercourses.

In the subject land and assessment buffer, there are extensive agricultural pastures along ridgelines and low-lying topography is used as grazing land, with existing access roads, tracks and fence lines. Scattered and intermittent tree cover is present within grazing land. There are also grassy woodlands on the undulating foothills and escarpments.

Forested mountain tops are dominated by dense, mature forests, most notably associated with Ben Halls Gap Nature Reserve to the east, Hanging Rock to the north and Crawney Pass National Park to the west. Adjacent land uses include predominantly cattle grazing, as well as areas of forestry present to the north.

As required under Section 3.1 of the BAM for connectivity features:

- The connectivity of different areas of habitat that may facilitate the movement of threatened species across their range are identified on the Location Map (Figure 4).
- No flyways for migratory species have been identified within the assessment area during desktop assessments, including extracts from the Bionet records and field assessments completed for this BDAR. As part of the Collision Risk Model (CRM) validation three seasons of bird utilisation surveys were completed. In addition, targeted surveys for threatened and migratory bird species surveys were undertaken in winter, spring and summer 2019 and autumn/winter 2020 (further supplemented in winter 2022) and no flyways or substantial numbers of migratory species were observed.

The biodiversity corridors that facilitate the movement of threatened species across their range for this project can broadly be classified into two types. The first corridor provides for the maintenance of movement across the vegetated ridgelines and the second provides for movement of altitudinal migrants between the Mount Royal and Liverpool Ranges (Figure 4). The ridgeline corridors are associated with vegetation retained on upper ridgelines and steep slopes, with previous grazing land uses removing vegetation on more gentle slopes and foothills. Corridors extend from the range and escarpment, largely following vegetated watercourses where thin strips of riparian vegetation have been retained.

There is also a network of protected areas in the wider landscape associated with Ben Halls Gap Nature Reserve, Wallabadah Nature Reserve and Crawney Pass National Park. The biodiversity corridors within the assessment area, particularly along the ridgelines, provide important connectivity between these conservation areas.

The majority of these mapped corridors occur outside the development footprint and will not be directly or indirectly impacted by the project. The corridor that runs along the ridgeline connecting Ben Halls Gap to areas of native vegetation to the north and to Crawney Pass National Park intersects and adjoins part of the development footprint. This corridor will be maintained, as the spatial distribution of vegetation on the ridgeline where wind farm infrastructure and internal roads are proposed is fragmented and patchy. The larger patches of contiguous vegetation and habitat are located to the south and north of the ridgeline, within protected area reserves and steeper terrain and are not impacted by the development footprint.

3.1.6 Areas of geological significance and soil hazard features

The presence of habitat features including karsts, caves, crevices and cliffs or other areas of geological significance likely to occur within and adjacent to the assessment area have been assessed. Field surveys have identified a number of areas of steep, rocky crevices on either side of the escarpment that provide potential roosting habitat for microbats. The location of steep cliff lines on the edge of the escarpments in the assessment area were mapped The GIS desktop analysis was undertaken as follows:

- A 5 m Digital Elevation Model (DEM) was created from a LiDAR bare earth point cloud.
- Focal statistics were run on the DEM to create a surface representing the range of elevation in a 2x2m cell neighbourhood around each input cell (roughly a 10m buffer).
- Focal range surface was reclassified to remove areas with a range less than 3m between highest and lowest points in the neighbourhood.
- The resulting cliff lines layer was symbolised to show areas of potential cliff lines based on where the range was 3, 4, 5, 6, 7 or >7 metres within the 2x2 neighbourhood.

These areas of steep cliff lines were initially used to identify all potential areas where cave-dwelling microbats could establish breeding or diurnal roosts. Follow-up desktop and ground-thruthing surveys have been able to be undertaken to better refine areas of potential habitat within and surrounding the development footprint.

Furthermore, expert advice regarding the presence of geological features of significance within the development footprint and in the broader landscape has been provided by Environmental Geosurveys Pty Ltd (Neville Rosengren, Geomorphologist and Honorary Associate La Trobe University). The full report (Environmental Geosurveys 2021) is attached as Appendix F of this BDAR. The assessment found that the landscape surrounding and encompassing the assessment area supports highly diverse terrain and lithology, which combined with dynamic geomorphology result in a high potential for geological features potentially suitable for microbat roosting sites to occur at all elevations.

The detailed findings of the geomorphological assessment and the follow-up desktop and ground-truthing assessment of potential microbat roots surrounding the assessment area are provided in Section 5.4.2. The updated microbat roosting habitat areas have been mapped in more detail in Section 5.5 of this BDAR.

In the wider landscape, outside of the development footprint defined by the BAM, there are known caves that support threatened cave bats:

- The presence of a known roost site for Large Bent-winged Bat *Miniopterus orianae* subsp*. oceanensis* at Timor Caves, approximately 5 kilometres south-west of the assessment area.
- Known breeding and non-breeding roosts for Large Bent-winged Bat and/or Little Bent-winged Bat *Miniopterus australis* are also known to occur at Willi National Park (130 kms north-east), Wellington Cave (225 kms south-west), Borenore Karst (260 kms south-west), Balickera Tunnel near Newcastle (180kms south-east), Kangara Boyd (270 kms south) and Wee Jasper (460 kms south-west).
- Four other known karst systems (caves) within 50 kms that support potential habitat for roosting and/or breeding microbats.
- The location of the development site is approximately 150 – 280 kms away from four known important maternity roost sites for Large-eared Pied Bat *Chalinolobus dwyeri* which are located on the same side of the dividing range as the development footprint. This the distance bats move from maternity roosts to non-breeding roosts has not been established but it likely to be less than 100 kilometres (DAWE 2020).

Due to the presence of cliffs within and directly adjacent to the development site, and caves and karst landscapes in the wider locality, a detailed assessment of the presence and relative abundance of cave-dwelling bats was carried out and is reported on in subsequent sections of this BDAR.

There are no known significant soil hazard features at the time of preparing this BDAR.

A search of the ASC Soil Type Map of NSW (OEH, 2019) reveals that the Ferrosols soil type dominates the Project Area. Ferrosols are characterised by their deep red friable soils that lack strong texture contrast, which are high in free iron oxide and generally have a high clay content. Soils appeared generally stable during the field surveys, with a reasonable cover of exotic grasses or native vegetation in areas. There was some minor erosion associated with waterways observed during the field survey.

A search of the NSW EPA Contaminated Sites Register, identified the closest sites recorded to the project area are two sites within the Tamworth LGA and two sites within the Upper Hunter Shire LGA, located within Tamworth and Scone (over 50 kilometres away from the assessment area). As such it was determined that the project location does not appear on the list of NSW contaminated sites. It was considered unlikely that contamination is present.

3.1.7 Biodiversity Values Map

The NSW Biodiversity Values Map identifies land with high biodiversity value that is particularly sensitive to impacts from development and clearing. The map forms part of the Biodiversity Offsets Scheme Threshold which is one of the triggers for determining whether the Biodiversity Offset Scheme (BOS) applies to a clearing or development proposal.

Based on a search of the NSW Biodiversity Values Map, there are areas of mapped high biodiversity value located within the assessment area as shown in Figure 4). The majority of the areas mapped in the Biodiversity Values Map are located outside of the development footprint and are associated with adjacent nature reserves, national park and higher order streams in the wind farm and transmission line corridor section of the project. There are only very small areas mapped in the Biodiversity Values Map within the development footprint in these areas (Figure 4).

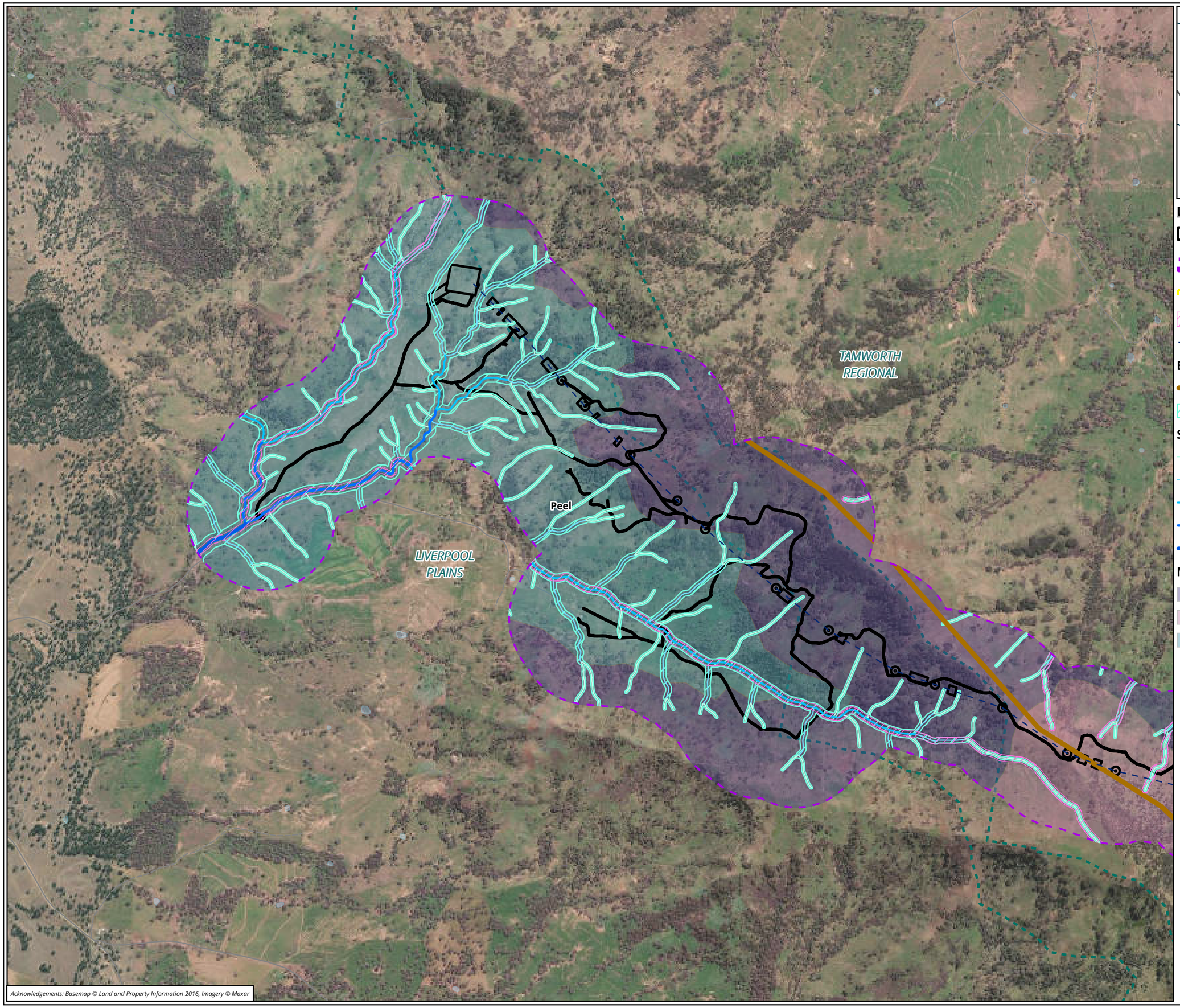
For the development footprint associated with the transport haul route there are no areas mapped in the Biodiversity Values Map (Figure 4).

3.1.8 Protected areas

Within the assessment area, but outside the development footprint there are two conservation areas protected by NSW legislation, which have been considered as part of the collection of baseline information on the ecological values of the assessment area and as part of the impact assessment.

Ben Halls Gap Nature Reserve is located directly adjacent to the development area and in close proximity to the certain infrastructure and internal roads elements of the development footprint. This reserve covers over 2,500 hectares of tall, old growth eucalypt forest, with a mix of grassy eucalypt woodland, tall moist eucalypt forest and rainforest (NPWS, 2002). It contains habitat for a number of threatened species, including Koala *Phascolarctos cinereus*, Spotted-tailed Quoll *Dasyurus maculatus*, forest owls and microbats. Given the proximity of the Ben Halls Gap Nature Reserve to the development footprint additional field surveys were carried out to ground-truth the vegetation communities, condition and habitat features 100 metres into those parts of the reserve which adjoin the development footprint.

At its closest point, Crawney Pass National Park is located 50 metres from parts of the development footprint for the transmission line corridor. In most sections, there is an approximately 300 metre buffer from the national park boundary to the development footprint. The national park is just over 310 hectares in size and contains mostly grassy open eucalypt forests and woodlands, with some smaller patches of rainforest on lower slopes on major creeklines on the southern side of the park (NPWS, 2019). There are no known populations of threatened plants in the National Park; however, it does provide habitat for Koala, forest owls, gliders and microbats.



Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Biodiversity values map (DPE 2022)
- Transmission line

Biodiversity corridors

- Ridgeline
- Riparian lands

Strahler Order

- 1
- 2
- 3
- 4
- 5

Mitchell landscapes

- Mount Royal Ridges
- Mount Royal Tops
- Nundle Hills

Figure 4 Site map and location map features, Page 2

0 250 500 750 1,000

Meters

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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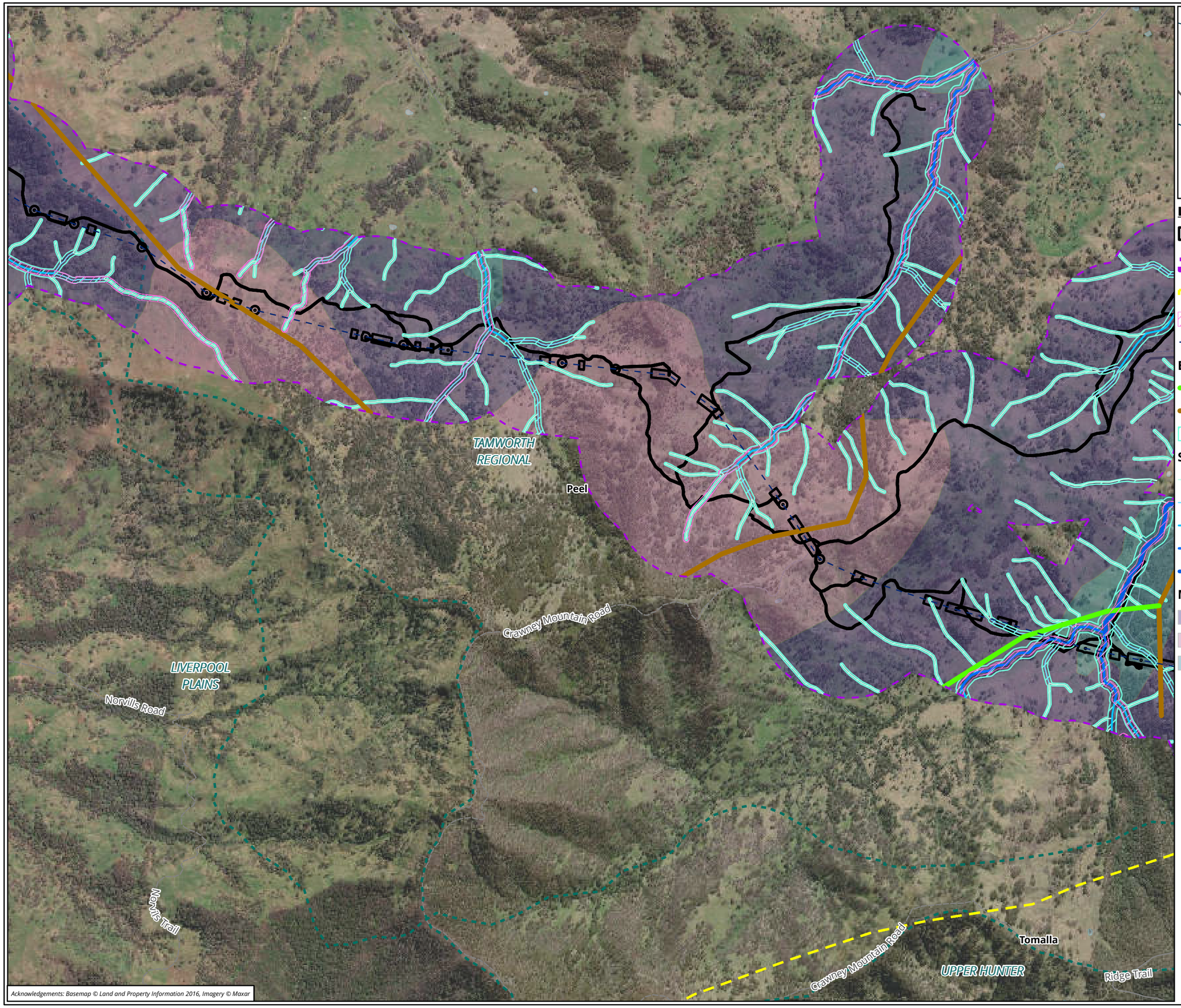

Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Biodiversity values map (DPE 2022)
- Transmission line

Biodiversity corridors

- Altitudinal
- Ridgeline
- Riparian lands

Strahler Order

- 1
- 2
- 3
- 4
- 5

Mitchell landscapes

- Mount Royal Ridges
- Mount Royal Tops
- Nundle Hills

Figure 4 Site map and location map features, Page 3

0 250 500 750 1,000

Meters

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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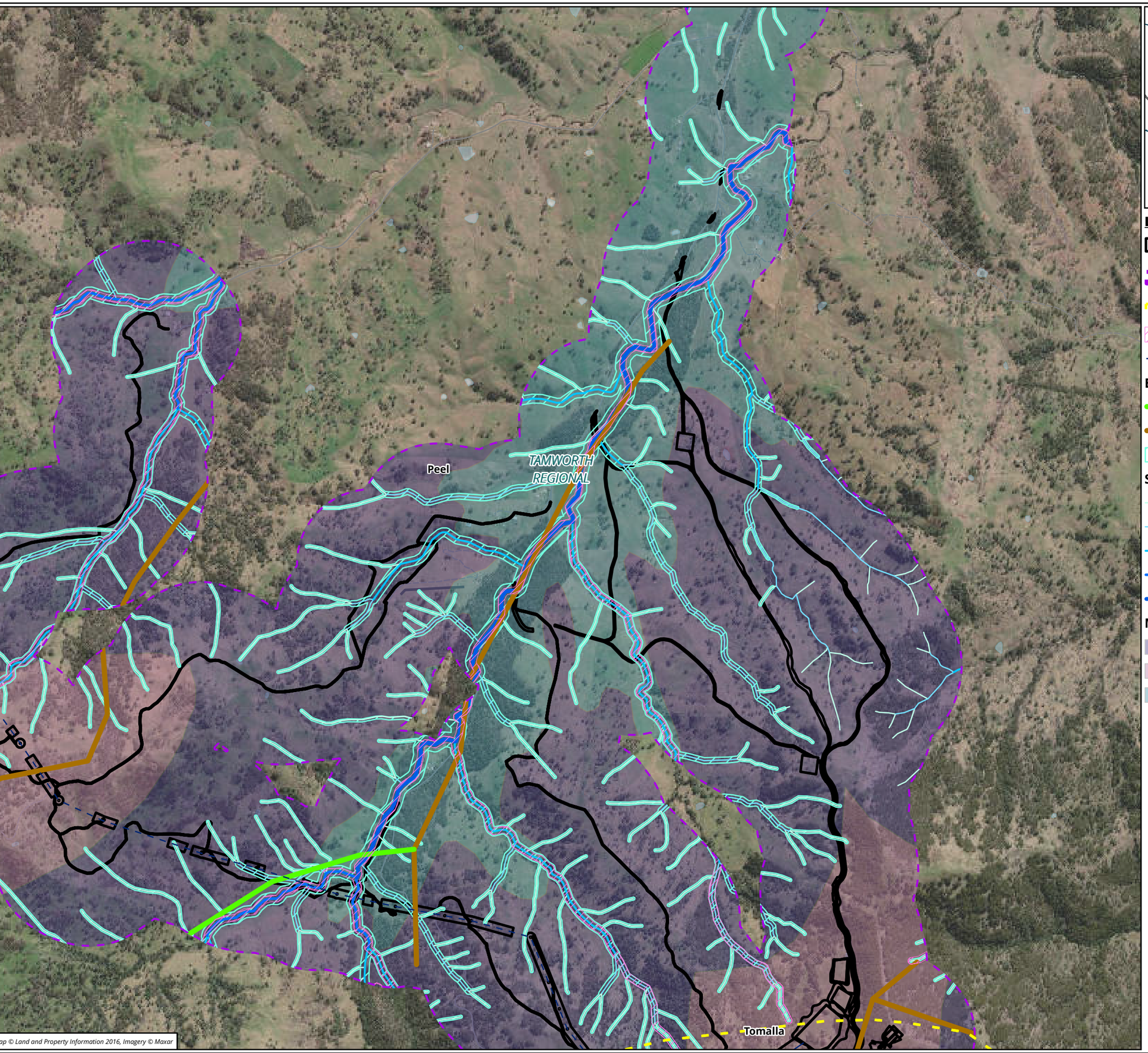

Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Biodiversity values map (DPE 2022)
- Transmission line

Biodiversity corridors

- Altitudinal
- Ridgeline
- Riparian lands

Strahler Order

- 1
- 2
- 3
- 4
- 5

Mitchell landscapes

- Mount Royal Ridges
- Mount Royal Tops
- Nundle Hills

Figure 4 Site map and location map features, Page 4

0 250 500 750 1,000

Meters

Scale: 1:25,000 @ A3

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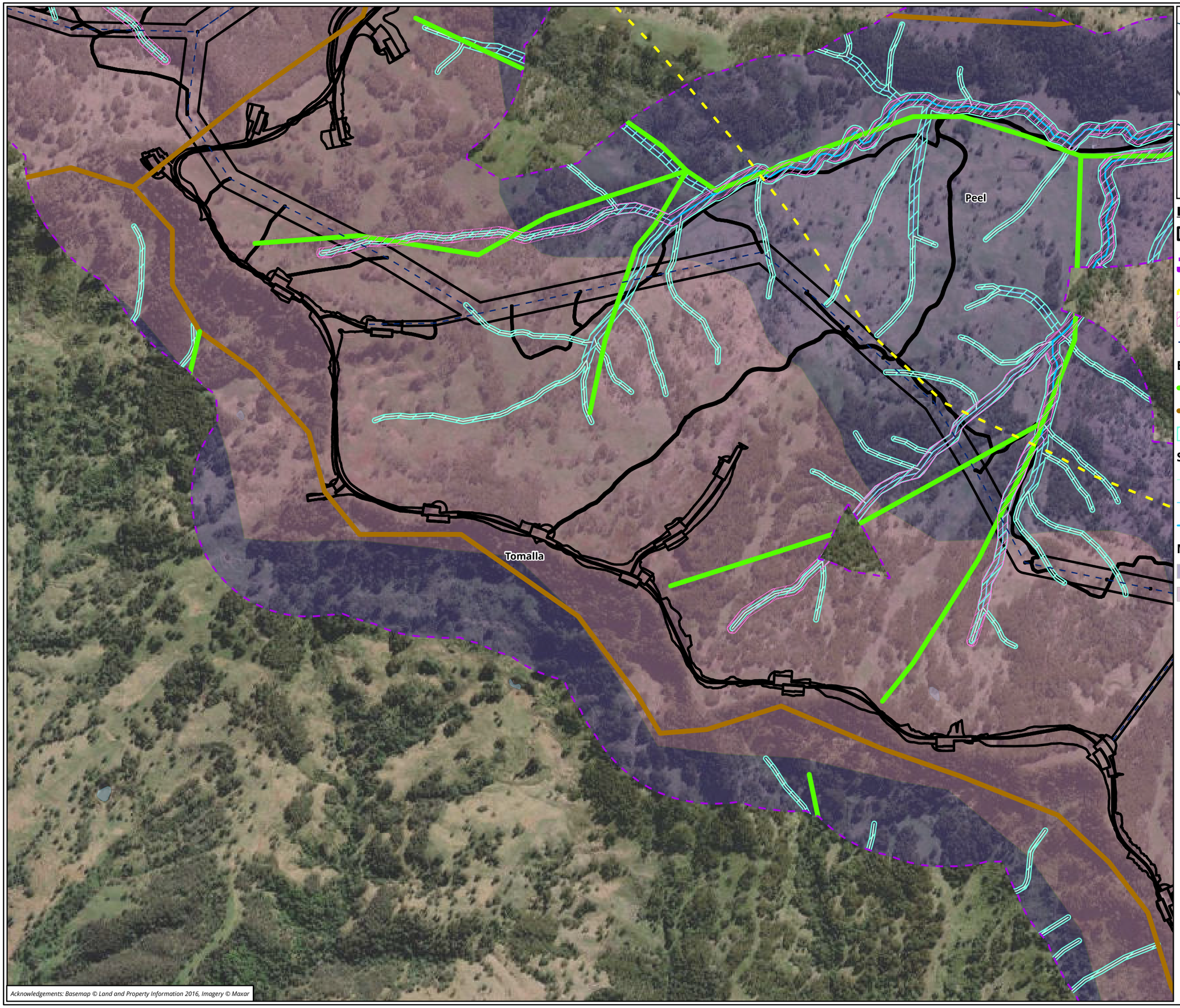

Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Biodiversity values map (DPE 2022)
- Transmission line

Biodiversity corridors

- Altitudinal
- Ridgeline
- Riparian lands

Strahler Order

- 1
- 2
- 3

Mitchell landscapes

- Mount Royal Ridges
- Mount Royal Tops

Figure 4 Site map and location map features, Page 5

0 150 300 450 600

Meters

Scale: 1:15,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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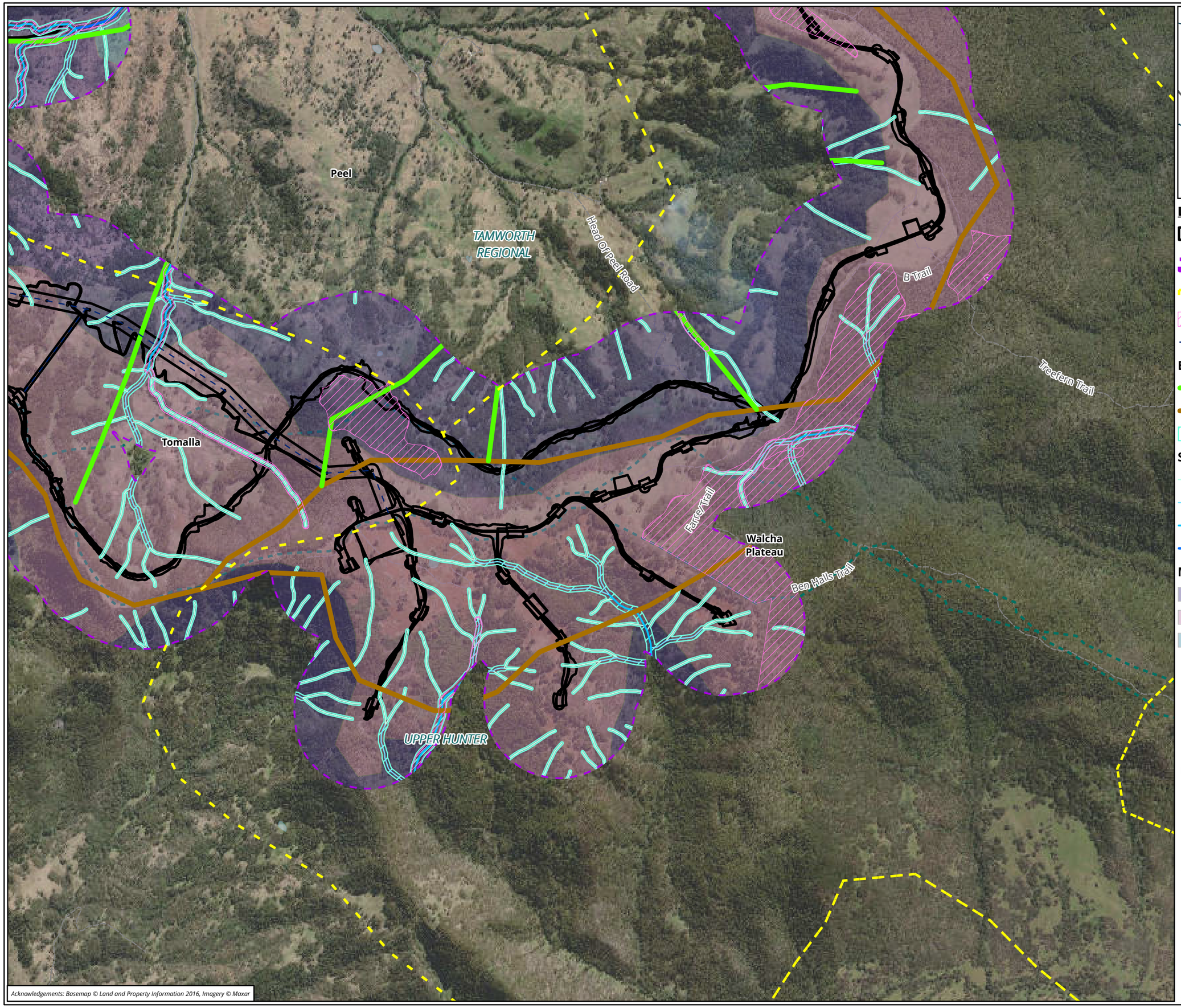

Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Biodiversity values map (DPE 2022)
- Transmission line

Biodiversity corridors

- Altitudinal
- Ridgeline
- Riparian lands

Strahler Order

- 1
- 2
- 3
- 4

Mitchell landscapes

- Mount Royal Ridges
- Mount Royal Tops
- Nundle Hills

Figure 4 Site map and location map features, Page 6

0 250 500 750 1,000

Meters

Scale: 1:25,000 @ A3

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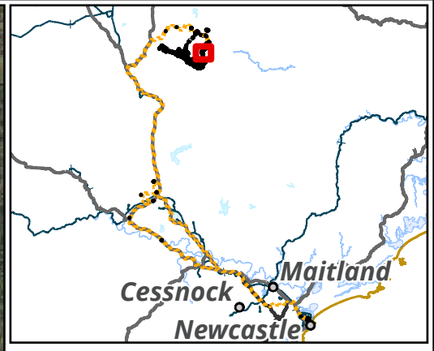

Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Biodiversity values map (DPE 2022)

Biodiversity corridors

- Altitudinal
- Ridgeline
- Riparian lands

Strahler Order

- 1
- 2

Mitchell landscapes

- Manning Great Escarpment Southern Aspects
- Mount Royal Ridges
- Mount Royal Tops

Figure 4 Site map and location map features, Page 7

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Meters

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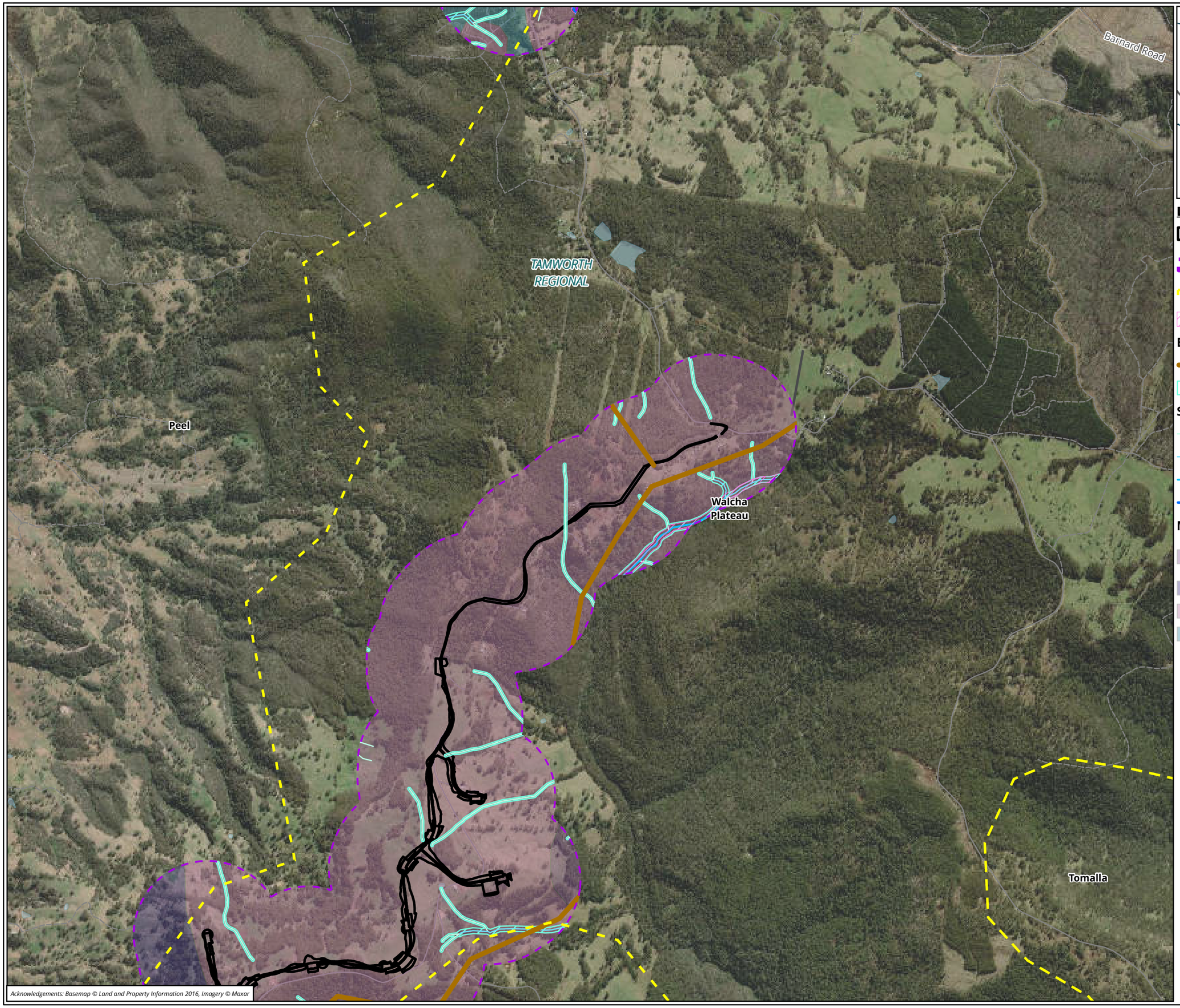

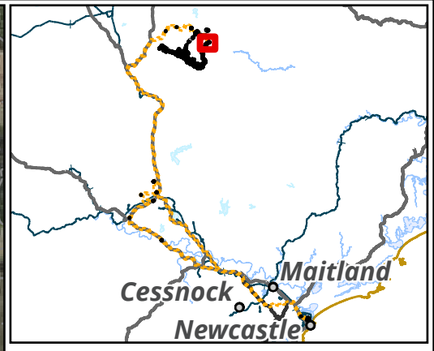

Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Biodiversity values map (DPE 2022)

Biodiversity corridors

- Ridgeline
- Riparian lands

Strahler Order

- 1
- 2
- 3
- 4

Mitchell landscapes

- Manning Great Escarpment Southern Aspects
- Mount Royal Ridges
- Mount Royal Tops
- Nundle Hills

Figure 4 Site map and location map features, Page 8

0 250 500 750 1,000

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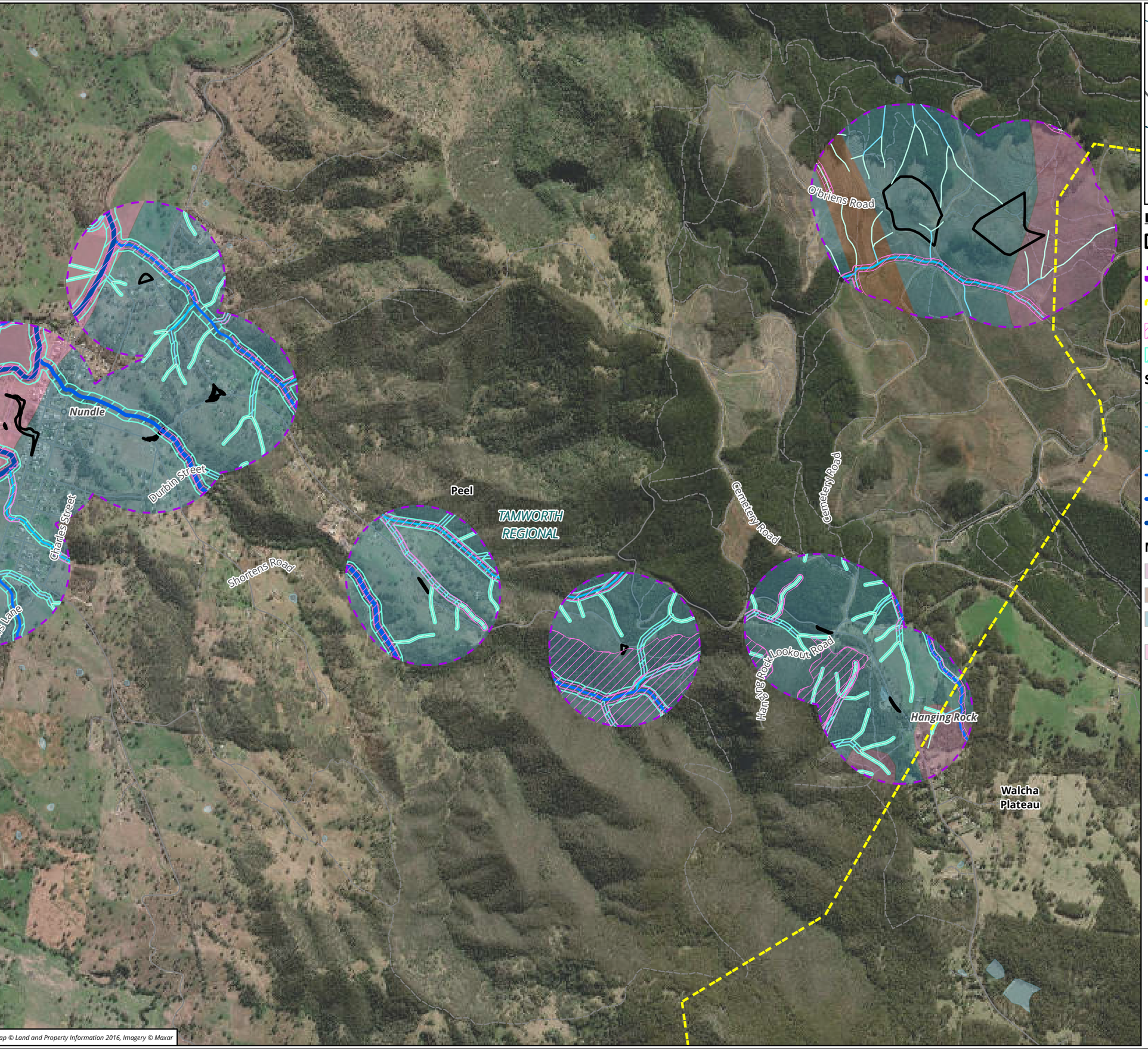

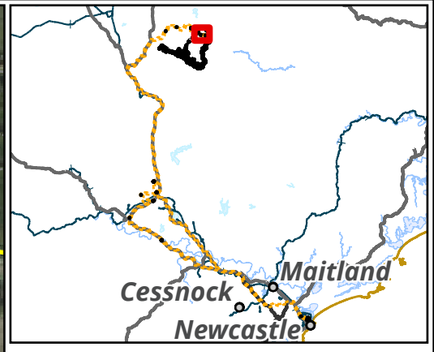

Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Biodiversity values map (DPE 2022)
- Riparian lands

Strahler Order

- 1
- 2
- 3
- 4
- 5
- 6

Mitchell landscapes

- Mount Royal Tops
- Nowendoc - Yarras Serpentinite
- Nundle Hills
- Tamworth - Keepit Slopes and Plains

