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Biodiversity Development
Assessment Report
EIS Technical Report 1

Declaration

I certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method and clause 6.15 of the *Biodiversity Conservation Act 2016* (BC Act).

Name: Simon Tweed *Signature:* *BAM Accreditation No.: BAAS17040* *Date: 18/08/2023*

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EIS Technical Report 1 - Biodiversity Development Assessment Report

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Prepared for Transgrid

niche-eh.com

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Executive summary

Transgrid proposes the construction and operation of around 360 kilometres of high-voltage transmission lines and associated infrastructure between Wagga Wagga, Bannaby and Maragle (the project). This project is collectively referred to as HumeLink. The project would be located across five Local Government Areas (LGAs) including Wagga Wagga City, Snowy Valleys, Cootamundra-Gundagai Regional, Upper Lachlan Shire and Yass Valley.

Transgrid is seeking approval for the project under Part 5 Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The project has been declared Critical State Significant Infrastructure (CSSI) under State Environmental Planning Policy (Planning Systems) 2021. The project was also declared a controlled action by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) and requires a separate approval under the (Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act). The project is subject to the bilateral assessment process that has been established between the Commonwealth and NSW governments.

The NSW Biodiversity Offsets Scheme (BOS) applies to State Significant Infrastructure (SSI) projects unless the Secretary of the Department of Planning and Environment (DPE) and the environment agency head determine that the project is not likely to have a significant impact. This document is the Biodiversity Development Assessment Report (BDAR) for the project as required under the BOS. This BDAR documents the methods and results of the biodiversity assessment undertaken for the project in line with the Biodiversity Assessment Method (BAM) and relevant State and Commonwealth environmental and threatened species legislation and policy. This BDAR addresses Stage 1 and Stage 2 of the BAM and is structured accordingly. This report is intended to support the HumeLink Environmental Impact Statement (EIS) and responds directly to the Planning Secretary's Environmental Assessment Requirements (SEARs) and supplementary SEARs.

This report assesses the project footprint, the area within which direct impacts could occur from the project. The project footprint includes an indicative disturbance area, which is an estimated area to be directly disturbed during construction and operation of the project including proposed transmission line and associated infrastructure. However, the indicative disturbance area may be altered during detailed design to further avoid and minimise biodiversity impacts or for other reasons. Biodiversity assessment activities (eg vegetation and habitat assessment) have been conducted throughout accessible areas of the project footprint with certain targeted survey activities occurring within the indicative disturbance area, which is the area used for all clearing and impact calculations.

Assessment methods

The assessment was undertaken in accordance with the BAM and associated methodologies as detailed in Section 4.1. Key methodologies adopted as a part of the assessment included:

- a desktop review of available data and existing reports relevant to existing vegetation, threatened flora and threatened fauna within the locality
- field surveys carried out within accessible lands to:
  - verify vegetation communities present and develop a map of vegetation zones
  - assess habitat suitability for threatened fauna including the presence/absence of known habitat constraints
  - carry out BAM plots within vegetation zones to calculate vegetation integrity
  - assess and survey bushfire affected lands

  - undertake targeted surveys for candidate threatened flora
  - undertake targeted surveys for candidate threatened fauna
  - assess aquatic habitat condition and suitability for threatened aquatic biota
- Light Detection and Ranging (LiDAR) survey incorporating high resolution aerial imagery to support vegetation and habitat mapping, vegetation height modelling and the development of avoidance strategies
- over-the-fence surveys from public roads, existing transmission line easements and accessible private landholdings to inform constraints within adjacent lands that could not be directly accessed for survey
- desktop-only assessments on inaccessible lands, which took into account all existing available data and review and extrapolation of field data collected to date.

Landscape

The project occurs within three Interim Biogeographic Regionalisation of Australia (IBRA) regions that are comprised of six IBRA subregions, being:

- South-Eastern Highlands region: Bondo subregion, Bungonia subregion, Crookwell subregion, Murrumbateman subregion
- NSW South-Western Slopes region: Inland Slopes subregion
- Australian Alps region: Snowy Mountains subregion.

The project traverses several landscapes and disturbance profiles. The project footprint is dominated by cleared farmland, with scattered discontinuous woodland patches. Some woodland and forest patches in the project footprint areas are continuous with native vegetation in national parks and conservation areas. Portions of the project footprint traverse woodland, native forests, and pine forests.

A total of 8,293 streams, of various types and condition, are located within the BAM assessment area, including the project footprint and a 500 metre buffer. The project footprint intersects several major waterways, including: Goobarragandra River, Gocup Creek, Tumut River, Murrumbidgee River, Adjungbilly Creek and the Lachlan River.

The landscape features relevant to each IBRA subregion within the landscape assessment area have been used to inform the suitability of habitats for threatened species. As per the BAM, calculations have been broken down by subregion.

Native vegetation cover for BAM landscape calculation purposes has been estimated as:

- Bondo subregion: 1,908.67 hectares
- Bungonia subregion: 1,035.51 hectares
- Crookwell subregion: 1,471.53 hectares
- Murrumbateman subregion: 1,670.86 hectares
- Inland Slopes subregion: 5,836.92 hectares
- Snowy Mountains subregion: 2,892.01 hectares

All non-woody and the majority (97.9 per cent) of native woody vegetation within the project footprint was assigned to the highest patch size class (equal to or greater than 100 hectares). A small proportion (0.3 to 3 per cent) of woody vegetation within the Bungonia, Bondo, Crookwell, Murrumbateman, and Inland Slopes IBRA subregions were assigned to patch sizes less than five hectares and five to 25 hectares. Approximately 2.5 per cent of native woody vegetation in the Crookwell IBRA subregions was assigned to the 25 to 100 hectares patch size class.

Native vegetation and habitats

Native vegetation recorded within the project footprint includes 12 vegetation formations, including:

- Alpine Complex
- Dry Sclerophyll Forests (Shrub/grass sub-formation)
- Dry Sclerophyll Forests (Shrubby sub-formation)
- Eastern Riverine Forests
- Forested Wetlands
- Freshwater Wetlands
- Grasslands
- Grassy Woodlands
- Semi-arid Woodlands (Shrubby sub-formation)
- Western Slopes Grassy Woodlands
- Wet Sclerophyll Forests (Grassy sub-formation)
- Wet Sclerophyll Forests (Shrubby sub-formation).

These vegetation formations include 42 Plant Community Types (PCTs) that were mapped within the project footprint. PCTs within the project footprint were stratified into five condition classes: very high, high, moderate, low and very low.

Five threatened ecological communities (TECs) listed under the BC Act were recorded or considered likely to occur within the project footprint:

- White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South-Eastern Highlands, NSW South-Western Slopes, South-East Corner and Riverina Bioregion (critically endangered under the BC Act)
- Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South-Western Slopes and South-Eastern Highlands Bioregions (endangered under the BC Act)
- Tableland Basalt Forest in the Sydney Basin and South-Eastern Highlands Bioregions (endangered under the BC Act)
- Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South-East Corner, South-Eastern Highlands and Australian Alps bioregion (endangered under the BC Act)
- Monaro Tableland Cool Temperate Grassy Woodland in the South-Eastern Highlands Bioregion (critically endangered under the BC Act).

Two TECs listed under the EPBC Act were recorded within the project footprint:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (critically endangered under the EPBC Act)
- Alpine Sphagnum Bogs and Associated Fens (endangered under the EPBC Act).

Groundwater Dependant Ecosystems

Vegetation communities dependent on groundwater were identified using the Atlas of Groundwater Dependent Ecosystems (GDEs) (Bureau of Meteorology, 2017). The project footprint supports 15 PCTs that are identified as moderate to high potential terrestrial GDEs. The project does not involve activities (ie deep excavations or significant grouting) likely to pose risk to groundwater flow and quality.

Threatened species

In accordance with the BAM, threatened species were assessed as either ecosystem credit (predicted) species or species credit species.

Ecosystem credit species

Ecosystem credit species are threatened species whose occurrence can generally be predicted by vegetation surrogates and/or landscape features, or that have a low probability of detection using targeted surveys. Targeted surveys are not required to identify or confirm the presence of ecosystem credit species.

This assessment assumed that all ecosystem credit species may have potential habitat in the project footprint.

A total of 14 ecosystem credit species were recorded in the project footprint including:

- 10 birds - Varied Sitella (*Daphoenositta chrysoptera*), Olive Whistler *(Pachycephala olivacea*), Dusky Woodswallow (*Artamus cyanopterus)*, Brown Treecreeper (*Climacteris picumnus victoriae*), Diamond Firetail (S*tagonopleura guttata*), Speckled Warbler (*Chthonicola sagittate*), Spotted Harrier (*Circus assimilis*), Scarlet Robin (*Petroica boodang*), Grey-crowned Babbler (*Pomatostomus temporalis temporalis*), Flame Robin (*Petroica phoenicea)*
- Three mammals - Yellow-bellied Glider (*Petaurus australis*), Greater Broad-nosed Bat (*Scoteanax rueppellii*), Eastern False Pipistrelle (*Stagonopleura guttata*)
- One reptile – Rosenberg's Goanna (*Varanus rosenbergi*).

Threatened flora species credit species

A total of 60 candidate threatened flora species were considered to have potential habitat within the project footprint and were the subject of targeted surveys. Five of these were recorded within and/ or immediately adjacent to the project footprint:

- *Ammobium craspedioides* (Yass Daisy) (listed as vulnerable under the BC Act and EPBC Act)
- *Leucochrysum albicans* var. *tricolor* (Hoary Sunray) (listed as endangered under the EPBC Act)
- *Prasophyllum bagoense* (Bago Leek Orchid) (listed as critically endangered under the BC and EPBC Act)
- *Prasophyllum keltonii* (Kelton's Leek Orchid), listed as critically endangered under the BC and EPBC Act
- *Xerochrysum palustre* (Swamp Everlasting) (listed as endangered under the EPBC Act).

Two candidate flora species, *Acacia clunies-rossiae* (Kanangra Wattle) and *Hakea dohertyi* (Kowmung Hakea) were sufficiently surveyed across the project footprint and were not recorded and are therefore deemed to be absent. The remaining 53 threatened flora species whose presence could not be determined due to seasonal survey requirements not being met or survey coverage limitation, have been assumed present for the purposes of this assessment.

Threatened fauna species credit species

Detailed assessment including targeted surveys was conducted for 33 candidate threatened or migratory fauna species and two endangered populations where their habitat was likely to occur within the project footprint. Fourteen species credit species were recorded, being:

- seven birds - Barking Owl (*Ninox connivens*), Gang-gang Cockatoo (*Callocephalon fimbriatum*), Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Little Eagle (*Hieraaetus morphnoides*), Powerful Owl (*Ninox strenua*), Superb Parrot (*Polytelis swainsonii*), White-bellied Sea-Eagle (*Haliaeetus leucogaster*)
- five mammals, including:
  - two bats - Large Bent-winged Bat (*Miniopterus orianae oceanensis)*, Southern Myotis (*Myotis Macropus)*

- three arboreal mammals - Eastern Pygmy Possum (*Cercartetus nanus*), Greater Glider (*Petauroides volans)*, Squirrel Glider (*Petaurus norfolcensis)*
- one reptile – Pink-tailed Legless Lizard (*Aprasia parapulchella*)
- one invertebrate – Key's Matchstick Grasshopper (*Keyacris scurra*).

The following two species associated with endangered populations were also recorded: Squirrel Glider in the Wagga Wagga City LGA and Yellow-bellied Glider in the Bago Plateau. An additional 17 candidate threatened fauna species whose presence could not be determined due to seasonal survey requirements not being met or survey coverage limitation, have been assumed present for the purposes of this assessment.