Figure 4 Site map and location map features, Page 9

0 250 500 750 1,000

Meters

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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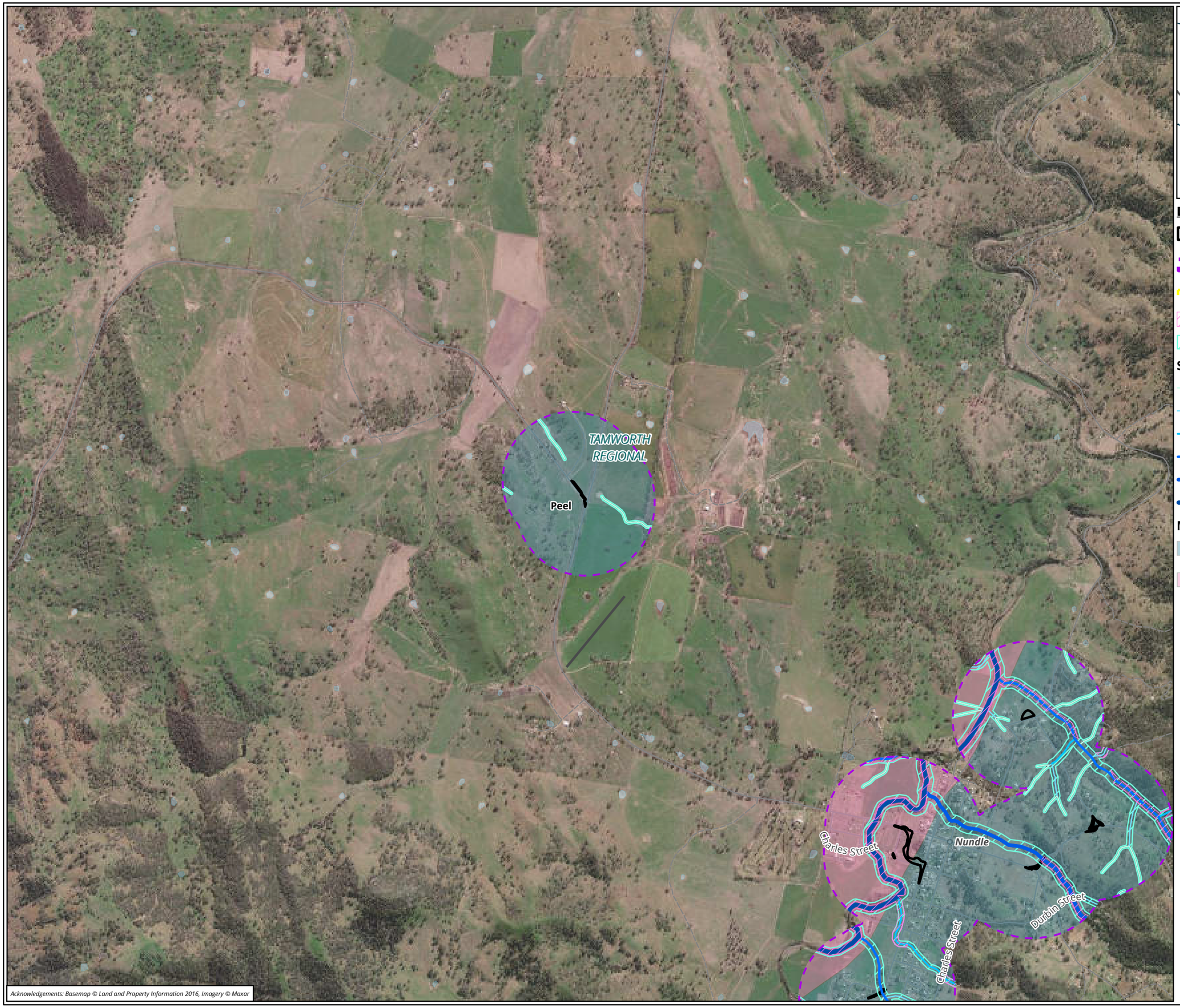

Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Biodiversity values map (DPE 2022)
- Riparian lands

Strahler Order

- 1
- 2
- 3
- 4
- 5
- 6

Mitchell landscapes

- Nundle Hills
- Tamworth - Keepit Slopes and Plains

Figure 4 Site map and location map features, Page 10

0 250 500 750 1,000

Meters

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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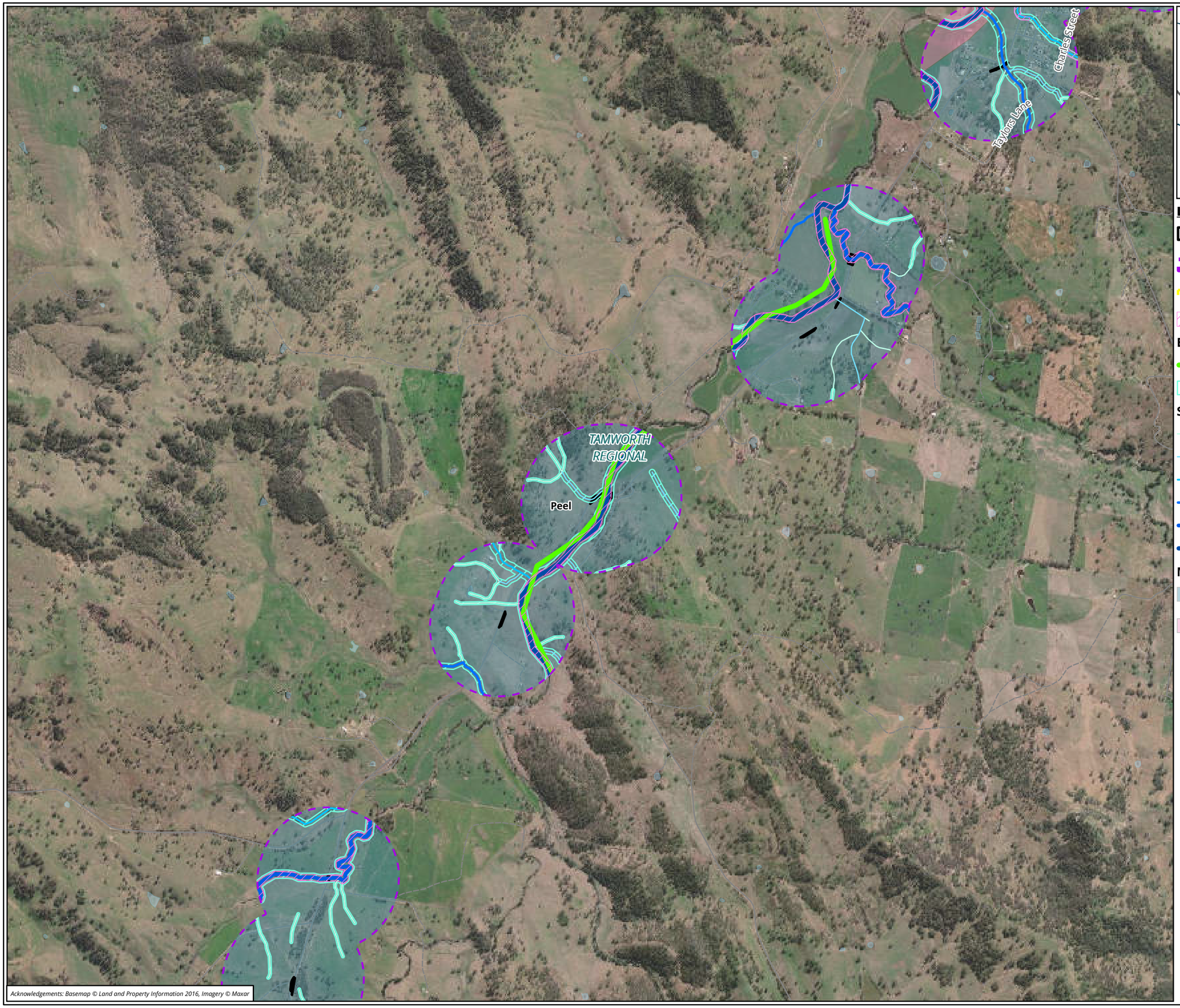

Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Biodiversity values map (DPE 2022)

Biodiversity corridors

- Altitudinal
- Riparian lands

Strahler Order

- 1
- 2
- 3
- 4
- 5
- 6

Mitchell landscapes

- Nundle Hills
- Tamworth - Keepit Slopes and Plains

Figure 4 Site map and location map features, Page 11

0 250 500 750 1,000

Meters

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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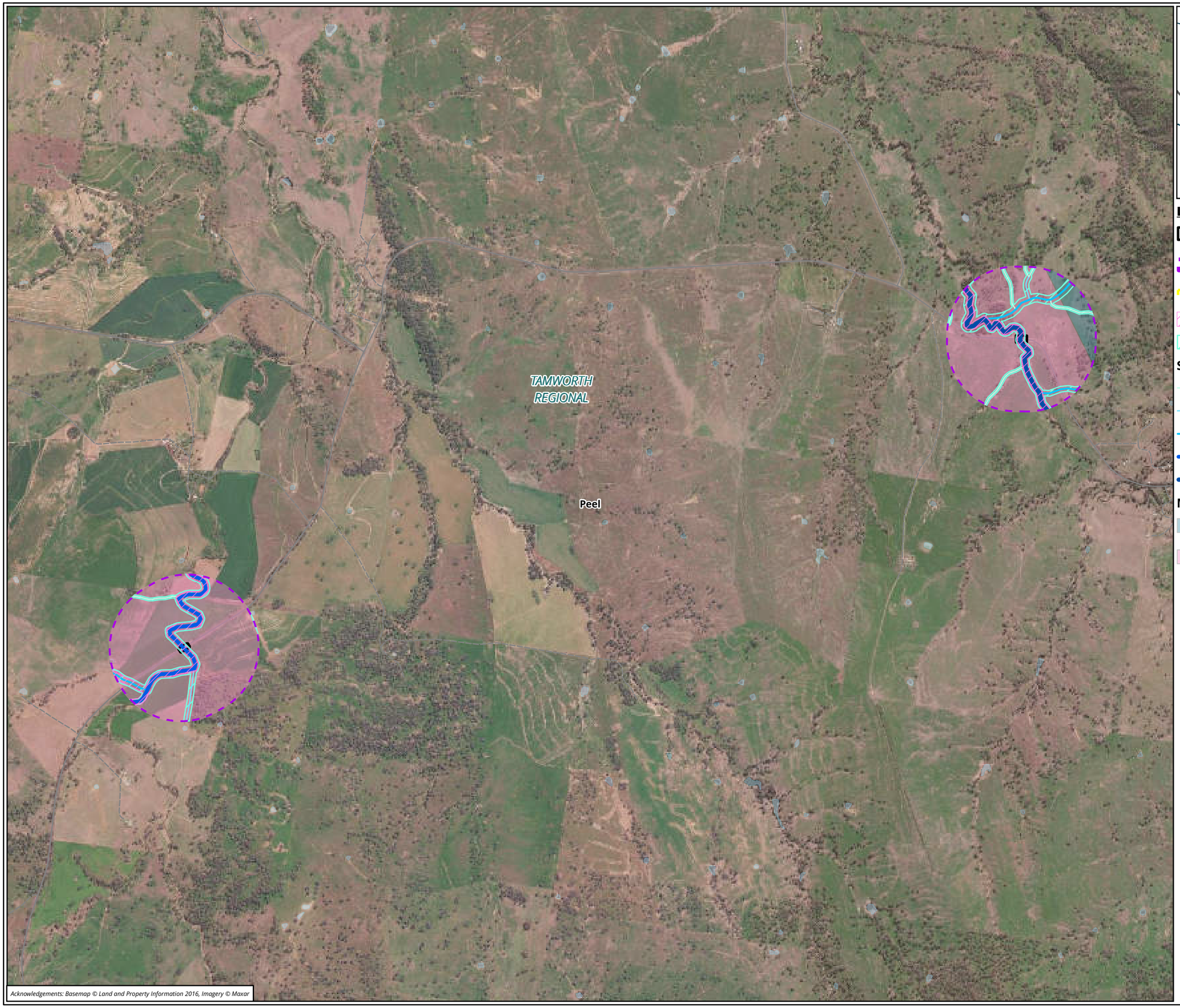

Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Biodiversity values map (DPE 2022)
- Riparian lands

Strahler Order

- 1
- 2
- 3
- 5
- 6

Mitchell landscapes

- Nundle Hills
- Tamworth - Keepit Slopes and Plains

Figure 4 Site map and location map features, Page 12

0 250 500 750 1,000

Meters

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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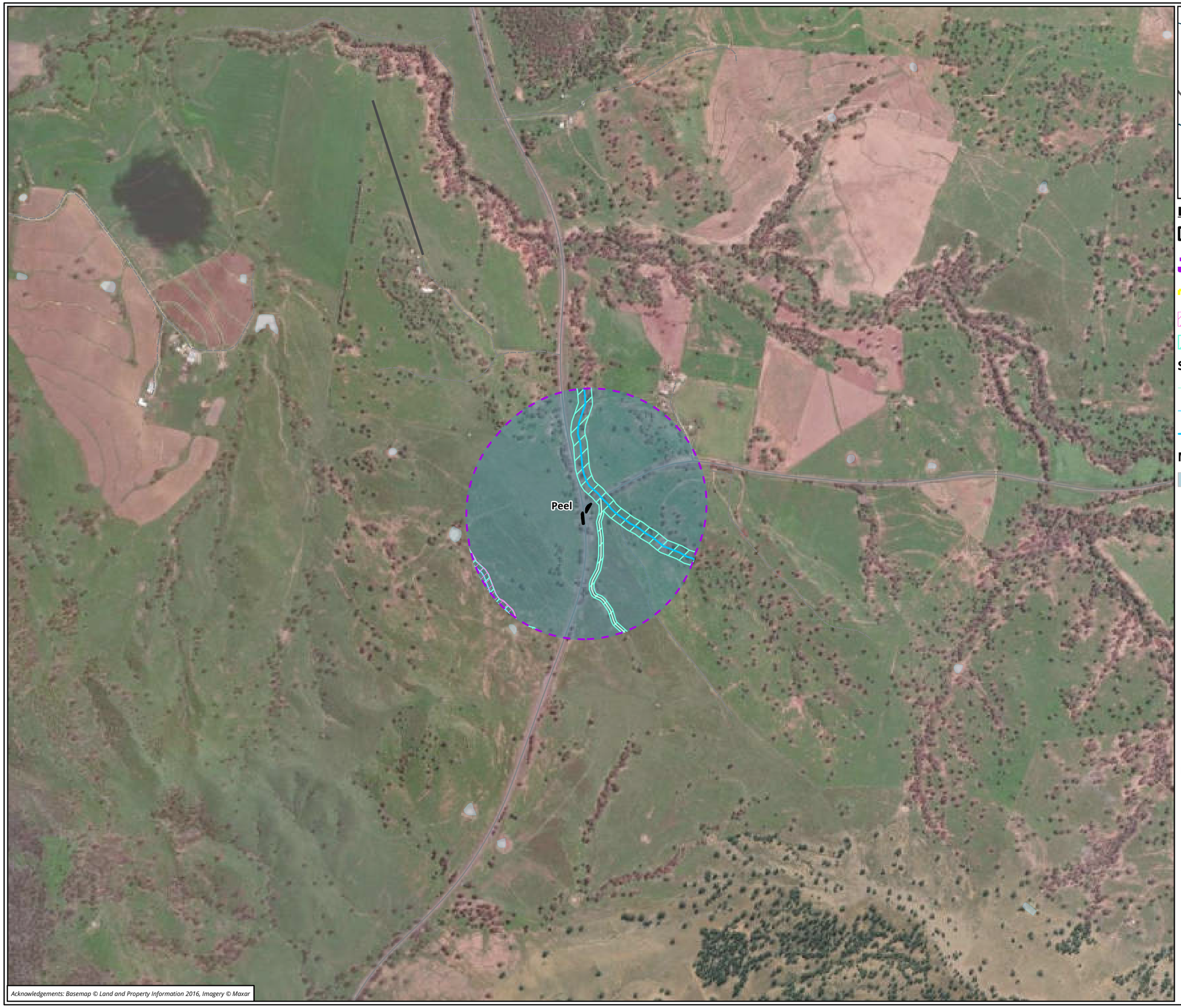

Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Biodiversity values map (DPE 2022)
- Riparian lands

Strahler Order

- 1
- 2
- 3

Mitchell landscapes

- Nundle Hills

Figure 4 Site map and location map features,
Page 13

0 150 300 450 600

Meters

Scale: 1:15,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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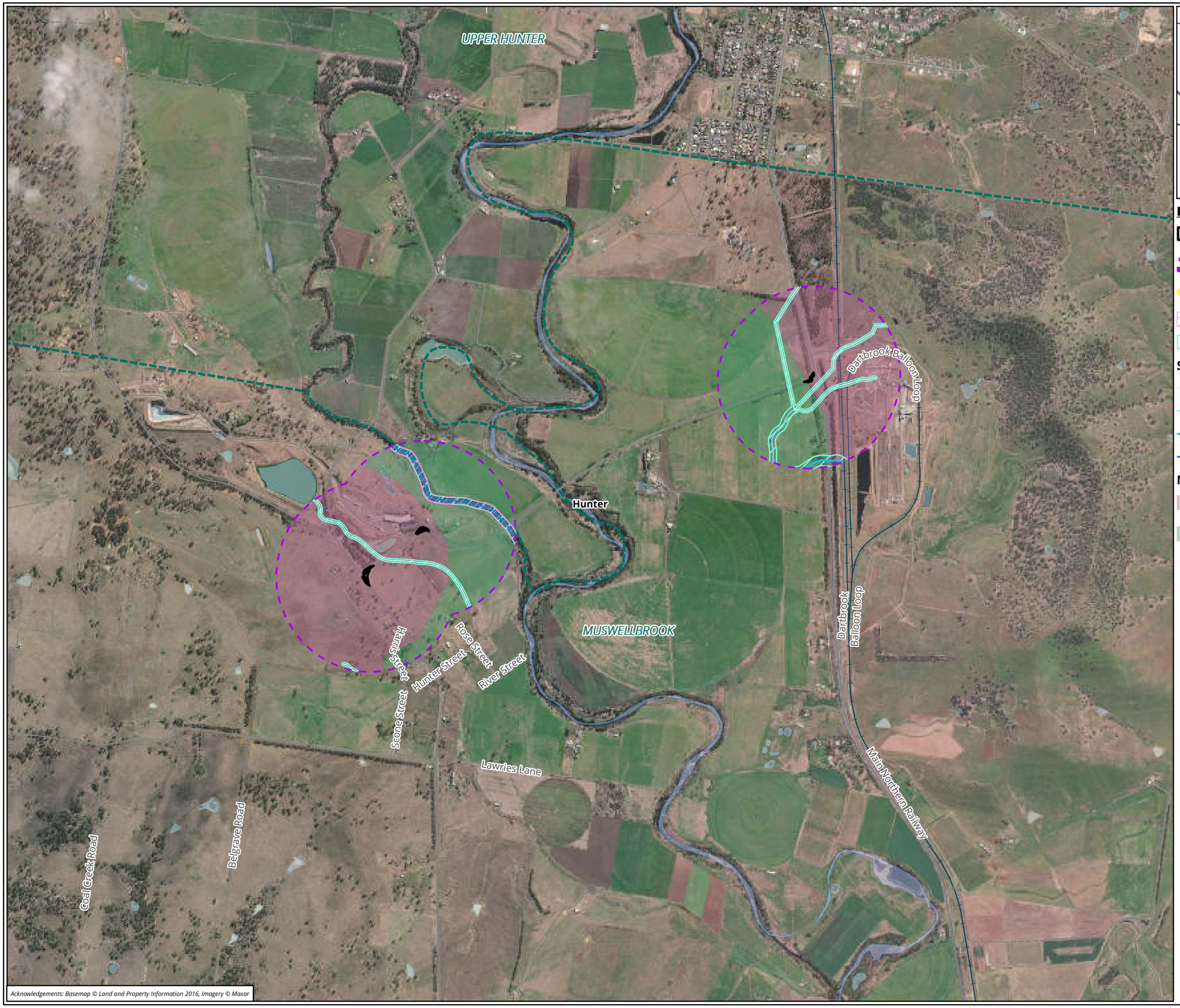

Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Biodiversity values map (DPE 2022)
- Riparian lands

Strahler Order

- 1
- 2
- 3
- 7

Mitchell landscapes

- Central Hunter Foothills
- Upper Hunter Channels and Floodplain

Figure 4 Site map and location map features, Page 14

0 200 400 600 800

Meters

Scale: 1:20,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Biodiversity values map (DPE 2022)
- Riparian lands

Strahler Order

- 1
- 2
- 3
- 4
- 9

Mitchell landscapes

- Central Hunter Foothills
- Upper Hunter Channels and Floodplain

Figure 4 Site map and location map features, Page 15

0 150 300 450 600

Meters

Scale: 1:15,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Riparian lands

Strahler Order

- 1

Mitchell landscapes

- Central Hunter Foothills

Hunter

Wyndham Arms Row

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Figure 4 Site map and location map features, Page 16

0 150 300 450 600

Meters

Scale: 1:15,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Biodiversity values map (DPE 2022)
- Riparian lands

Strahler Order

- 3
- 9

Mitchell landscapes

- Central Hunter Foothills
- Upper Hunter Channels and Floodplain

Figure 4 Site map and location map features, Page 17

0 150 300 450 600

Meters

Scale: 1:15,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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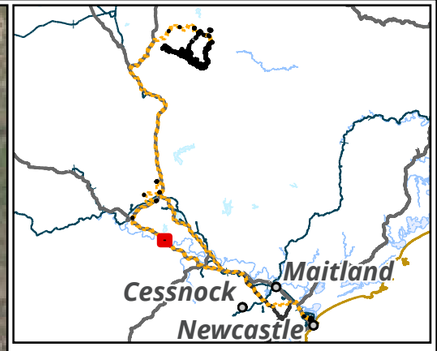

Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Biodiversity values map (DPE 2022)
- Riparian lands

Strahler Order

- 1
- 2

Mitchell landscapes

- Central Hunter Foothills
- Upper Hunter Channels and Floodplain

Hunter

Perimeter Trail

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Figure 4 Site map and location map features, Page 18

0 150 300 450 600

Meters

Scale: 1:15,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Riparian lands

Strahler Order

- 1

Mitchell landscapes

- Central Hunter Alluvial Plains
- Central Hunter Foothills

Figure 4 Site map and location map features, Page 19

0 250 500 750 1,000

Meters

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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Figure 4 Site map and location map features, Page 19

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Legend

- Infrastructure footprint
- Landscape assessment buffer (study area)
- IBRA subregions
- Riparian lands

Strahler Order

- 1
- 5

Mitchell landscapes

- Gosford - Cooranbong Coastal Slopes
- Lower Hunter Channels and Floodplains
- Sydney - Newcastle Barriers and Beaches

Figure 4 Site map and location map features, Page 20

0 200 400 600 800

Meters

Scale: 1:20,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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3.2 Site context

Site context considerations include the assessment of native vegetation cover and patch size, in accordance with Section 3.2 and 4.3 of the BAM. These assessments were undertaken using the following existing vegetation mapping available for the region:

- Ground-truthed PCT map prepared for the wind farm infrastructure area and haul route sites.
- State Vegetation Type Map: Border Rivers Gwydir / Namoi Region Version 2.0. VIS_ID 4467 (OEH, 2020a).
- State Vegetation Type Map: Upper Hunter Version 1.0. VIS_ID 4894 (OEH, 2020b).
- Greater Hunter Native Vegetation Mapping Version 4.0. VIS_ID 3855 (DPIE, 2015).
- OEH BioNet Vegetation Classification Database.

Figure 5 shows native vegetation cover and patch assignment relative to the estimated development footprint.

Parts of the assessment area were burnt by the summer 2019/2020 bushfires which burnt large tracks of the surrounding vegetation. Within a 20 kilometre buffer area of the assessment area approximately 32,000 hectares (25%) of native vegetation has been burnt, with the area estimated to support a total of approximately 116,500 hectares of native vegetation. Most (approximately 26,200 hectares or 82%) of this vegetation has been burnt to a medium or high degree of intensity, in accordance with the burnt area classes outlined in the GEEBAM (NSW Department of Planning, Industry and Environment 2020), meaning both the canopy and understorey have either been partially of completely burnt.

Within the vicinity of the wind farm, bushfire effected areas along the southern side of the central portion of the development footprint within and surrounding Ben Halls Gap Nature Reserve, nears turbines WP20 to WP45. Consideration of bushfire effects on vegetation, habitat and refugia within and surrounding the development site has been considered during this assessment.

3.2.1 Native vegetation cover

About 44% of the 12,700 hectare landscape assessment has been cleared of native vegetation. However, approximately 7091 hectares (or 56% of the assessment area) consists of native vegetation which is classified as having a cover class of between >30-70% meaning that this is the percentage of native vegetation cover within the assessment area. This is summarised in Table 19.

The extent of native vegetation cover across all areas of the landscape context maps are provided in Figure 5.

Table 19 Native vegetation cover

IBRA subregions	Native vegetation extent (ha)	Assessment area (ha)	% assessment area	Native vegetation cover class
Combined project total				
All	7091	12,296	56%	>30-70%
Breakdown by IBRA subregion				
Hunter	184	1478	12%	<30%
Peel	3155	6739	47%	>30-70%
Tomalla	1508	1752	86%	>70%
Walcha Plateau	2245	2727	82%	>70%

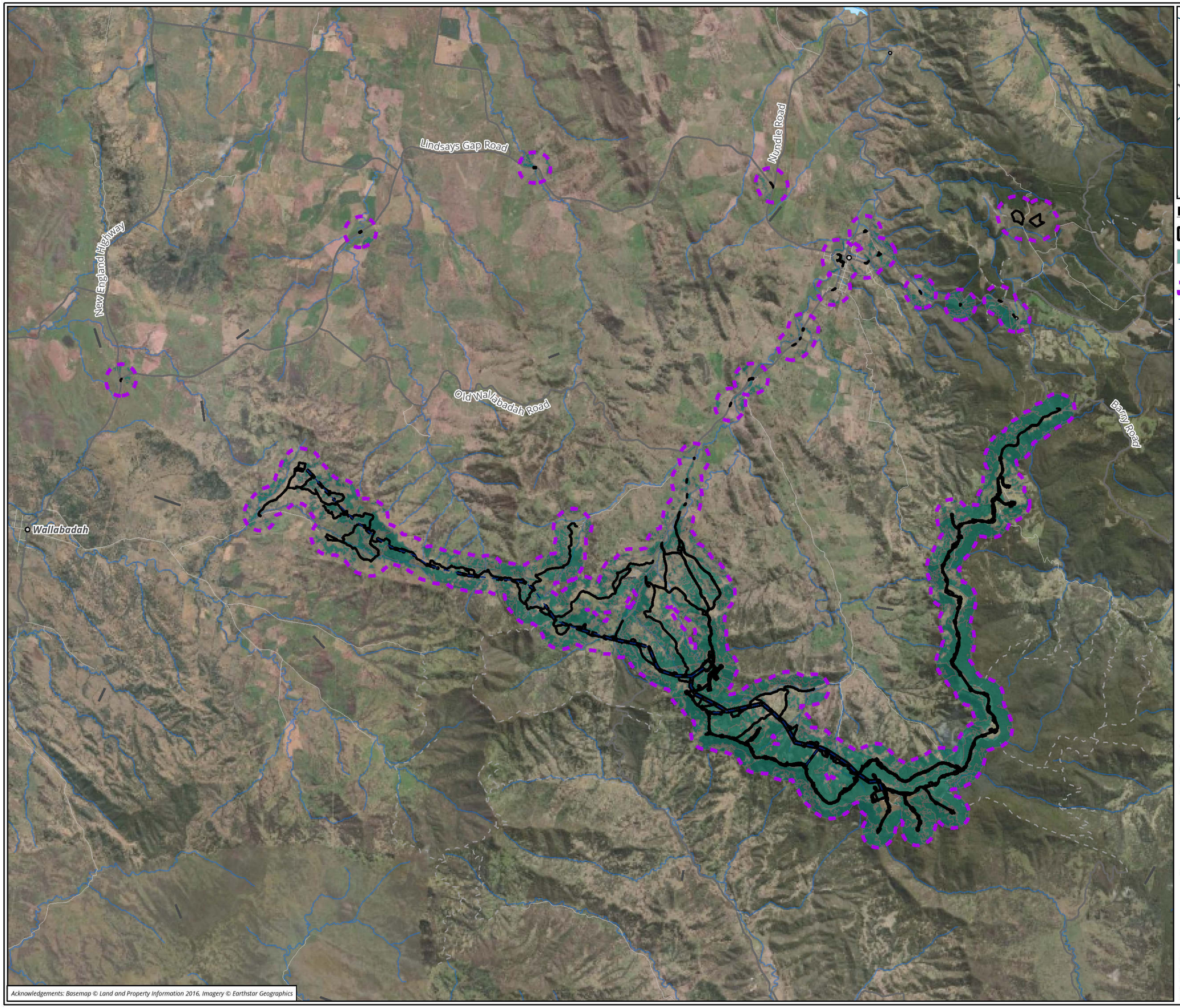
3.2.2 Patch size

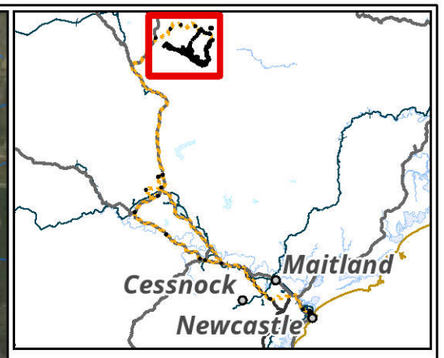
Patch size for the native vegetation within the assessment area has been assessed in accordance with the requirements of Section 4.3.2 of the BAM. Each native vegetation zone in the development footprint was assessed and assigned to a required patch size class, being <5 hectares, 5–<25 hectares, 25–100 hectares or ≥100 hectares.