Aquatic biota and habitats

A total of 1,139 streams intersect the project footprint. The streams are in the Hawkesbury--Nepean, Lachlan and Murrumbidgee catchments. Seventy-nine per cent of these waterways are first and second order streams, reflecting the dominance of smaller streams within the project footprint. Major rivers that occur within the project footprint include the Lachlan River, the Murrumbidgee River, and the Tumut River as well as several major creeks that are tributaries of these major rivers.

The condition assessment informed by the detailed desktop assessment and field inspection across the project footprint indicate prevailing poor stream conditions, particularly in predominantly agricultural settings. Prevalent forms of degradation include land clearing, online dam construction, grazing and cropping, as well as existing informal access track and waterway crossing construction. The existing impacts have resulted in deleterious processes such as bank erosion and channel incision and contribute to an overall picture of generally degraded aquatic habitats within the project footprint.

Six threatened aquatic species and one threatened aquatic ecological community listed under the *Fisheries Management Act* 1991 (FM Act) and/or EPBC Act have been identified as having the potential to occur within the project footprint. These include:

- Lowland Murray River EEC (*Aquatic Ecological Community in the Natural Drainage System of the Lower Murray River Catchment*)
- Silver Perch (*Bidyanus bidyanus*)
- Murray Crayfish (*Euastacus armatus*)
- Flatheaded Galaxias (*Galaxias rostratus*)
- Southern Pygmy Perch (*Nannoperca australis*)
- Trout Cod (*Maccullochella macquariensis*)
- Macquarie Perch (*Macquaria australasica*).

Avoid and minimise

The project has been designed to avoid and minimise potential impacts on biodiversity values through:

- Route selection criteria and the project footprint initially being developed by mapping constraints and identifying opportunities. Constraints were grouped as: Tier 1 constraints, which were no-go areas to be avoided and Tier 2 constraints, which were to be avoided if possible and impacts minimised.
- co-location with existing transmission lines or areas of disturbance to avoid and minimise additional clearance or fragmentation of vegetation wherever possible
- refinements during the early development phases of the project, leading to a reduced total length of transmission line, particularly when the additional 'arm' of the project was removed due to progression of project development to a double-circuit configuration

- targeting narrow crossing points of waterways and their associated riparian habitats)
- use of existing access tracks and roads, in preference to the construction of new tracks and roads, to minimise additional disturbance to ecological values within the project footprint wherever possible
- inclusion of a partial clearing methodology, thereby retaining vegetation where possible within the easement during the construction, operational maintenance phases of the project.

Ongoing commitment to avoid and minimise impacts on biodiversity values would be further achieved through micro-siting new transmission line structures, brake and winch sites and access tracks during the detailed design phase, where practicable.

Biodiversity impacts

The impact assessment is based on the current understanding of design and construction methodology and the associated disturbance required for this. The indicative disturbance area has been used to assess the likely quantum and type of impacts of the project. The final area required for construction and operation of the project would be confirmed during finalisation of design and construction methodology. Finalisation of project design and construction will be further developed and refined in consideration of avoidance and impact minimisation associated with transmission line structure siting, access track design and other measures. As such, the assessed disturbance area is indicative and likely to represent the maximum extent of disturbance for the project.

Potential impacts presented for species credit species are higher than impacts that will occur from the project due to the required BAM method employed, survey limitations and a reduction in impacts that will take place due to avoidance and mitigation measures detailed within Chapter 14 of this report.

Unavoidable impacts of the project have been assessed in accordance with Stage 2 of the BAM, the relevant SEARs and Matters of National Environmental Significance – Significant impact guidelines 1.1, EPBC Act.

Direct impacts on biodiversity values resulting from the project include:

- direct impacts to 42 native PCTs, including five TECs listed under the BC Act and two TECs listed under the EPBC Act
- direct impacts on native vegetation including:
  - removal of 670.21 hectares of native vegetation (excluding Category 1 exempt lands)
  - removal of up to 353.07 hectares of TECs listed under the BC Act (excluding Category 1 exempt lands) in the form of:
    - 0.75 hectares of Montane Peatlands and Swamps listed as endangered under the BC Act
      - 0.56 ha aligns to Alpine Sphagnum Bogs and Associated Fens (endangered under the EPBC Act)
    - 1.7 hectares of Monaro Tableland Cool Temperate Grassy Woodland listed as critically endangered under the BC Act
    - 1.42 hectares of Coolac Tumut Serpentine Shrubby Woodland listed as endangered under the BC Act
    - 37.42 hectares of Tableland Basalt Forest listed as endangered under the BC Act
    - 311.78 hectares of White Box Yellow Box Blakely’s Red Gum grassy woodland and derived native grassland listed as critically endangered under the BC Act
      - 111.47 ha aligns to White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (critically endangered under the EPBC Act)

- loss of habitat for 50 threatened fauna species identified and/or predicted as ecosystem credit species, 14 of which were recorded and 36 assumed present (refer to Section 7.3.5)
- impacts to 58 threatened flora species credit species (detailed in Table ES-1)
- impacts to 33 threatened fauna species credit species and two endangered fauna populations (detailed in Table ES-2).

Table ES- 1: Potential impacts to threatened flora species credit species

Species	Common name	BC Act status	Area of impact (ha)	Recorded/assumed present
Acacia ausfeldii	Ausfeld's Wattle	V	14.6	Assumed present
Acacia bynoeana	Bynoe's Wattle	E	3.0	Assumed present
Acacia flocktoniae	Flockton Wattle	V	14.3	Assumed present
Acacia phasmoides	Phantom Wattle	V	2.0	Assumed present
Ammobium craspedioides	Yass Daisy	V	1147 (count)	Recorded
Baloskion longipes	Dense Cord-rush	V	1.2	Assumed present
Bossiaea fragrans	Bossiaea fragrans	CE	6.1	Assumed present
Bossiaea oligosperma	Few-seeded Bossiaea	V	1.2	Assumed present
Caesia parviflora var. *minor*	Small Pale Grass-lily	E	0.2	Assumed present
Caladenia concolor	Crimson Spider Orchid	E	34.1	Assumed present
Caladenia tessellata	Thick Lip Spider Orchid	E	16.0	Assumed present
Calotis glandulosa	Mauve Burr-daisy	V	16.0	Assumed present
Calotis pubescens	Max Mueller's Burr-daisy	E	0.25	Assumed present
Commersonia prostrata	Dwarf Kerrawang	E	0.75	Assumed present
Cullen parvum	Small Scurf-pea	E	71.7	Assumed present
Dillwynia glaucula	Michelago Parrot-pea	E	1.7	Assumed present
Diuris aequalis	Buttercup Doubletail	E	28.3	Assumed present
Diuris ochroma	Pale Golden Moths	E	0.25	Assumed present
Diuris tricolor	Pine Donkey Orchid	V	1.4	Assumed present
Eucalyptus aggregata	Black Gum	V	2 (count)	Assumed present
Eucalyptus alligatrix subsp. *alligatrix*	Eucalyptus alligatrix subsp. alligatrix	V	1 (count)	Assumed present
Eucalyptus cannonii	Capertee Stringybark	V	1 (count)	Assumed present
Eucalyptus macarthurii	Paddy’s River Box, Camden Woollybutt	E	18 (count)	Assumed present
Eucalyptus robertsonii subsp. *hemisphaerica*	Robertson's Peppermint	V	1 (count)	Assumed present
Euphrasia arguta	Clover Glycine	V	92.9	Assumed present
Euphrasia scabra	Rough Eyebright	E	1.9	Assumed present
Genoplesium superbum	Superb Midge Orchid	E	8.8	Assumed present
Glycine latrobeana	Glycine latrobeana	CE	0.25	Assumed present
Grevillea iaspicula	Wee Jasper Grevillea	CE	9 (count)	Assumed present

Species	Common name	BC Act status	Area of impact (ha)	Recorded/assumed present
Grevillea wilkinsonii	Tumut Grevillea	CE	34.7	Assumed present
Irenepharsus magicus	Elusive Cress	E	26.5	Assumed present
Kunzea cambagei	Cambage Kunzea	V	12.2	Assumed present
Lepidium hyssopifolium	Aromatic Peppercress	E	36.4	Assumed present
Leucochrysum albicans var. *tricolor*	Hoary Sunray	E	17098 (count)	Recorded
Persoonia marginata	Clandulla Geebung	V	1.2	Assumed present
Persoonia mollis subsp. *revoluta*	Persoonia mollis subsp. revoluta	V	8.0	Assumed present
Phyllota humifusa	Dwarf Phyllota	V	11.4	Assumed present
Pomaderris cotoneaster	Cotoneaster Pomaderris	E	11.7	Assumed present
Pomaderris delicata	Delicate Pomaderris	CE	8.0	Assumed present
Pomaderris pallida	Pale Pomaderris	V	0.77	Assumed present
Prasophyllum bagoense	Bago Leek-orchid	CE	31.9	Assumed present
Prasophyllum innubum	Brandy Marys Leek-orchid	CE	0.25	Assumed present
Prasophyllum keltonii	Kelton's Leek Orchid	CE	31.7	Assumed present
Prasophyllum petilum	Tarengo Leek Orchid	E	24.5	Assumed present
Prasophyllum sp. *Wybong*	Prasophyllum sp. Wybong	E	87.8	Assumed present
Pterostylis alpina	Alpine Greenhood	V	24.4	Assumed present
Pterostylis foliata	Slender Greenhood	V	36.5	Assumed present
Pterostylis oreophila	Blue-tongued Greenhood	CE	0.56	Assumed present
Pultenaea humilis	Dwarf Bush-pea	V	4.2	Assumed present
Rutidosis leiolepis	Monaro Golden Daisy	V	350 (count)	Assumed present
Senecio garlandii	Woolly Ragwort	V	1.2	Assumed present
Solanum armourense	Solanum armourense	V	0.51	Assumed present
Swainsona recta	Small Purple-pea	E	127.0	Assumed present
Swainsona sericea	Silky Swainson-pea	V	187.1	Assumed present
Thelymitra alpicola	Alpine Sun-orchid	V	0.56	Assumed present
Thesium australe	Austral Toadflax	V	110.3	Assumed present
Xerochrysum palustre	Swamp Everlasting	-	1.5	Recorded
Zieria obcordata	Granite Zieria	E	43.4	Assumed present

Table ES- 2: Potential impacts to threatened fauna species credit species

Scientific name	Common name	BC Act status	Area of impact (ha)	Recorded/assumed present
Aprasia parapulchella	Pink-tailed Legless Lizard	V	140.8	Recorded
Burhinus grallarius	Bush Stone-curlew	E	60.5	Assumed present
Callocephalon fimbriatum	Gang-gang Cockatoo	V	306.4	Recorded

Scientific name	Common name	BC Act status	Area of impact (ha)	Recorded/assumed present
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	66.1	Recorded
Cercartetus nanus	Eastern Pygmy-possum	V	193.8	Recorded
Chalinolobus dwyeri	Large-eared Pied Bat	V	7.7	Assumed present
Crinia sloanei	Sloane's Froglet	V	2.6	Assumed present
Cyclodomorphus praealtus	Alpine She-oak Skink	E	12.2	Assumed present
Delma impar	Striped Legless Lizard	V	174.4	Assumed present
Haliaeetus leucogaster	White-bellied Sea-eagle	V	18.64	Recorded
Hieraaetus morphnoides	Little Eagle	V	397.8	Recorded
Keyacris scurra	Key's Matchstick Grasshopper	E	229.0	Recorded
Litoria booroolongensis	Booroolong Frog	E	0.11	Assumed present
Litoria castanea	Yellow-spotted Tree Frog	CE	1.36	Assumed present
Lophoictinia isura	Square-tailed Kite	V	123.9	Assumed present
Mastacomys fuscus	Broad-toothed Rat	V	2.2	Assumed present
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	0.12	Recorded
Mixophyes balbus	Stuttering Frog	E	13.8	Assumed present
Myotis macropus	Southern Myotis	V	13.56	Recorded
Ninox connivens	Barking Owl	V	177.0	Recorded
Ninox strenua	Powerful Owl	V	217.0	Recorded
Petauroides volans	Greater Glider	E	118.0	Recorded
Petaurus norfolcensis	Squirrel Glider	V	170.5	Recorded
Petaurus norfolcensis - endangered population	Squirrel Glider in the Wagga Wagga City Local Government Area	EP	46.7	Assumed present
Petrogale penicillata	Brush-tailed Rock-wallaby	E	1.1	Assumed present
Petroica rodinogaster	Pink Robin	V	213.0	Assumed present
Phascogale tapoatafa	Brush-tailed Phascogale	V	129.9	Assumed present
Phascolarctos cinereus	Koala	E	418.4	Assumed present
Polytelis swainsonii	Superb Parrot	V	59.8	Recorded
Pseudomys fumeus	Smoky Mouse	CE	132.66	Assumed present
Pseudophryne corroboree	Southern Corroboree Frog	CE	22.2	Assumed present
Petaurus australis - endangered population	Yellow-bellied Glider population on the Bago Plateau	EP	19.4	Recorded
Synemon plana	Golden Sun Moth	V	35.9	Assumed present
Tyto novaehollandiae	Masked Owl	V	162.5	Assumed present
Tyto tenebricosa	Sooty Owl	V	21.2	Assumed present

Prescribed impacts relevant to the project include:

- karst, caves, crevices, cliffs, rocks, and other geological features of significance
- human-made structures
- non-native vegetation offering habitat for threatened species
- habitat connectivity, including injury or mortality from transmission line collision, entanglement, or electrocution
- waterbodies, water quality and hydrological processes
- vehicle strikes.