Patch size was assessed in accordance with the BAM using ArcGIS to select, measure and classify native vegetation patches. Within each NSW Landscape, all native vegetation not defined as low condition and separated by a distance of less than 100 metres (woody vegetation types) and 30 metres (non-woody vegetation types) was mapped sequentially using the development footprint PCT mapping and desktop mapped data.

Vegetation patches and associated patch size classes were all classified in the greater than 100 hectares patch size class in accordance with Section 4.3.2 of the BAM. This is due to the vegetation zones within the development footprint occurring less than 100 metres apart and so being assigned to the same patch as under the BAM, the definition of a patch is an area of intact native vegetation that occurs within the development footprint and includes other areas of native vegetation that are within 100 metres of the patch.

Patches sizes are illustrated on Figure 8.





Legend

- Infrastructure footprint
- Native vegetation
- Landscape assessment buffer (study area)
- Transmission line

Figure 5 Location map native vegetation cover, Page 1

0 1,000 2,000 3,000 4,000

Meters

Scale: 1:120,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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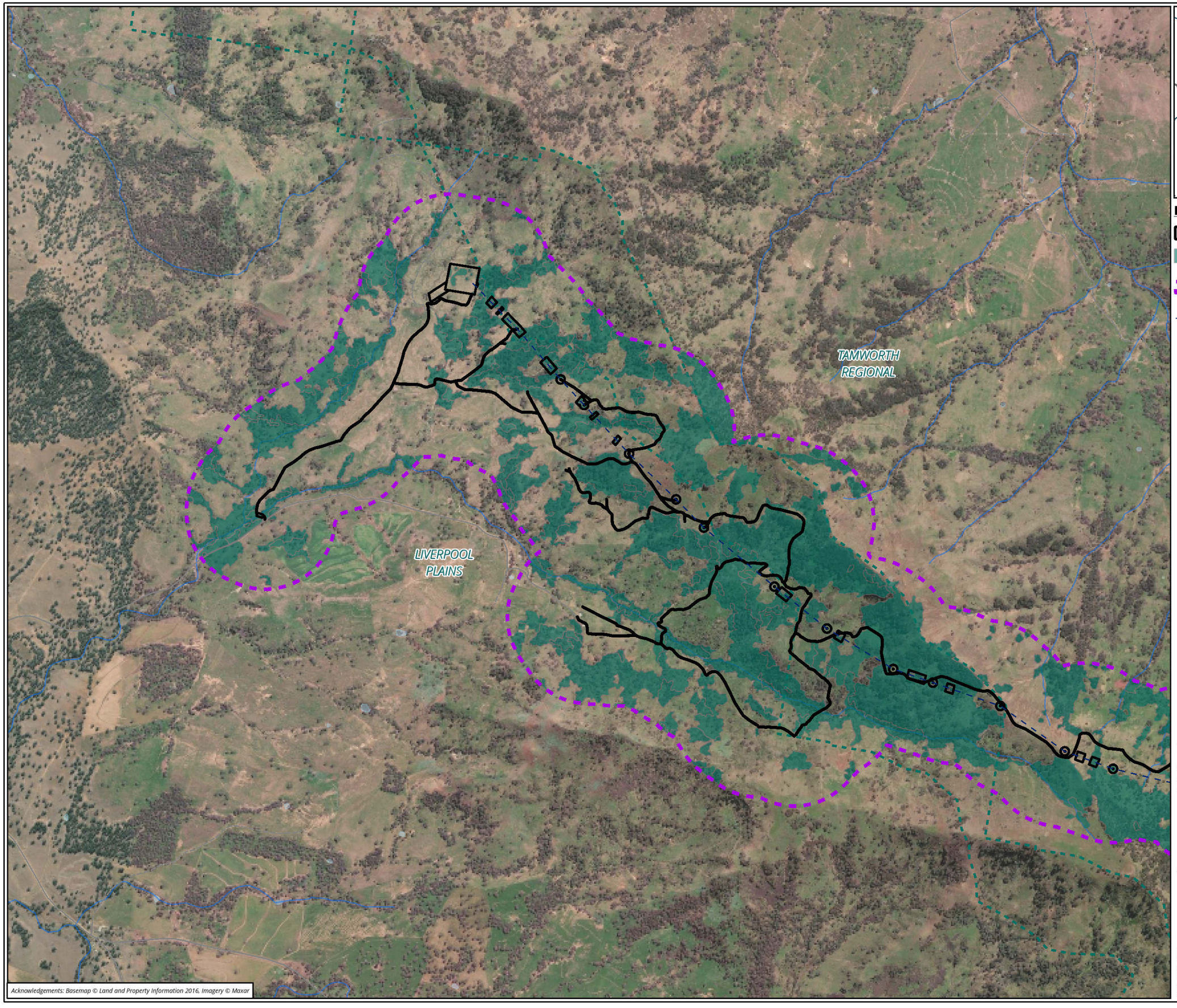

Legend

- Infrastructure footprint
- Native vegetation
- Landscape assessment buffer (study area)
- Transmission line

Figure 5 Location map native vegetation cover, Page 2

0 300 600 900 1,200 N

Meters

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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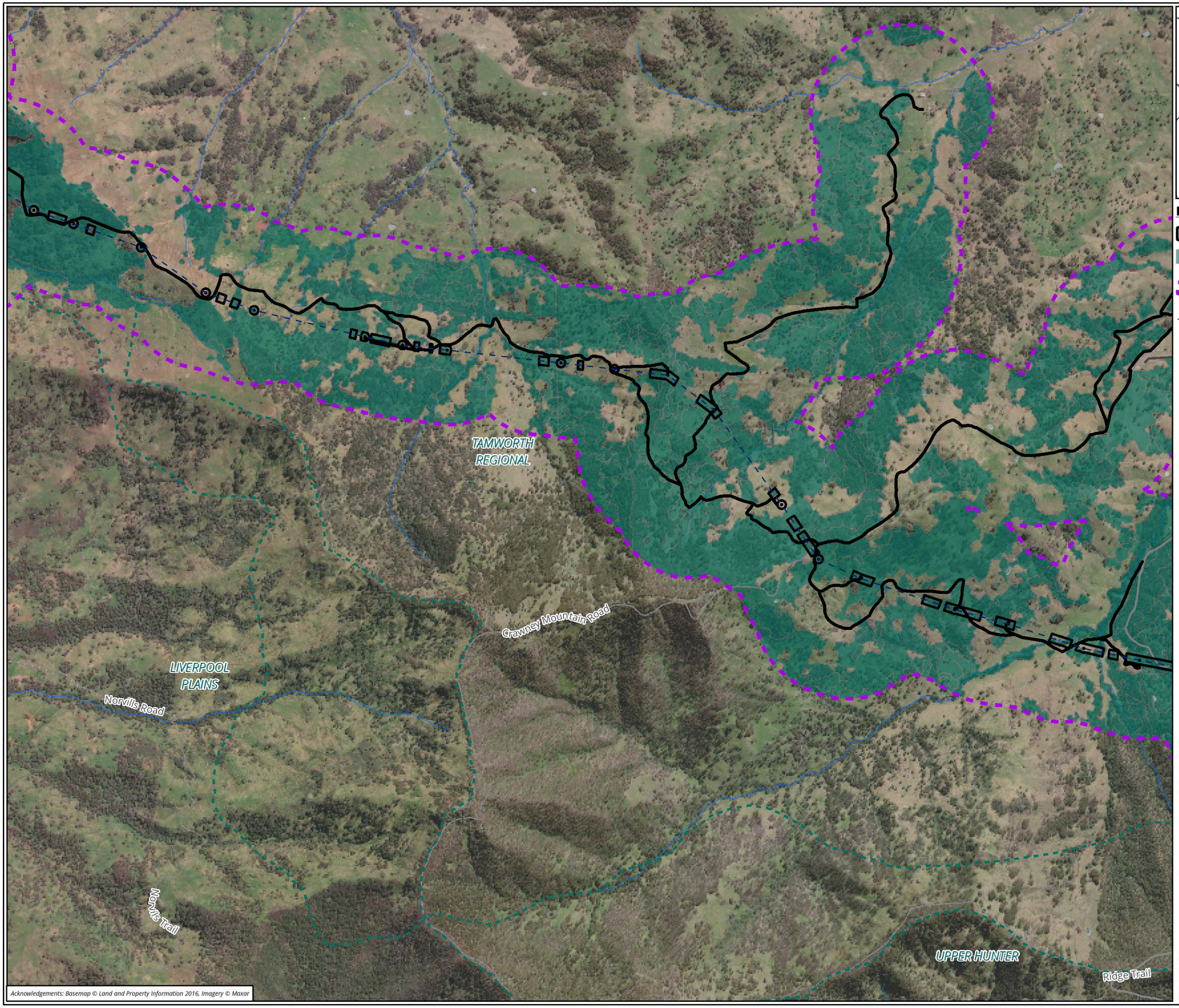

Legend

- Infrastructure footprint
- Native vegetation
- Landscape assessment buffer (study area)
- Transmission line

Figure 5 Location map native vegetation cover, Page 3

0 300 600 900 1,200

Meters

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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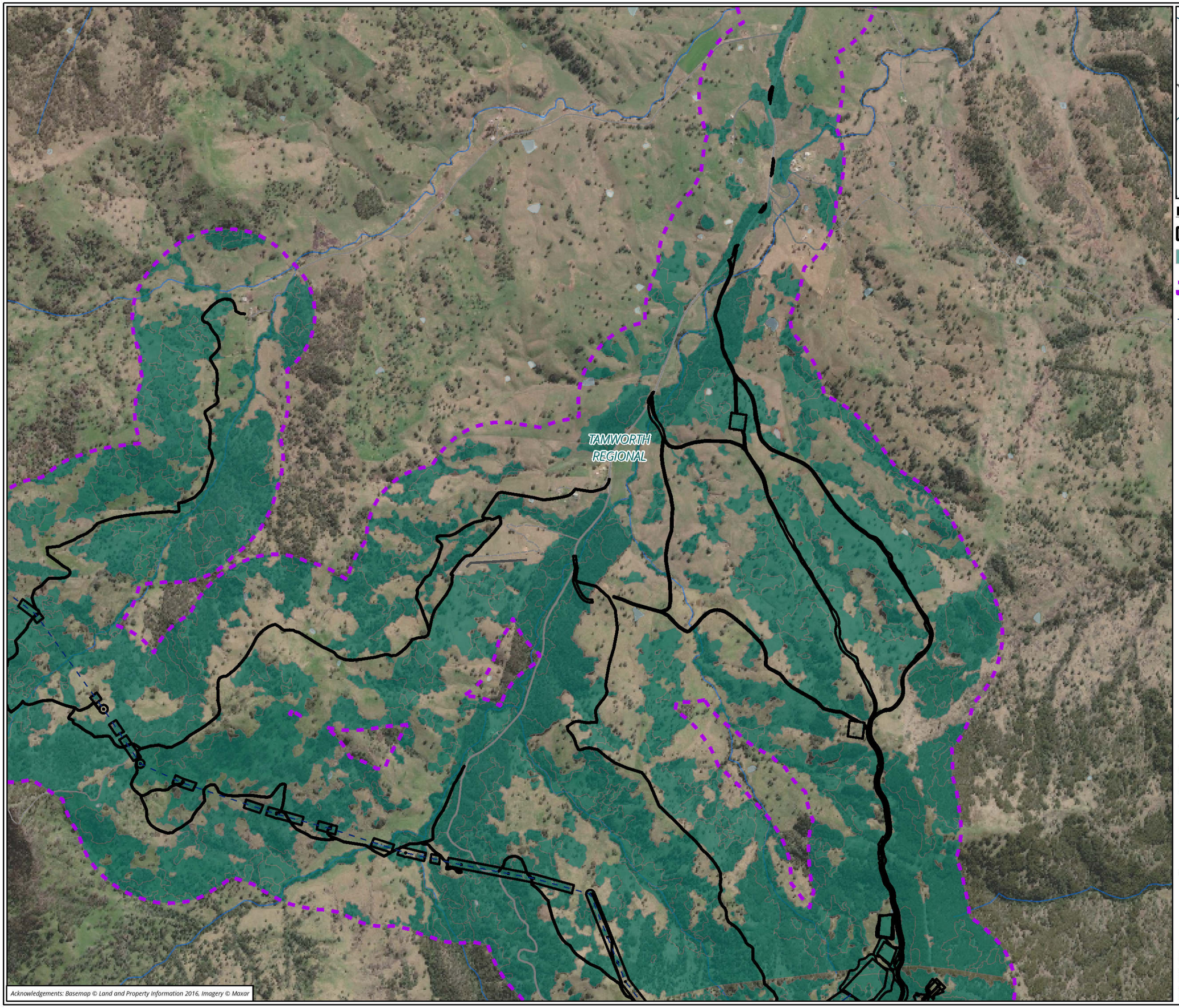