The project would result in minor impacts on groundwater during construction and negligible impacts on groundwater during operation. Therefore, the project is considered unlikely to lead to any adverse impact on the groundwater availability or status for groundwater dependent ecosystems.

Indirect impacts to avifauna and flying mammals may occur due to the potential for increased risk of collision with transmission lines and electric and magnetic fields associated with the new infrastructure. Fourteen threatened fauna species potentially affected by this operational indirect impact include:

- Forest Owls and Cockatoos
  - Barking Owl *(Ninox connivens)*
  - Masked Owl *(Tyto novaehollandiae)*
  - Powerful Owl *(Ninox strenua)*
  - Sooty Owl *(Tyto tenebricosa)*
  - Gang-gang Cockatoo *(Callocephalon fimbriatum)*
  - Glossy Black Cockatoo *(Calyptorhynchus lathami)*
- Raptors:
  - Square-tailed Kite *(Lophoictinia isura)*
  - Little Eagle *(Hieraaetus morphnoides)*
  - White-bellied Sea-Eagle *(Haliaeetus leucogaster)*
- Megabats:
  - Grey-headed Flying-fox *(Pteropus poliocephalus)*
- Microbats:
  - Large Bent-winged Bat *(Miniopterus orianae oceanensis*)
  - Large-eared Pied Bat *(Chalinolobus dwyeri)*
  - Little Bent-winged Bat *(Miniopterus australis)*
  - Southern Myotis *(Myotis macropus).*

The project is considered unlikely to lead to a significant impact on any threatened aquatic species, ecological communities or their habitats.

In terms of impacts on Matters of National Environmental Significance the project would:

- impact on two TECs
- impact on known or assumed habitat for 12 threatened flora species listed under the EPBC Act
- impact on known or potential habitat for 23 threatened fauna species
- impact on potential habitat for 10 migratory species listed under the EPBC Act.

The impact assessment outcomes for Matters of National Environmental Significance concluded that:

- The project is likely or has the potential to lead to a significant impact on 10 threatened flora species and/or their habitat, 16 threatened fauna species and/ or their habitat, six migratory species and two threatened ecological communities listed under the EPBC Act.
- For two threatened fauna, six threatened flora and one TEC, conclusions of potentially significant impacts are driven by a precautionary approach given survey limitations and without being able to state with certainty that impacts could be avoided during detailed design for the project. Once additional survey is completed and avoidance measures undertaken the risk of a significant impact would be substantially reduced.
- The project would not impact on any wetlands of national or international importance.

Aquatic biota and habitats

The proposed construction methodology for the transmission line structures themselves avoids direct impacts to streams and waterways. Importantly, this includes the major waterways and majority of streams included in Key Fish Habitat (KFH) mapping within the project footprint. The maximum impact to aquatic environments likely to occur at any of waterways relevant to the transmission line would be the removal or trimming of tree canopy on waterway banks to facilitate the construction and operation of the transmission lines spanning riparian areas, as necessary. The construction of waterway crossings to support access for the project has been identified as the primary pathway of potential direct impact to aquatic habitats as this would result in the direct disturbance to aquatic ecosystems.

A total of five threatened aquatic species and one threatened aquatic ecological community listed under the FM Act and/or EPBC Act have been identified as potentially occurring within the project footprint with the potential to be impacted. Assessment of potential impacts (7-part tests under the FM Act and Commonwealth Assessments of Significance under the EPBC Act) concluded that they are unlikely to be significantly impacted.

The project is considered unlikely to result in significant environmental impacts to aquatic systems within the project footprint, in consideration of the following:

- No significant impacts to any threatened aquatic biota listed under the FM Act or EPBC Act are likely to occur.
- The construction methodology for transmission line structures avoids direct impacts to streams, especially for major streams and Key Fish Habitats.
- The assessment of proposed access track crossings within identified KFHs has identified typically small streams with poor riparian and aquatic habitats throughout the construction footprint, and where available “Very Poor” freshwater fish community status grades. The scale of potential impacts in this context is not considered significant.
- The project would not significantly increase the operation of any Key Threatening Processes (KTPs) relevant to aquatic environments.
- A standard construction methodology for access tracks and crossings has been developed, aligning with Fisheries guidelines, to construct the waterway crossings in an environmentally sensitive manner. A suite of mitigation measures relevant to the design of the structures to minimise impacts to fish passage and manage erosion and sedimentation risk have been included.
- The potential for direct and indirect impacts during construction generally is further managed through the provision of a comprehensive suite of mitigation measures specific to aquatic habitats, including the avoidance of sensitive habitat features, erosion and sediment control, and the reinstatement of bank forms following works.

In light of the factors listed above, no net loss of Key Fish Habitat, or significant impacts to threatened aquatic species are anticipated to occur as a result of the project. Therefore, no offsets for aquatic species or Key Fish Habitats under the FM Act are proposed.

Mitigation and monitoring

Implementation of mitigation measures would minimise residual indirect impacts to native vegetation and threatened species throughout the construction and operational phases of the project. Mitigation measures include (but are not limited to):

- avoidance of areas of high biodiversity value (such as TEC and/or threatened species habitat) through the establishment of 'no go zones' and micro-siting of infrastructure during the detailed design phase of the project
- development of a Construction Environmental Management Plan (CEMP) which describes the approach to environmental management, monitoring and reporting during construction. Specifically, the CEMP will list the requirements to be addressed by the construction contractors and encompasses sub-plans, and other supporting documentation for each specific environmental aspect including:
    - development and implementation of a Biodiversity Management Plan to minimise and monitor impacts of construction on biodiversity
    - development and implementation of a Connectivity Strategy to minimise impacts of fragmentation on biodiversity
- development and implementation of a Soil and Water Management Plan, Erosion and Sediment Control Plan and Water Quality Monitoring Plan as part of the approaches to operational maintenance and minimising biodiversity impacts would be in accordance with the detail provided in this report and the EIS.

Offset requirements

A total requirement of 10,997 ecosystem credits and 134,578 species credits has been generated by the Biodiversity Assessment Method Calculator (BAM-C) for unavoidable impacts to the project within the six IBRA subregions assessed:

- Bungonia:
    - 701 ecosystem credits
    - 10,242 species credits
- Crookwell:
    - 1,462 ecosystem credits
    - 13,944 species credits
- Murrumbateman:
    - 1,609 ecosystem credits
    - 15,497 species credits
- Inland Slopes:
    - 3,798 ecosystem credits
    - 30,450 species credits
- Bondo:
    - 645 ecosystem credits
    - 12,936 species credits
- Snowy Mountains:
    - 2,782 ecosystem credits
    - 51,509 species credits.

This BDAR has assessed impacts to biodiversity based on a likely maximal extent of disturbance. Once detailed design is complete further analysis of vegetation impact would be undertaken and where applicable the adjusted biodiversity offset liability would be updated post-approval. A biodiversity offset strategy is currently being prepared for the project to satisfy the project's biodiversity offset liability.

Glossary and list of abbreviations

Term or abbreviation	Definition
AOBV	Areas of Outstanding Biodiversity Value
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Credit Calculator
BC Act	*Biodiversity Conservation Act 2016*
BC Regulation	*Biodiversity Conservation Regulation 2017*
BCD	Biodiversity Conservation Division of the NSW Department of Planning and Environment
BDAR	Biodiversity Development Assessment Report
Biosecurity Act	*Biosecurity Act 2015*
BOS	NSW Biodiversity Offsets Scheme
BoM	Bureau of Meteorology
Brake and winch sites	A brake and winch site is a temporarily cleared area where plant and equipment are located to spool and winch conductors into place on transmission line structures. The locations of the brake and winch sites may or may not be within the nominated transmission line easement. These sites are only required for construction of the project and do not need to be maintained during operation.
Category 1 land	Land that was cleared of native vegetation as of 1 January 1990, or land that was lawfully cleared between 1 January 1990 and 25 August 2017.
Category 2 land	Land that was not cleared as of 1 January 1990, was unlawfully cleared after 1 January 1990, or is a prescribed area with an identified environmental value.
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
cm	Centimetre/s
Construction compounds	Main construction compounds proposed for construction of the project. Each main construction compound would accommodate a range of facilities which may include (but not be limited to): • Laydown areas • Site offices • Amenities • Construction support facilities such as vehicle and equipment storage, maintenance sheds, chemical/ fuel stores and stockpile areas • Parking.
CSSI	Critical State Significant Infrastructure
DAWE	Commonwealth Department of Agriculture, Water and the Environment (now the Department of Climate Change, Energy, the Environment and Water – DCCEEW)
DBH	Diameter at Breast Height
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water (formally the Department of Agriculture, Water and Environment)
DEM	Digital Elevation Model
DPE	NSW Department of Planning and Environment (formerly Department of Planning, Industry and Environment)
DPI	Department of Primary Industries
Easement	A legal right attached to a parcel of land that enables the non-exclusive use of the land by a third party other than the owner. For transmission lines, an easement defines the corridor area where the lines are located and that allows access, construction and maintenance work to take place. The

Term or abbreviation	Definition
	easements for the 500 kV transmission lines would typically be 70 m wide. However, a few locations would require wider easements up to 110 m wide at transposition locations and up to 130 m wide where the new transmission line would parallel the relocated section of Line 51. The easement grants a right of access and for construction, maintenance and operation of the transmission line and other operational assets.
ECZ	Easement clearing zone
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
ELA	Eco Logical Australia
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FESM	Fire Extent Severity Mapping
Field survey extent	Land within the project footprint that was accessed during the assessment for the purpose of field survey. The field survey extent is detailed in Table 4-21 and shown in Figure 4-4 relative to the project footprint and associated Interim Biogeographic Regionalisation for Australia (IBRA) subregions.
FM Act	*Fisheries Management Act 1994*
FMZs	Forestry Management Zones
Forestry Act	*Forestry Act 2012*
Future Maragle 500 kV substation	The future Maragle 500/330 kV substation that would be built under the Snowy 2.0 Transmission Connection Project, which is subject to separate planning approval (reference SSI-9717, EPBC 2018/836).
GDEs	Groundwater Dependent Ecosystems
GIS	Geographic information system
ha	Hectare/s
HV	High voltage electricity
HTZ	Hazard tree zone
HTW	High threat weeds
HumeLink	The project
IBRA	Interim Biogeographic Regionalisation for Australia
Indicative disturbance area	An indicative area that would be temporarily or permanently cleared during project construction and operation. This includes land within and adjacent to the proposed transmission line subject to varying levels of physical disturbance, as follows: • Total Clearing Zone (TCZ); lands subject to total clearing and ground disturbance. Permanent structures such as transmission line structures, access tracks and substations would be situated within these lands as well as temporary brake and winch sites. Temporary construction compounds are also included in the TCZ. • Easement Clearing Zone (ECZ); includes lands within the proposed transmission line easement where clearing and ongoing maintenance of tall growing vegetation would be undertaken. Earthworks are not required within this zone except in limited circumstances. • Hazard Tree Zone (HTZ); includes lands within and immediately adjacent to the transmission line easement where selective tree removal, trimming or lopping would be undertaken to manage any risk of damage to transmission lines and structures in the event of tree fall. Earthwork is not required within this zone. Disturbance area has the same meaning as 'Development Footprint' as defined by the BAM.
IDE	Inflow-dependent ecosystems
KFH	Key Fish Habitat

Term or abbreviation	Definition
km	Kilometre/s
Koala SEPP 2021	State Environmental Planning Policy (Koala Habitat Protection) 2021
KPoM	Koala Plans of Management
KTP	Key Threatening Process
kV	Kilovolt/s
Landscape assessment area	The project footprint and adjacent lands (ie land within 500 m of the project footprint).
LGA	Local Government Area
LiDAR	Light Detection and Ranging
LLS Act	*Local Land Services Act 2013*
Local population	The population of a particular threatened species that occurs in the locality
Locality	The project footprint and surrounds, nominally a 20 km radius from the project footprint
LWD	Large woody debris
m	Metre/s
mAHD	Metres above Australian Height Datum
mL	Millilitre/s
MNES	Matters of National Environmental Significance (from the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*)
Native Vegetation	As described in the BAM (DPIE, 2020): 1. Native vegetation means any of the following types of plants native to New South Wales: • trees (including any sapling or shrub or any scrub), • understorey plants, • groundcover (being any type of herbaceous vegetation), • plants occurring in a wetland. 2. A plant is native to New South Wales if it was established in New South Wales before European settlement. The regulations may authorise conclusive presumptions to be made of the species of plants native to New South Wales by adopting any relevant classification in an official database of plants that is publicly accessible. 3. For the purposes of this Part, native vegetation extends to a plant that is dead or that is not native to New South Wales if: • the plant is situated on land that is shown on the native vegetation regulatory map as category 2-vulnerable regulated land, and • it would be native vegetation for the purposes of this Part if it were native to New South Wales. 4. For the purposes of this Part, native vegetation does not extend to marine vegetation (being mangroves, seagrasses or any other species of plant that at any time in its life cycle must inhabit water other than fresh water). A declaration under Section 14.7 of the BC Act that specified vegetation is or is not marine vegetation also has effect for the purposes of this Part.
NEM	National Electricity Market
NPW Act	*National Parks and Wildlife Act 1974*
NRAR	Natural Resources Access Regulator
NSW	New South Wales
NTG	Natural Temperate Grassland
OPGW	Optical Fibre Ground Wire
PCT	Plant Community Type, classified according to the BioNet Vegetation Classification database.

Term or abbreviation	Definition
PMST	Protected Matters Search Tool
Project (the)	The CSSI project "HumeLink", which is the subject of this Environmental Impact Statement. The project involves the construction and operation of high voltage transmission lines and associated infrastructure between Wagga Wagga, Bannaby and Maragle.
Project footprint	The area within which direct impacts could occur from construction and operation of the project for the purpose of this EIS. It includes an indicative disturbance area, which is an estimated area to be directly disturbed during construction and operation. Project footprint has the same meaning as 'Development Site' as defined by the BAM.
Proponent	The entity seeking approval for the SSI application, which for the HumeLink project is New South Wales (NSW) Electricity Networks Operations Pty Ltd (referred to as Transgrid).
Proposed Gugaa 500 kV substation	The new 500/330 kV substation proposed near Wagga Wagga.
SAII	Serious and Irreversible Impacts
SEARs	Planning Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SPRAT	Species Profile and Threats
SSI	State Significant Infrastructure
Subject land	This is the same area as the indicative disturbance area.
TBDC	Threatened Biodiversity Data Collection
TCZ	Total clearing zone
The Fund	Biodiversity Credit Supply Fund
The Taskforce	Credit Supply Taskforce
TEC	Threatened Ecological Community
Transmission line route	The location of the transmission line structures along the middle of the transmission line easement.
VI	Vegetation Integrity as calculated by the BAM Calculator
VRZ	Vegetated riparian zone
Wagga 330 kV substation	The existing 330/132 kV substation located at Wagga Wagga.
WM Act	*Water Management Act 2000*
WoNS	Weeds of National Significance
Worker accommodation facilities	Temporary worker accommodation facilities that would be established for the construction workers.

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Stage 1: Biodiversity assessment

1 Introduction

This chapter provides an overview of the project, relevant biodiversity assessment requirements and the purpose and structure of this report.

1.1 Project overview

The Australian energy landscape is transitioning to a greater mix of low-emission renewable energy sources, such as wind and solar. To support this transition, meet future energy demands and connect Australian communities and businesses to these lower cost energy sources, the national electricity grid needs to evolve.

Transgrid proposes to increase the energy network capacity in southern New South Wales (NSW) through the development of around 360 kilometres of new 500 kilovolt (kV) high-voltage transmission lines and associated infrastructure between Wagga Wagga, Bannaby and Maragle (the project). This project is collectively referred to as HumeLink. The project would be located across five Local Government Areas (LGAs) including Wagga Wagga City, Snowy Valleys, Cootamundra-Gundagai Regional, Upper Lachlan Shire and Yass Valley. The location of the project is shown in Figure 1-1.

HumeLink would involve construction of a new substation east of Wagga Wagga as well as connection to existing substations at Wagga Wagga and Bannaby and a future substation at Maragle in the Snowy Mountains (referred to as the future Maragle 500 kV substation). The future Maragle 500 kV substation is subject to a separate major project assessment and approval (reference SSI-9717, EPBC 2018/836).

The project would deliver a cheaper, more reliable and more sustainable grid by increasing the amount of renewable energy that can be delivered across the national electricity grid, helping to transition Australia to a low carbon future. It would achieve this by supporting the transfer of energy from existing renewable generation as well as facilitate development of new renewable generation in the Wagga Wagga and Tumut Renewable Energy Zones. The project would provide the required support for the network in southern NSW, allowing for the increase in transfer capacity between new renewable generation sources and the state's demand centres of Sydney, Newcastle and Wollongong. The project would also improve the efficiency and reliability of the current energy transfer in this part of the network.

Furthermore, HumeLink would form a key part of the transmission line infrastructure that supports the transfer of energy within the National Electricity Market (NEM) by connecting with other major interconnectors. The NEM incorporates around 40,000 kilometres of transmission lines across Queensland (QLD), NSW, Australian Capital Territory (ACT), Victoria (VIC), South Australia (SA) and Tasmania (TAS).

Construction of the project is targeted to commence in 2024, subject to the required planning and regulatory approvals. Once construction has commenced, the project is estimated to take approximately 2.5 years to build and would become operational by the end of 2026.

1.2 Key components of the project

The key components of HumeLink (Figure 1-2) include:

- construction and operation of around 360 kilometres of new double circuit 500 kV transmission lines and associated infrastructure between Wagga Wagga, Bannaby and Maragle
- construction of a new 500/330 kV substation at Gregadoo (Gugaa 500 kV substation) approximately 11 kilometres south-east of the existing Wagga 330/132 kV substation (Wagga 330 kV substation)
- demolition and rebuild of a section of Line 51 (around two kilometres in length) as a double circuit 330 kV transmission line connecting into the Wagga 330 kV substation
- modification of the existing Wagga 330 kV substation and Bannaby 500/330 kV substation (Bannaby 500 kV substation) to accommodate the new transmission line connections
- connection of transmission lines to the future Maragle 500/330 kV substation (Maragle 500 kV substation, approved under the Snowy 2.0 Transmission Connection Project (SSI-9717))
- provision of one optical repeater telecommunications hut and associated connections to existing local electrical infrastructure
- establishment of new and/or upgraded temporary and permanent access tracks
- ancillary works required for construction of the project such as construction compounds, worker accommodation facilities, utility connections and/or relocations, brake and winch sites, and helipad/helicopter support facilities.