Legend

- Infrastructure footprint
- Native vegetation
- Landscape assessment buffer (study area)
- Transmission line

Figure 5 Location map native vegetation cover, Page 4

0 300 600 900 1,200

Meters

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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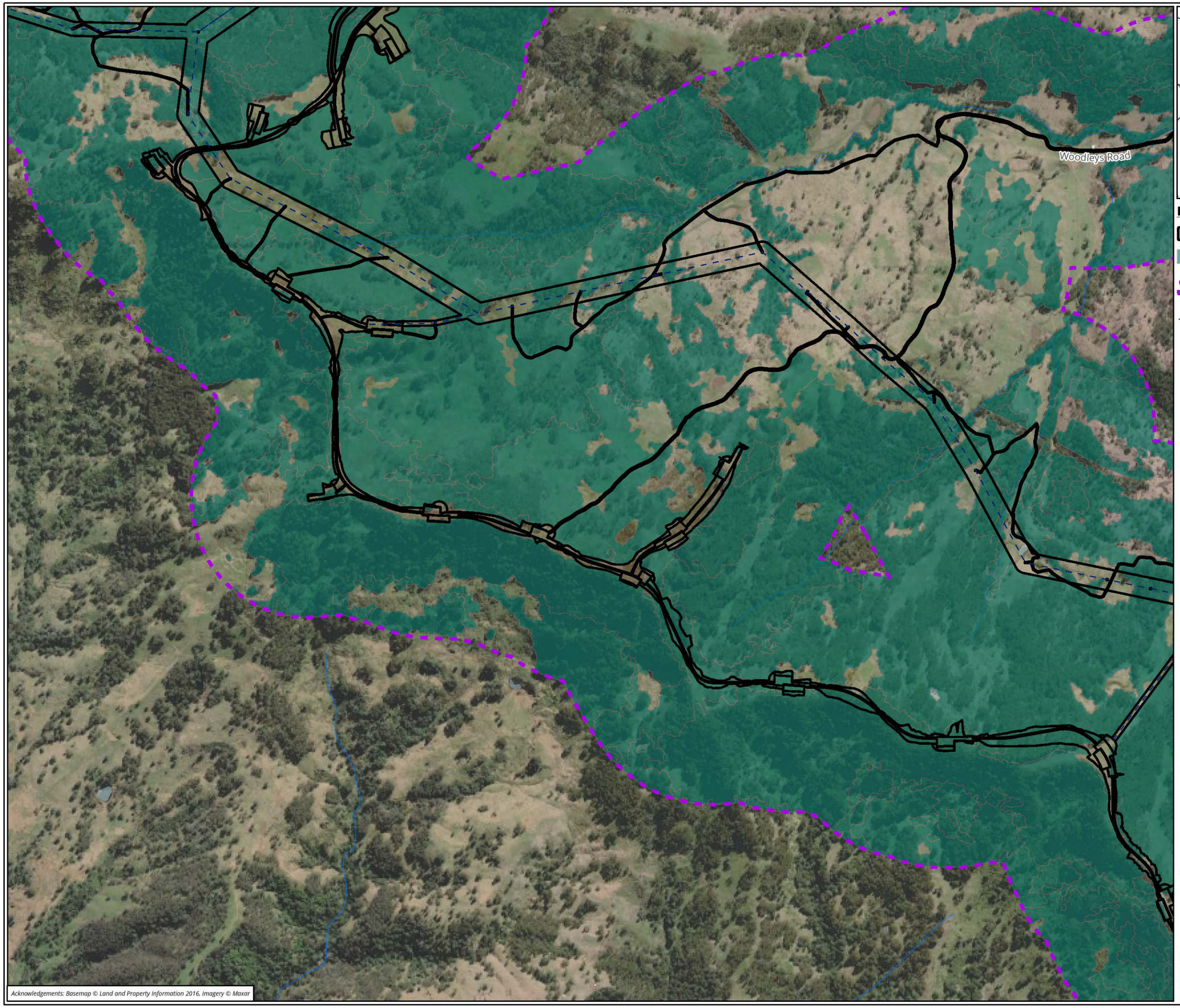

Legend

- Infrastructure footprint
- Native vegetation
- Landscape assessment buffer (study area)
- Transmission line

Figure 5 Location map native vegetation cover, Page 5

0 180 360 540 720 N

Meters

Scale: 1:15,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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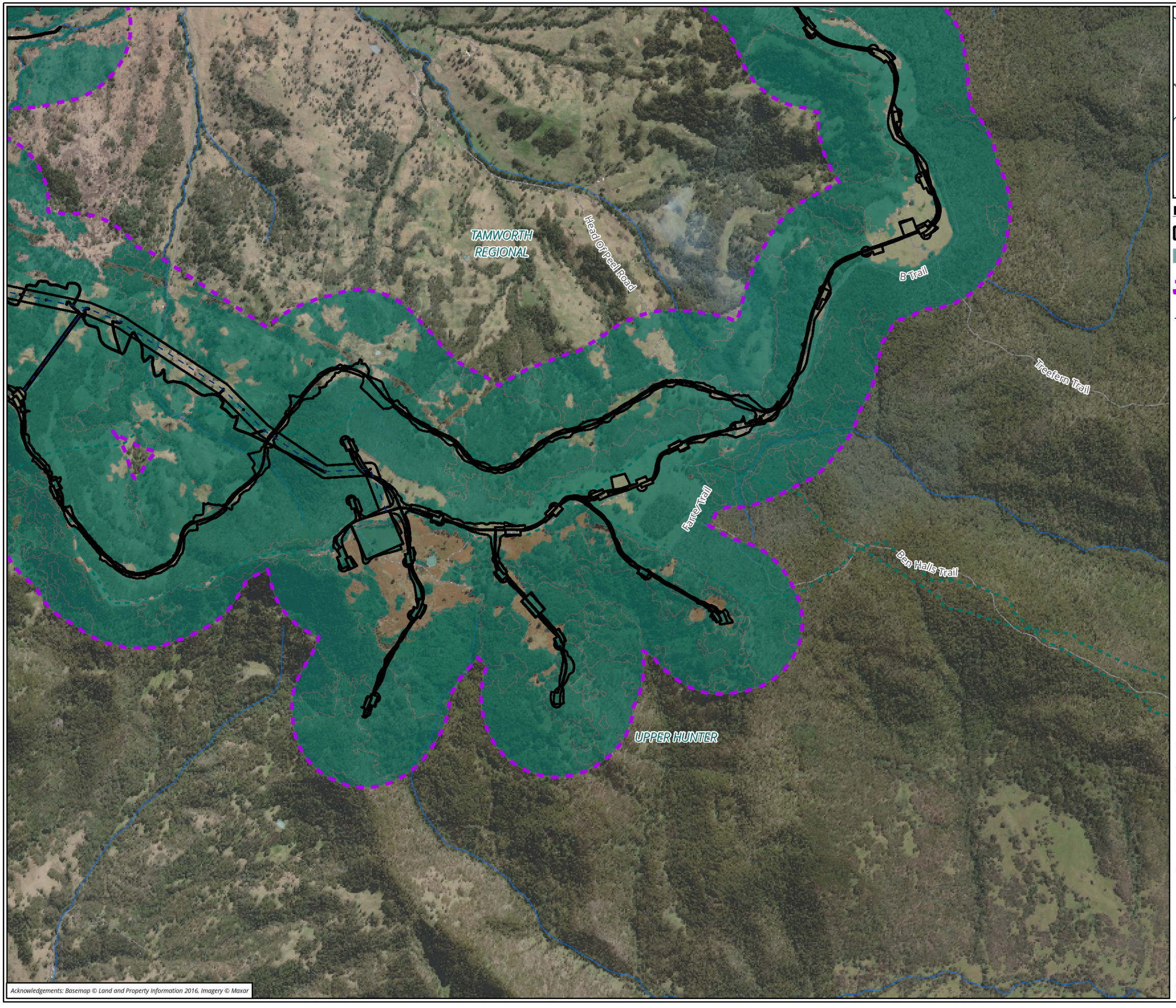

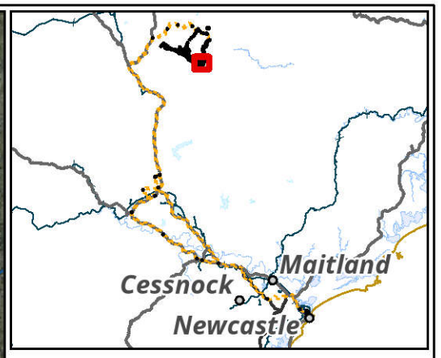

Legend

- Infrastructure footprint
- Native vegetation
- Landscape assessment buffer (study area)
- Transmission line

Figure 5 Location map native vegetation cover, Page 6

0 300 600 900 1,200 N

Meters

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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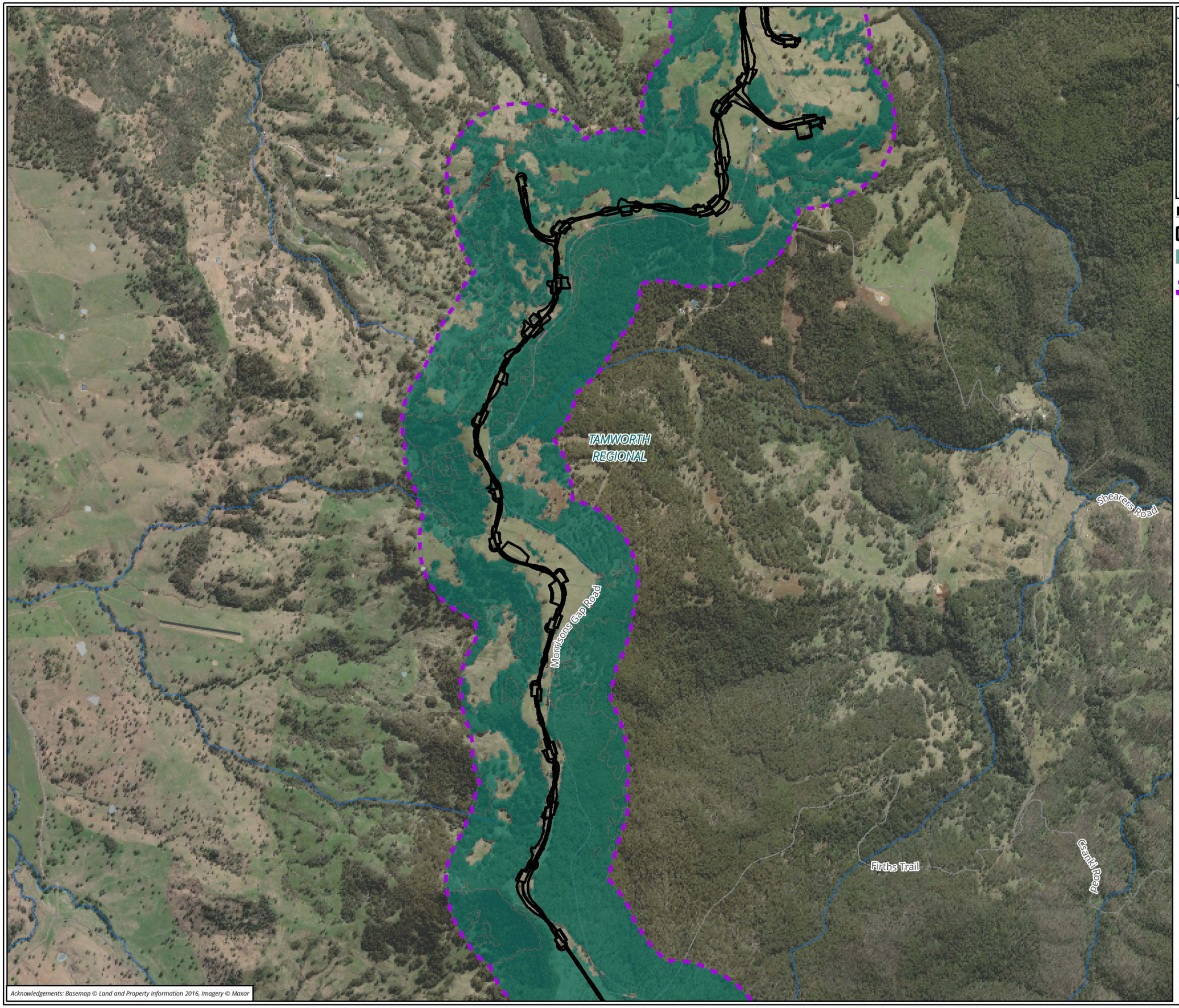

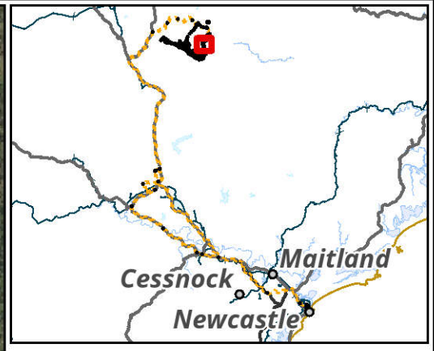

Legend

- Infrastructure footprint
- Native vegetation
- Landscape assessment buffer (study area)