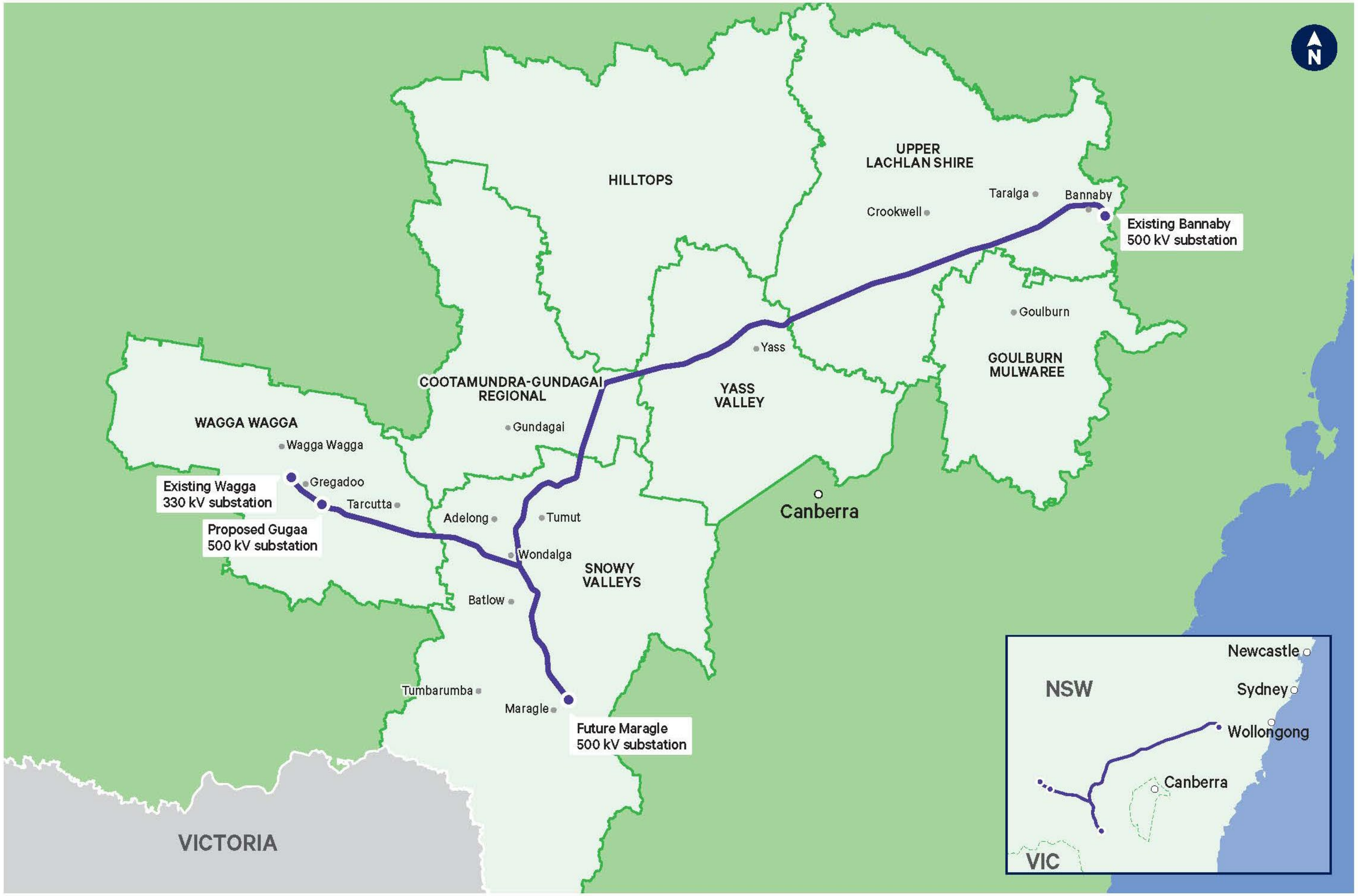
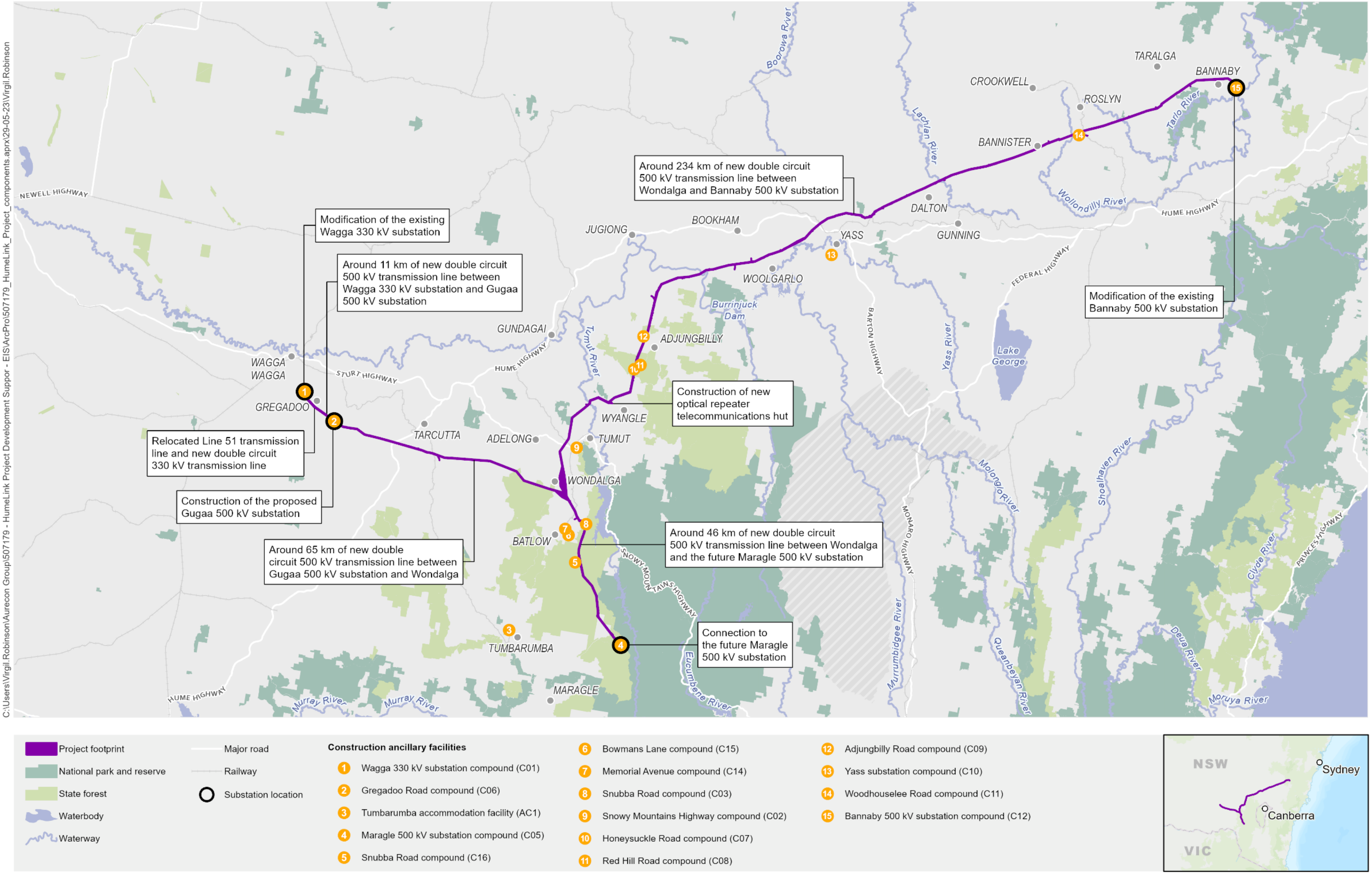


Figure 1-1: Location of the project



Project footprint	Major road		
National park and reserve	Railway		
State forest	Substation location		
Waterbody			
Waterway			

Construction ancillary facilities

1. Wagga 330 kV substation compound (C01)
2. Gregadoo Road compound (C06)
3. Tumbarumba accommodation facility (AC1)
4. Maragle 500 kV substation compound (C05)
5. Snubba Road compound (C16)
6. Bowmans Lane compound (C15)
7. Memorial Avenue compound (C14)
8. Snubba Road compound (C03)
9. Snowy Mountains Highway compound (C02)
10. Honeysuckle Road compound (C07)
11. Red Hill Road compound (C08)
12. Adjungbilly Road compound (C09)
13. Yass substation compound (C10)
14. Woodhouselee Road compound (C11)
15. Bannaby 500 kV substation compound (C12)

Source: *Aurecon, Transgrid, Spatial Services (DCS), ESRI Basemap*

1:925,000

0 20 40km

Projection: GDA 1994 MGA Zone 55

HumeLink **Biodiversity Assessment**

FIGURE 1-2: Key components of the project

1.3 Purpose of this report

The purpose of this report is to use the guidelines and methodology provided in the NSW Biodiversity Assessment Method 2020 (BAM) to determine the impact the project would have on biodiversity, to provide avoidance and minimisation measures, and to identify the need and calculate the project's biodiversity offset requirement. This report is intended to support the HumeLink Environmental Impact Statement (EIS) and responds directly to the Planning Secretary's Environmental Assessment Requirements (SEARs) issued on 14 March 2022 (refer to Table 1-1). Supplementary SEARs issued for the project by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) are also addressed in Table 1-1.

Table 1-1: Project SEARs reconciliation table

Assessment requirement	How addressed in the Biodiversity Development Assessment Report (BDAR)
NSW Department of Planning and Environment (14 March 2022)	
Key Issues- Biodiversity The level of assessment of key matters must be proportionate to the likely significance of the impacts on the matter. In particular, the EIS must address the following specific matters:	Chapter 4 details the approach to the assessment including survey coverage, effort and supplementary approaches to address remaining information gaps relating to key matters. Given the nature of the proposed project, land clearing and associated fragmentation of habitats is considered to pose the greatest risk to biodiversity. This risk is perceived greatest within intact landscapes (such as Snowy Mountains and Bondo IBRA subregions) or where intact habitat fragments (such as conservation lands) remain within more disturbed landscapes. These lands where prioritised for field survey, in accordance with the approach documented in Section 4.10.1.
An assessment of the biodiversity impacts of the project, in accordance with the NSW *Biodiversity Conservation Act 2016*, the BAM 2020, the guideline for applying the Biodiversity Assessment Methods at severely burnt sites 2020 and documented in a BDAR.	Chapter 4 of this BDAR documents the methods implemented as a part of this assessment. These are generally consistent with the BAM 2020 and the Guideline for applying the BAM at severely burnt sites (where relevant).
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 BAM.	Chapter 12 of this BDAR identifies measures implemented to avoid and minimise impacts to biodiversity. Chapter 14 identifies mitigation and management measures that would be implemented to further reduce and manage impacts to biodiversity during project construction and operation. Chapter 15 documents project offset requirements to address any residual biodiversity impacts.
An assessment of the impacts of the project on listed aquatic threatened species, populations or ecological communities, scheduled under the *Fisheries Management Act 1994*, and a description of the measures to minimise and rehabilitate impacts.	An assessment of impacts to aquatic threatened species, populations and ecological communities was undertaken in accordance with the methodology outlined in Section 4.8 of this document. The results of the assessment are documented in Chapter 10 and an assessment of project impacts presented in Section 13.7.
If an offset is required, details of the measures proposed to address the offset obligations.	Chapter 16 outlines the proposed measures to address the project offset obligation.

Assessment requirement	How addressed in the Biodiversity Development Assessment Report (BDAR)
Supplementary SEARs- Department of Climate Change, Energy, the Environment and Water	
Key Issues- Biodiversity (threatened species and communities and migratory species) 15. 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 footprint or in the vicinity that are not likely to be impacted, provide evidence why they are not likely to be impacted.	Matters of National Environmental Significance (MNES), including threatened species and ecological communities and migratory species likely to be impacted by the project, are identified in Chapter 11 of this document. Species with potential to occur within the project footprint and broader locality were also considered and are addressed in Attachment 16 and Attachment 18.
16. Further analysis of the impacts of the 2019-20 bushfires on the EPBC Act listed threatened species and communities should be undertaken during the assessment. Further assessment would determine whether the remaining habitat within the proposed action area is of substantially greater importance to the survival of listed threatened species following the fires and/ or whether the population of the species in the area is considered an important population. This information, once obtained, can be considered when determining avoidance, mitigation and offset measures for these species.	Section 11.8 presents the analysis of bushfire impacts on MNES and any implications for the project avoidance, mitigation and offsets.
17. For each EPBC Act listed threatened species and communities and migratory species likely to be impacted by the action the EIS must provide a separate:	Addressed in Chapter 11 of this BDAR.
Description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical to their survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans;	Addressed in Chapter 11 and Attachment 18 of this BDAR.
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;	Addressed in Chapter 4 of this BDAR.
Description of the relevant impacts of the action having regard to the full national extent of the species or community's range;	Addressed in Section 13.8 and Attachment 18 of this BDAR.
Description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action;	Addressed in Chapter 12, Chapter 14 and Attachment 18 of this BDAR.
Identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account;	Addressed in Section 13.8 and Attachment 18 of this BDAR.
A description of any offsets proposed to address residual adverse significant impacts and how these offsets would be established;	Addressed in Chapter 15 and Chapter 16 of this BDAR.
Details of how the current published NSW BAM has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts	Addressed in Chapter 16.4 of this BDAR.

Assessment requirement	How addressed in the Biodiversity Development Assessment Report (BDAR)
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 BAM and/ or mapping and descriptions of the extent and condition of the relevant habitat and/ or threatened communities occurring on the proposed offset sites.	Addressed in Chapter 15 and Chapter 16 of this BDAR.
18. Any significant residual impacts not addressed by the BAM may need to be addressed in accordance with the EPBC Act 1999 Environmental Offset Policy.	Addressed in Chapter 17.4 of this BDAR.
Key Issues- Heritage (National Heritage places) 19. The EIS must provide a detailed Heritage Impact Assessment conducted by an experienced and qualified heritage expert. The assessment must also include a visual impact assessment and detailed species assessment on potential impacts to the Bogong moth (which is a value of the heritage place). Whilst not an EPBC Act listed threatened species, the Bogong moth's assessment should follow the information requirements for EPBC listed species that is listed under paragraph 17.	The impact assessment and results for the Bogong Moth are addressed in Section 13.8.6 and Attachment 18 of this BDAR as well as *Technical Report 2 – Aboriginal Cultural Heritage Assessment Report*.