Figure 5 Location map native vegetation cover, Page 7

0 300 600 900 1,200 N

Meters

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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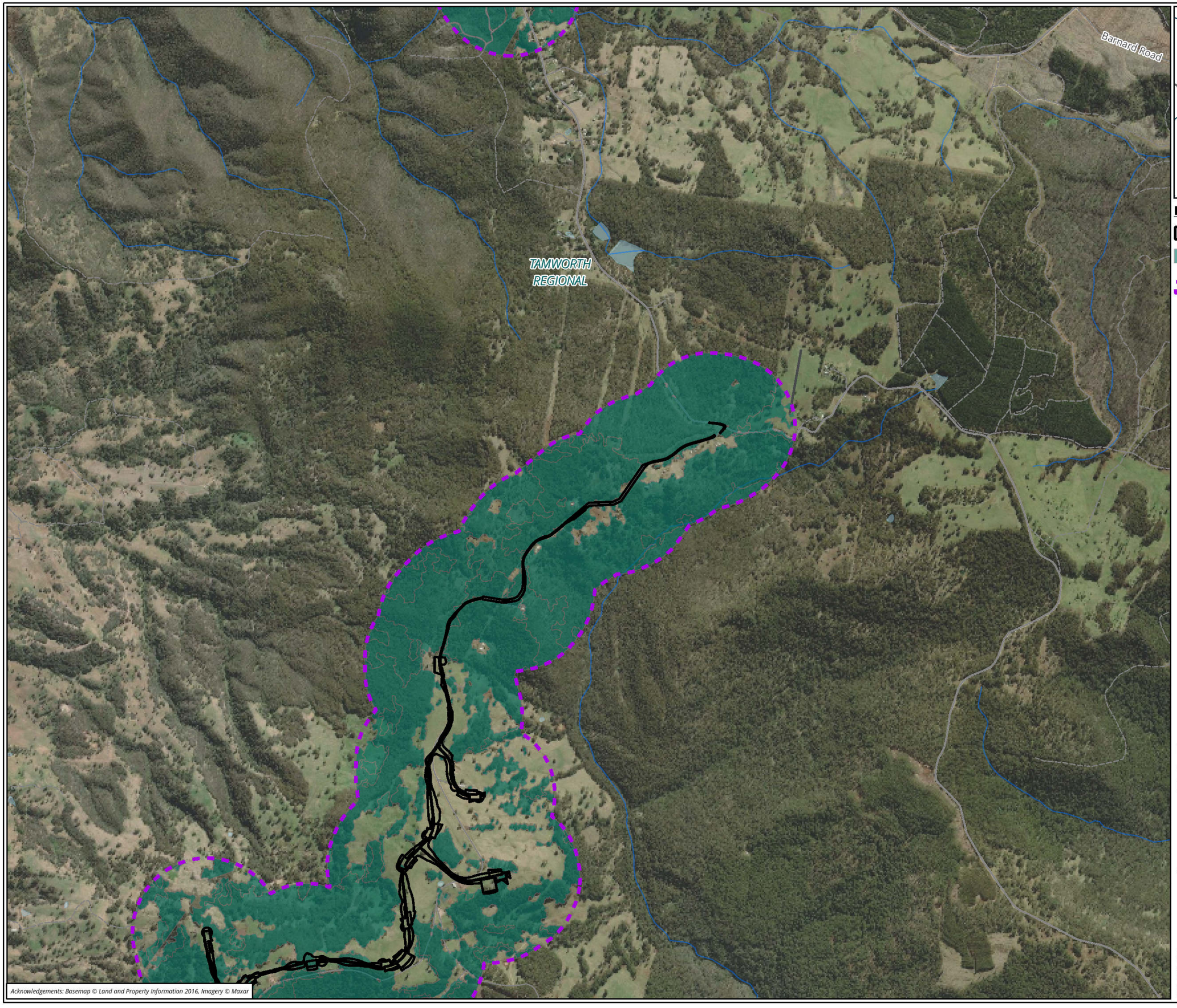

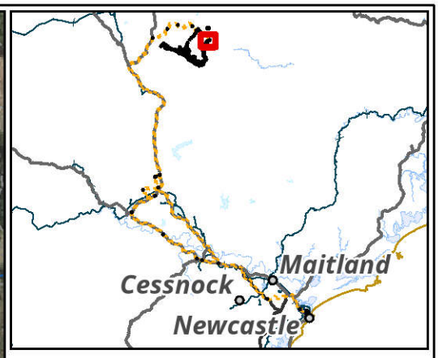

Legend

- Infrastructure footprint
- Native vegetation
- Landscape assessment buffer (study area)

Figure 5 Location map native vegetation cover, Page 8

0 300 600 900 1,200 N

Meters

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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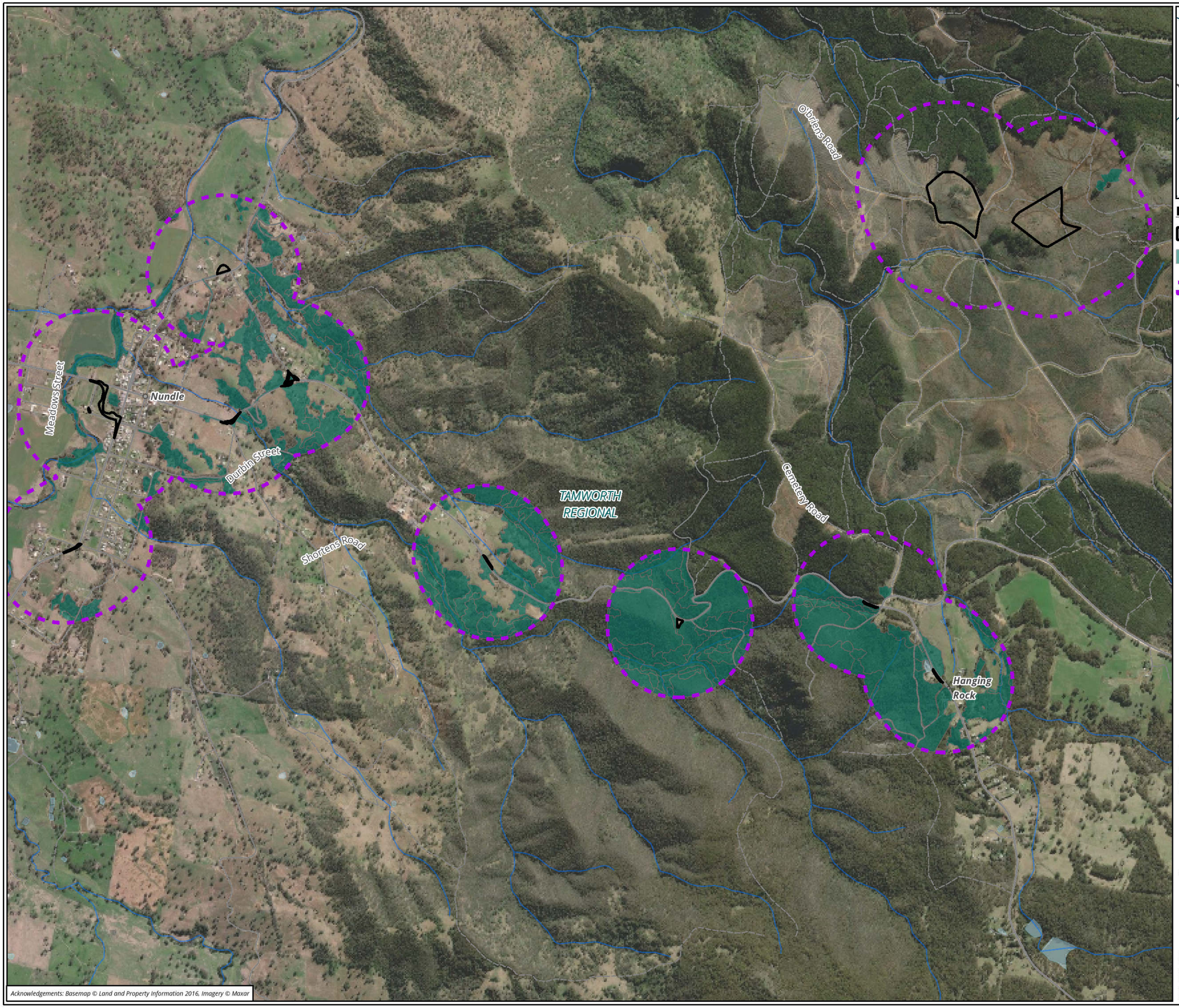

Legend

- Infrastructure footprint
- Native vegetation
- Landscape assessment buffer (study area)

Figure 5 Location map native vegetation cover, Page 9

0 300 600 900 1,200

Meters

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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Legend

- Infrastructure footprint
- Native vegetation
- Landscape assessment buffer (study area)

Figure 5 Location map native vegetation cover, Page 10

0 300 600 900 1,200 N

Meters

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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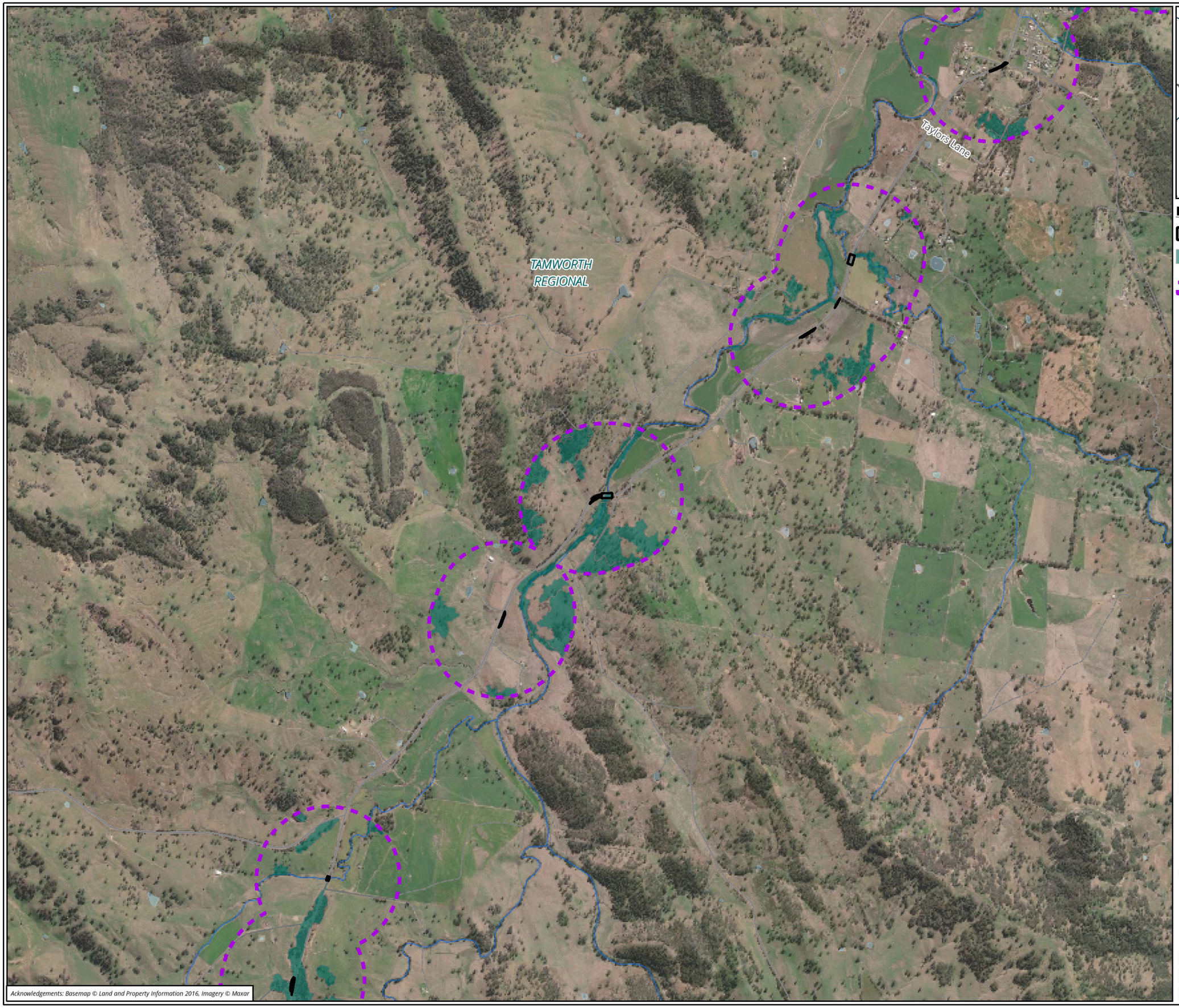

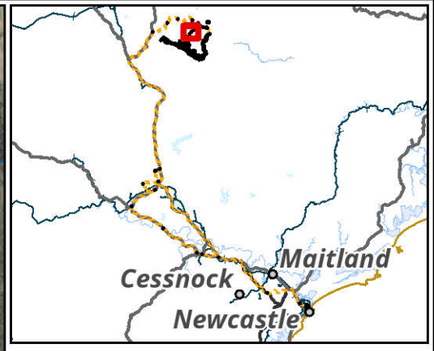

Legend

- Infrastructure footprint
- Native vegetation
- Landscape assessment buffer (study area)

Figure 5 Location map native vegetation cover, Page 11

0 300 600 900 1,200 N

Meters

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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Legend

- Infrastructure footprint
- Native vegetation
- Landscape assessment buffer (study area)

Figure 5 Location map native vegetation cover, Page 12

0 300 600 900 1,200

Meters

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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