1.4 Report structure

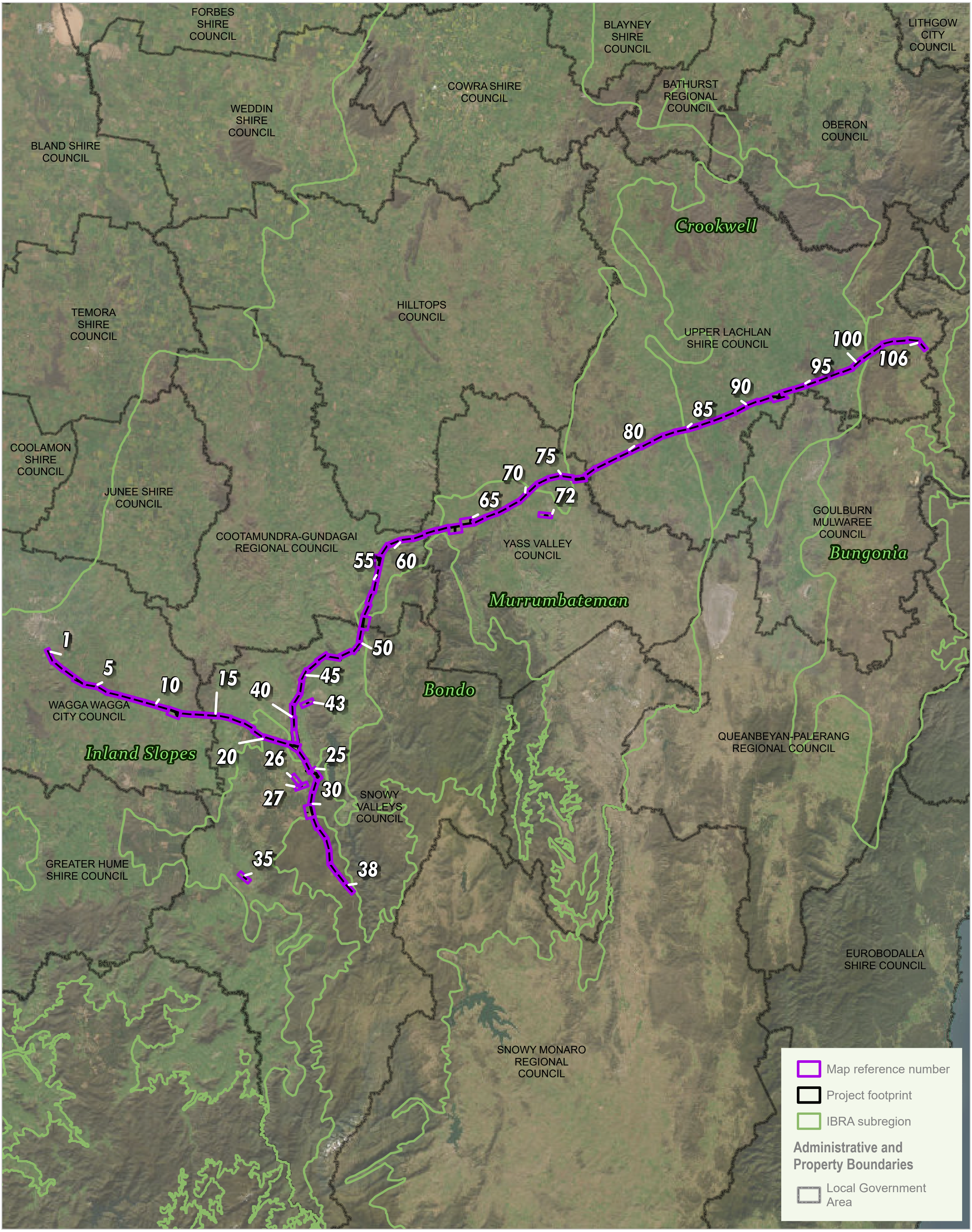
The structure and content of this report is detailed in Table 1-2 below.

The spatial data captured within BDAR figures is presented across a series of map reference pages as shown in Figure 1-3. The numbering, sequence and spatial extent of each map reference page remains consistent across all figure sets. Map reference pages are only included in a figure set where spatial data needs to be displayed for that location. For this reason map reference page numbers may not follow a chronological sequence. BDAR figures are provided in Attachment 1.

Table 1-2: BDAR structure and content

Chapter	Summary
Stage 1 Biodiversity Assessment	
Chapter 1: Introduction	Provides an overview of the project, relevant biodiversity assessment requirements and the purpose and structure of this report.
Chapter 2: Project description	Describes key components of the project's design specifications and construction methodology.
Chapter 3: Legislation and policy context	Provides an outline of the key biodiversity legislative requirements and policy guidelines relating to the project.
Chapter 4: Assessment methods	Details the methodology adopted as a part of the assessment.
Chapter 5: Landscape context	Addresses the landscape context of the project in accordance with Section 3 of the BAM.
Chapter 6: Native vegetation	Addresses native vegetation in accordance with Section 5 of the BAM and matters relating to the NSW *Biodiversity Conservation Act 2016* (BC Act).
Chapter 7: Threatened species	Addresses threatened species in accordance with Section 6 of the BAM and matters relating to the BC Act.
Chapter 8: Identifying prescribed impacts	Documents site features recorded within the project footprint relevant to the assessment of prescribed impacts, as per clause 6.1 of the Biodiversity Conservation Regulation 2017 (BC Regulation).
Chapter 9: Bushfire impacts and assessment considerations	Documents the extent of severely burnt lands, impacted threatened species and ecological communities and the adopted assessment approach.
Chapter 10: Aquatic species and habitats	Addresses matters relating to the *Fisheries Management Act 1994* (FM Act) including threatened aquatic species, populations and ecological communities.
Chapter 11: Matters of National Environmental Significance	Addresses relevant MNES under the EPBC Act.
Stage 2 Impact assessment	
Chapter 12: Avoid and minimise impacts	Addresses proposed measures to avoid and minimise impacts to biodiversity in accordance with Section 8 of the BAM.
Chapter 13: Impact assessment-	Addresses likely impacts associated with project construction and operation in accordance with Section 9 of the BAM.
Chapter 14: Mitigation and management measures-	Addresses the mitigation and management measures to be implemented during the construction and operation phases of the project.
Chapter 15: Offset requirements-	Details offset requirements necessary to address any residual biodiversity impacts associated with the project in accordance with Section 10 and 11 of the BAM.
Chapter 16: Biodiversity Offset Strategy-	Outlines the proposed approach for offset delivery.
Chapter 17: Conclusion	Summarises key outcomes of the assessment.
Chapter 18: References	Details information and data sources informing the assessment.
Attachments	

Chapter	Summary
Attachment 1	BDAR figures
Attachment 2	Biodiversity Conservation Division of the NSW Department of Planning and Environment (BCD) consultation meeting log
Attachment 3	Vegetation within Category 1- exempt land
Attachment 4	Assessment of bushfire affected lands
Attachment 5	Floristic plot data
Attachment 6	BAM plot function, structure and composition scores
Attachment 7	BAM Plot data used for plot shortfalls
Attachment 8	Survey dates and weather conditions
Attachment 9	Golden Sun Moth expert report
Attachment 10	Plant Community Type descriptions
Attachment 11	Planted native vegetation streamlined assessment module
Attachment 12	Candidate species habitat mapping and polygon development
Attachment 13	Serious and irreversible impacts
Attachment 14	Fauna species recorded during field surveys
Attachment 15	Assessment of BC Act candidate species within severely burnt vegetation
Attachment 16	Threatened species likelihood of occurrence
Attachment 17	EPBC Act Protected Matters search results
Attachment 18	EPBC Act Significant Impact Assessment
Attachment 19	Aquatic assessments of significance
Attachment 20	Ecosystem and species credits required (Biodiversity Assessment Method Credit Calculator (BAM-C) credit report).
Attachment 21	Prescribed impacts assessment
Attachment 22	Assessment of bushfire impacts to EPBC Act species and communities



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niche Environment and Heritage

0 20 Kilometers
WGS 1984 Web Mercator

Niche PM: Simon Tweed
Niche Proj. #: 6699
Client: Aurecon

Overview map
HumeLink BDAR

Figure 1-3

World Imagery: Earthstar Geographics | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to WGS1984 Web Mercator Auxilliary Sphere is used in the map above. For ease of reference, the grid tick marks and labels shown around the border of the map are presented in GDA2020, using the relevant MGA zone.

1.5 Key project terms

Table 1-3 outlines key project terms relevant to the assessment and application of the BAM 2020. Important project infrastructure and construction elements are also defined.

Table 1-3: Key project terms

Term or abbreviation	Definition
Easement	A legal right attached to a parcel of land that enables the non-exclusive use of the land by a third party other than the owner. For transmission lines, an easement defines the corridor area where the lines are located and that allows access, construction and maintenance work to take place. The easements for the 500 kV transmission lines would typically be 70 m wide. However, a few locations would require wider easements up to 110 m wide at transposition locations and up to 130 m wide where the new transmission line would parallel the relocated section of Line 51. The easement grants a right of access and for construction, maintenance and operation of the transmission line and other operational assets.
Field survey extent	Land within the project footprint that was accessed during the assessment for the purpose of field survey. The field survey extent is detailed in Table 4-21 and shown in Figure 4-4 (Attachment 1) relative to the project footprint and associated Interim Biogeographic Regionalisation for Australia (IBRA) subregions.
Indicative disturbance area	An indicative area that would be temporarily or permanently cleared during project construction and operation. This includes land within and adjacent to the proposed transmission line corridor subject to varying levels of physical disturbance, as follows: • Total Clearing Zone (TCZ); lands subject to total clearing and ground disturbance. Permanent structures such as transmission line structures, access tracks and substations would be situated within these lands as well as temporary brake and winch sites. Temporary construction compounds are also included in the TCZ. • Easement Clearing Zone (ECZ); includes lands within the proposed transmission line easement where clearing and ongoing maintenance of tall growing vegetation would be undertaken. Earthworks are not required within this zone except in limited circumstances. • Hazard Tree Zone (HTZ); includes lands within and immediately adjacent to the transmission line easement where selective tree removal, trimming or lopping would be undertaken to manage any risk of damage to transmission lines and structures in the event of tree fall. Earthwork is not required within this zone. The indicative disturbance area has the same meaning as ‘Development Footprint’ as defined by the BAM.
Landscape assessment area	The project footprint and adjacent lands (ie land within 500 m of the project footprint).
Locality	The project footprint and surrounds, nominally a 10 km radius from the project footprint.
Project footprint	The area within which direct impacts could occur from the project. The project footprint includes an indicative disturbance area, which is an estimated area to be directly disturbed during construction and operation of the proposed transmission line and associated infrastructure. Project footprint has the same meaning as ‘Development Site’ as defined by the BAM.

1.6 Assessment resources and assessor qualifications

This BDAR has been prepared by the accredited personnel and support staff identified in Table 1-4. Eco Logical Australia (ELA) completed the early stages of the biodiversity assessment including collection of field data and some vegetation and habitat mapping. Niche was engaged in October 2021 to complete and deliver the BDAR.

Assessment and survey guidelines used in the development of this BDAR are detailed in Table 1-5.

Table 1-4: Assessor and support staff qualifications

Personnel	Role	Qualifications	Tasks carried out
Niche staff and contractors			
Simon Tweed	Senior Ecologist – Fauna Biodiversity Lead; BAM Accredited Assessor	BEnvSc. (Hons) Accredited Biodiversity Assessor (BAAS 18088)	Project management, technical review and quality assurance.
Chani Wheeler	Senior Ecologist; BAM Accredited Assessor	BSc. MConsBiol. Accredited Biodiversity Assessor (BAAS 19077)	Project management, data management, report preparation and quality assurance.
Sian Griffiths	Senior Ecologist; BAM Accredited Assessor	BEnvSc. (Hons) Accredited Biodiversity Assessor (BAAS 17066)	Project management, report preparation and quality assurance.
Dr Amanda Griffith	Senior Ecologist; BAM Accredited Assessor	BSc, PHD, Accredited Biodiversity Assessor (BAAS 19016)	Quality assurance, quality control.
Jessie Bear	Ecologist	BNatSc. (Advanced) (EnvMgt)	Project management, data management and report preparation.
Arne Bishop	Director- Ecology EcoResolve Pty Ltd	BEnvSc. BLandArch. Accredited Biodiversity Assessor (BAAS 17065)	Vegetation mapping, BAM plots, threatened flora surveys, report preparation and technical review.
Alex Christie	Senior Ecologist	BEnvSc. Accredited Biodiversity Assessor (BAAS 18131)	BAM plots, threatened flora surveys.
Meredith Leal	Ecologist	BSc. Accredited Biodiversity Assessor (BAAS 22007)	BAM plots, threatened flora surveys and report preparation.
Kayla McGregor	Ecologist	BEnvSc. (Hons)	Fauna surveys, data management and report preparation.
Isabel Lyons	Ecologist	BSc. Accredited Biodiversity Assessor (BAAS 22002)	BAM plots, threatened flora surveys, data management, report preparation.
Nathan Browne	Ecologist	BSc. (Hons)	Targeted threatened flora and fauna surveys, data management.
Amy Legge	Ecologist	BSc.	Targeted threatened flora and fauna surveys, data management.
Annabel Grundy	Ecologist	BSc.	Targeted threatened flora and fauna surveys, data management.
Lauren Eade	Ecologist	BSc.	Targeted threatened flora and fauna surveys, data management.
Jodie Danvers	Ecologist	BEnvSc.	Targeted threatened flora and fauna surveys.
Jai Green-Barber	Ecologist	BNat Sc (AnSc), BSc (Hons), PhD, Accredited Biodiversity Assessor (BAAS 2002)	Targeted threatened flora and fauna surveys.

Personnel	Role	Qualifications	Tasks carried out
Alana Homewood	Senior Ecologist	BSc, MEnvMgmt, SQP, MEIANZ	BAM plots, threatened flora surveys.
Sophia Dunn	Ecologist	BSc/MEScM	BAM plots, threatened flora and fauna surveys, data management, report preparation.
Freya Gordon	Senior Ecologist	BSc (Hons)	Project management, data adequacy review and field survey planning.
Fin Murphy	Casual	BMarineSc.	Targeted threatened flora and fauna surveys.
Reilly Todd	Casual	BMarineSc.	Targeted threatened flora and fauna surveys.
Rosemary Hulak	Ecologist	BEnvBio	BAM plots, targeted threatened flora and fauna surveys.
George Madani	Fauna Ecologist	BSc. MAppSc.	Targeted threatened fauna survey and data management.
Stephen Mahony	Ecologist- Ecology EcoResolve Pty Ltd	BSc.	Targeted threatened flora and fauna surveys.
Kazz Tokek	Ecologist- Ecology EcoResolve Pty Ltd	BBioSc (Hons).	Targeted threatened flora and fauna surveys.
Hugh James	Ecologist- Ecology EcoResolve Pty Ltd	BEnvSc.	BAM plots, targeted threatened flora and fauna surveys.
Breanna Heidke	Ecologist- Ecology EcoResolve Pty Ltd	BEnvScMgt. MEnvMgt.	BAM plots, targeted threatened flora and fauna surveys.
Andrew Carty	Ecopath Consulting	BEnvSc. Certificate IV Natural Area Restoration and Management. Accredited Biodiversity Assessor (BAAS 20021)	BAM plots and targeted threatened flora surveys.
Maya Potapowicz	Subconsultant	BEnvSc. Accredited Biodiversity Assessor (BAAS 18157)	BAM plots and targeted threatened flora surveys.
Isaac Mammot	Sclerophyll	BSc. BA. Accredited Biodiversity Assessor (BAAS 18008)	BAM plots and targeted threatened flora surveys.
Damian Licari	Principal Ecologist- Ascent Ecology	BSc. MBA. PhD Science. Accredited Biodiversity Assessor (BAAS 18006)	BAM plots, targeted threatened flora and fauna surveys.
Nigel Cotsell	Ascent Ecology	BSc. MNatRes. Accredited Biodiversity Assessor (BAAS 18026)	BAM plots, targeted threatened flora and fauna surveys.
Louis Bell	Ascent Ecology	BEnvMarScMgt.	BAM plots, targeted threatened flora and fauna surveys.

Personnel	Role	Qualifications	Tasks carried out
Brian Adam	Ascent Ecology	BEnvSc.	BAM plots, targeted threatened flora and fauna surveys.
Jordan Peppin	Ascent Ecology	BSc. BA.	BAM plots, targeted threatened flora and fauna surveys.
Jennifer Young	Ascent Ecology	BEnvSc. Accredited Biodiversity Assessor (BAAS19036)	BAM plots and targeted threatened flora surveys.
Skye Rivett	The Environmental Factor	BAppSc (ConsBio). MSc (ConsBio). Accredited Biodiversity Assessor (BAAS 22001)	BAM plots, targeted threatened flora and fauna surveys.
Graham Stirling	The Environmental Factor	BSc (Zool). MSc (EnvMgt).	Targeted threatened flora and fauna surveys.
Anna Uhrig	The Environmental Factor	BWildSc.	Targeted threatened flora and fauna surveys.
Ben Perrott	The Environmental Factor	DipEnvSt. BEnvScMgt.	Targeted threatened flora and fauna surveys.
Kayla Le Gros	Ecologist	BNatSc (AnConsBio). MRes.	Targeted threatened flora and fauna surveys.
Desiree Gowell	GIS Consultant	BSc. MSc	GIS support and figure preparation.
Luke Stone	Senior Aquatic Ecologist	BSc. MRes	Aquatic desktop assessment.
Matthew Russell	Associate – Aquatic Ecology	BSc.	Technical review, aquatic ecology.
Eco Logical Australia staff and contractors			
Alicia Scanlan	ELA Staff or Contractor	BSc (Ecology and Biogeography).	Targeted threatened flora and fauna surveys.
Andrew Carty	ELA Staff or Contractor	BEnvSc., Certificate IV Natural Area Restoration and Management	BAM plots, targeted threatened flora and fauna surveys.
Bronwyn Callaghan	ELA Staff or Contractor	BEnvSc (Hons), Accredited BAM Assessor (BAAS) 20019	Coordination of and participation in threatened species (flora) targeted surveys, BAM plots, Vegetation validation.
Cameron Radford	ELA Staff or Contractor	BSc (Environmental Science and Biology) University of Sydney (2009), Master of Wildlife Health and Population Management (Wildlife Biology) University of Sydney (2010), PhD Candidate - Human-wildlife Conflict Mitigation, University of Sydney (2019)	Threatened fauna surveys
Carolina Mora	ELA Staff or Contractor	BSc (Advanced) (Honours Class I): Geography. The University of Sydney (2018), Bachelor of Science (Advanced): Marine Science.	BAM plots

Personnel	Role	Qualifications	Tasks carried out
		The University of Sydney (2017)	
Claire Wheeler	ELA Staff or Contractor	Graduate Certificate River Restoration and Management, Charles Sturt University (2016), Bachelor of Environmental Management, Macquarie University (2005), Certificate III Conservation & Land Management, Ryde TAFE (2007)	Threatened fauna surveys
Clare Duck	ELA Staff or Contractor	Master of Forest Ecosystem Science, University of Melbourne (2017), BA, University of Melbourne - major in Geography and minor in Philosophy (2014)	BAM plots
Dan McKenzie	ELA Staff or Contractor	BEnvScMgmt (Honours), University of Newcastle (2011)	Threatened fauna surveys
Danielle Woodhams	ELA Staff or Contractor	BSc (Wildlife Conservation and Biology) Honours, La Trobe University (2015)	Threatened fauna surveys (mammals, nocturnal birds, reptiles, frogs)
Dee Ryder	ELA Staff or Contractor	BEnvScMgmt	Threatened fauna surveys
Diane Campbell	ELA Staff or Contractor	BSc, University of Sydney, Accredited BAM Assessor – BAAS 17069	Threatened flora surveys, BAM plots
Dr Frank Lemckert	ELA Staff or Contractor	BSc, Terrestrial Ecology and Marine Management, University of Sydney (1984), Master of Science, Population biology of the Common Froglet, University of Sydney (1991), PhD, Management of forest frogs in timber production forests of NSW, University of Newcastle (2009)	Threatened fauna technical lead (mammals, nocturnal birds, reptiles, frogs)
Dr Lachlan Copeland	ELA Staff or Contractor	Research PhD in plant systematics, University of New England (Systematic studies in *Homoranthus* (*Myrtaceae: Chamelaucieae*): species limits, phylogeny, and generic boundaries) (2005), Bachelor of Natural Resources (Hons), University of New England (1995)	Threatened flora surveys
Dr Meredith Henderson	ELA Staff or Contractor	PhD, Victoria University, Melbourne. Vegetation dynamics in response to fire and slashing in remnants of Western Basalt Plains grasslands and the	Technical Lead

Personnel	Role	Qualifications	Tasks carried out
		implications for conservation management (2003), Accredited BAM Assessor - BAAS 17001, Bachelor of Science (Honours), University of Wollongong (1991)	
Griffin Taylor-Dalton	ELA Staff or Contractor	Bachelor of Zoology, Major in Conservational Biology (WSU) (2017)	Threatened flora surveys, BAM plots
Hugh James	ELA Staff or Contractor	BEnvScMgmt (Hons)	BAM plots
James King	ELA Staff or Contractor	Bachelor of Environmental Systems (Honours), University of Sydney, (2018)	Threatened flora surveys, Threatened fauna surveys
Janene Devereux	ELA Staff or Contractor	BSc (Marine Science), University of Newcastle (2008)	Threatened fauna surveys
Julia Ryeland	ELA Staff or Contractor	PhD in Ecology and Environment - Western Sydney University (2016 – 2021), BEnvSc (Wildlife and Conservation Biology) (1st Class Hons) - Deakin University (2014)	Threatened fauna surveys
Karen Spicer	ELA Staff or Contractor	BEnvSc (Biology) Hons 1, University of NSW (1999), WIRES Volunteer	BAM plots
Katy Wilkins	ELA Staff or Contractor	BSc in Biodiversity and Conservation, Macquarie University (2010)	Threatened flora surveys
Kazz Tokek	ELA Staff or Contractor	BSc Science with Honours (Ecology), La Trobe University (2002)	Threatened fauna surveys
Keagan Jones	ELA Staff or Contractor	BEnvScMgmt, Majoring in Earth Systems. University of Newcastle (2020)	Threatened flora surveys
Kristen Bigland	ELA Staff or Contractor	BAppSc (Ecosystems and Ecology), Charles Darwin University (2014)	PBA author
Lauren Perkins	ELA Staff or Contractor	BSc (Marine Science), University of Technology Sydney (2017)	Threatened flora surveys, Threatened fauna surveys
Leura Kowald	ELA Staff or Contractor	Bachelor of Arts and Science (Biodiversity and Physical Geography), University of New England (2019), Certificate III Horticulture (Landscape), Ryde School of Horticulture, Northern Sydney Institute TAFE (2010)	PBA author, BAM Plots, Threatened flora surveys, Threatened fauna surveys
Loren Appleby	ELA Staff or Contractor	BSc (Ecology & Conservation Biology), Griffith University (2012)	Threatened flora surveys, Threatened fauna surveys

Personnel	Role	Qualifications	Tasks carried out
Melinda Westcook	ELA Staff or Contractor	BSc (Environmental Biology) University of Technology Sydney (2012), Master of Science (Bird foraging behaviour), University of Technology Sydney (2017)	Threatened flora surveys
Michael Gregor	ELA Staff or Contractor	BSc (Geography) UNSW (2015) Conservation and Land Management Certificate 3	BAM plots, Threatened flora surveys
Mike Lawrie	ELA Staff or Contractor	BEnvScMgmt - University of Newcastle (2011), Master of Environment (Specialisation in Environmental Science) – Macquarie University (2016)	Threatened fauna surveys
Nicole McVicar	ELA Staff or Contractor	Accredited BAM Assessor - BAAS 18077, BEnvSc, Macquarie University, Bush Regeneration Certificate II, Ryde TAFE	BAM plot technical lead
Nigel Cotsell	ELA Staff or Contractor	Masters of Natural Resources, University of New England (2015), BSc (Zoology/Animal Biology), The Australian National University (1990)	Threatened fauna surveys
Pearce Thomas	ELA Staff or Contractor	BEnvSc, University of Canberra (2014), Bachelor of Landscape Architecture, University of Canberra (2012)	Threatened flora surveys, Threatened fauna surveys
Robyn Stevens	ELA Staff or Contractor	Master of Science and Technology in Spatial Information, University of New South Wales (2010), BSc (Evolution and Diversity of the Australian Biota), Sydney University (1997), Certificate III - Conservation and Land Management – Ryde College of TAFE (2010)	GIS analysis
Roger Lembit	ELA Staff or Contractor	Agricultural Science, University of Sydney (1979)	Threatened flora surveys
Samantha Patch	ELA Staff or Contractor	Bachelor of Marine Science/Environmental Science and Management, Southern Cross University (2021)	Threatened fauna survey, BAM Plot
Shawn Ryan	ELA Staff or Contractor	BEnvScMgmt, University of Newcastle (2011)	Threatened flora surveys
Sophie Montgomery	ELA Staff or Contractor	BEnvScMgmt (Sustainability) University of Newcastle (2020)	Threatened flora surveys
Stacey Wilson	ELA Staff or Contractor	Master of Environment (Environmental Science) –	BAM plots

Personnel	Role	Qualifications	Tasks carried out
		Macquarie University (2015), Bachelor of Biodiversity and Conservation – Macquarie University (2013), Certificate III Conservation Land Management – Ryde TAFE (2015)	

Table 1-5: Assessment and survey guidelines used

Assessment resources/guideline	
Assessment guidelines	• Biodiversity *Assessment Method* (DPIE, 2020a) • *BAM Operational Manual – Stage 1* (DPIE, 2020b) • *BAM Operational Manual – Stage 2* (DPIE, 2019) • *BAM Calculator User Guide* (DPIE, 2018) • Guideline for appl*ying the BAM at severely burnt sites* (DPIE, 2020e) • Interim Grasslands and other Groundcover Assessment Method: Determining conservation value of grasslands and groundcover vegetation in NSW (OEH, 2017)
Survey guidelines	• Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method (DPIE, 2020c) • Species specific survey requirements in the Threatened Biodiversity Database Collection (DPIE, 2021a) • 'Species credit' threatened bats and their habitats, NSW survey guide for the Biodiversity Assessment Method (OEH, 2018) • Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (DEC, 2004a) • NSW Survey Guide for Threatened Frogs: A Guide for the Survey of Threatened Frogs and their Habitats for the Biodiversity Assessment Method (DPIE, 2020d). In the absence of specific survey guidelines issued at the state level, Commonwealth survey guidelines were adopted: • Survey guidelines for Australia's threatened mammals (DSEWPC, 2011a) • Survey guidelines for Australia's threatened reptiles (DSEWPC, 2011b) • Survey guidelines for Australia's threatened birds (DEWHA, 2010a) • Survey guidelines for Australia's threatened frogs (DEWHA, 2010b) • Survey guidelines for Australia's threatened bats (DEWHA, 2010c) • Relevant Significant Impact Guidelines and Referral Guidelines for EPBC Act listed species • Draft survey guidelines for Australia's threatened orchids (DOE, 2013).

1.7 Excluded impacts

Vegetation clearing impacts associated with the following matters are not addressed and offset under the standard BAM methodology, however assessment of impacts to these areas has been incorporated where appropriate (such as where these areas constitute habitat for threatened species which are species credit species):

- Category 1 exempt lands, as defined under the *Local Land Services Act 2013* (LLS Act)
- Non-native vegetation
- Aquatic species and habitats.

Section 4.2 of this BDAR documents the approach to Category 1 exempt land determination implemented for the project. An assessment of prescribed impacts associated with non-native vegetation is presented within Section 13.5.6. An assessment of impacts to aquatic species and habitats has been carried out in accordance with the FM Act and is presented in Chapter 10 and Section 12.7 of this BDAR.

1.8 Agency consultation

Consultation with BCD has been ongoing throughout the development of this BDAR and has included general correspondence, meetings, species-specific workshops, discussion of issues relating to mapping and analysis and presentation of datasets to the BCD for review and comment. Consultation involved key BCD personnel from the southeast team. Dates of the ten meetings and workshops held to date include:

- 14 October 2021
- 18 November 2021
- 16 December 2021
- 24 January 2022
- 1 July 2022
- 24 August 2022
- 19 October 2022
- 25 October 2022
- 8 March 2023
- 9 March 2023.

Key items addressed as a part of consultation are detailed in Attachment 2 and summarised below.

Table 1-6: Agency consultation

Consultation items	Details of discussion	Feedback / status
Field survey approach and survey adequacy	The project team consulted with the BCD regarding the proposed approach to field surveys, including: Limitations associated with restricted survey timing for the spring seasonal survey and issues regarding private land access. Strategies for prioritising field survey efforts given the scale of the project, ongoing design refinement and limitations as raised above. Category 1 lands identification and requirements for field survey. Data relating to survey effort and type across accessible areas was supplied to the BCD and	Feedback regarding survey adequacy to date has been general in nature rather than highlighting specific concerns regarding species that require additional information to inform approval or assessment decisions and where survey needs to be targeted. Further workshopping with the BCD is proposed to allow additional feedback. The project team outlined that we are not necessarily talking about adequacy of survey to rule out species from polygons/offsetting rather checking that the survey undertaken is adequate from an impact assessment point of

Consultation items	Details of discussion	Feedback / status
	feedback requested regarding any areas of concern: *ie Does BCD have any specific species survey concerns based on data supplied to date?* BCD were provided example data for clearing footprint for Bondo and Bungonia subregions (28 September 2022).	view (although both steps would occur at some point). BCD would need further knowledge/data regarding final impact/clearing footprint to make this assessment.
Adequacy of survey coverage	Survey coverage and supporting survey data was provided to BCD along with explanation of access constraints and alternative assessment method options. Specific feedback has been asked of BCD including: "*Transgrid are willing to complete further ecological surveys to verify inputs into the project BDAR, however certain properties are unlikely to be accessible until after initial submission of the EIS. We therefore seek to consult on processes that can be included into the approvals process to verify assumptions made within the BDAR, if considered necessary. We seek comment on whether the level of survey coverage presented is perceived as adequate, specifically in terms of BAM compliance and any other relevant legislation.*"	A process has been outlined for EnergyConnect (NSW – Eastern Section) for assessment of biodiversity and potential impacts within inaccessible areas. The BCD think this could be adopted for HumeLink. It includes best estimation of Plant Community Type (PCT) and condition as well as species presence in a conservative manner with offsets then provided on that basis to a trust fund. Post approval assessment would verify findings with credits adjusted as required. The BCD have confirmed support of the precedent set by EnergyConnect and other large linear CSSI projects.
Burnt areas assessment	The project team sought feedback from the BCD regarding the need for and to confirm the approach to implementing the 'Guideline for applying the Biodiversity Assessment Method at severely burnt sites' (DPIE, 2020e).	BCD advised application of the DPIE (2020e) Guideline was required and indicated in-principle support for the proposed approach to Vegetation Integrity (VI) analysis. Some additional acceptance of approaches to species such as owls in burnt lands based on knowledge of the species occurrence and presence of hollows was provided.
Category 1 exempt lands mapping	The project team consulted and received feedback from the BCD regarding the Category 1 lands mapping process. Draft mapping was provided to the BCD for review (via email, 30/03/2022).	There are some differences in interpretation regarding Category 1 lands (specifically around automatic exclusion of Critically Endangered PCTs) however the project is proposing to adopt the stated requirements of the BCD in these instances. BCD have not released finalised Category 1 land mapping and are unlikely to do so prior to submission.
Approach to species polygons/ impact assessment	A review of methods was supplied to the BCD (June 2022). Some input data layers have been provided (ie native vegetation, patch size and Category 1 lands). BAM-C predicted and candidate species lists have been provided for all IBRA subregions.	Workshop (October 2022) and feedback on specific threatened species is underway and ongoing with future consultation to include consideration of where offsets may need to be considered in degraded areas.
Approach to estimation of threatened flora counts in areas of assumed presence	Guidance provided by BCD on estimating the count for the threatened flora assumed present for the HumeLink assessment. This advice was provided in consultation with the department's threatened species officers and was based on data from known reference site and /or SOS monitoring sites: *"Should Niche choose not to apply guidance provided, BCD would expect the BDAR to provide*	There are 12 species for which count estimates needed to be developed. The process has considered data from BCD which has been gathered through consultation. An approach to estimating impacts to count species was provided by BCD for some, but not all of the species required to be considered, and the approach BCD provided was very conservative, based on counts at known reference sites

Consultation items	Details of discussion	Feedback / status
	sufficient evidence based rationale and detail to explain and justify the counts applied to the assessment. *An alternative option would be to obtain an expert report to estimate the number and location of individuals likely to be present and map the species polygon. Again, the method used to make estimations must be documented in the expert report as part of the BDAR and must include justification of the approach used (e.g. based on scientific literature, reference populations in the local area)."*	where the species is known to occur and did not account for variation in species presence (i.e assumed species presence across the entirely of the species polygon and did not account for areas of habitat where the species may not be physically present). Therefore, Niche developed a justifiable methodology to ensure impacts to count species, and their offsetting costs, were not significantly overestimated. These methods are detailed in Attachment 12.
Conservation Agreement site AB563794	Transgrid sought clarification from BCD regarding the extent of Conservation Agreement site AB563794, where it intersects the project footprint.	Data was provided to Transgrid regarding the extent of the site and the nature of the agreement. Contacts at DPE were provided to obtain further specific information on locational details of threatened entities and conservation areas so that avoidance and mitigation measures could be incorporated into the project. Niche has received spatial information after consultation with the NSW Biodiversity Conservation Trust and BCD. Any additional feedback has been requested.

2 Project description

The project description in this chapter is based on a concept design and indicative construction methodology for the project. The design and construction methodology would continue to be refined and confirmed during detailed design and construction planning by the construction contractors. Further details on the project are provided in Chapters 3 and 4 of the EIS.

2.1 Summary of key components of the project

Key components of the project are summarised in Table 2-1.

Table 2-1: Summary of key components of the project

Component	Description
Transmission lines and supporting infrastructure	
Transmission lines and structures	The project includes the construction of new 500 kV transmission line sections between: • Wagga 330 kV substation and Gugaa 500 kV substation (approximately 11 km) • Gugaa 500 kV substation and Wondalga (approximately 65 km) • Wondalga and Maragle 500 kV substation (approximately 46 km) • Wondalga and Bannaby 500 kV substation (approximately 234 km). The transmission line section between the Wagga 330 kV substation and proposed Gugaa 500 kV substation would operate at 330 kV under HumeLink. The project also includes the rebuild of approximately 2 km of Line 51 as a new 330 kV transmission line between the Wagga 330 kV substation and around Ivydale Road, Gregadoo. This would be adjacent to the new transmission line between the existing Wagga 330 kV and proposed Gugaa 500 kV substations. The 500 kV transmission lines would be supported on a series of free-standing steel lattice structures that would range between around 50 m up to a maximum of 76 m in height and generally spaced between 300 to 600 m apart. The typical transmission line structure height would be around 60 m. Earth wire and communications cables would be co-located on the transmission line structures. The 330 kV structures for the rebuild of Line 51 would range between 24 m and 50 m in height and have a typical height of 40 m. Indicative configurations of transmission line structures that may be used as part of the project are shown in Figure 2-1. The type and arrangement of the structures would be refined during detailed design. The footings of each structure would require an area of up to 300 m^2 to 450 m^2, depending on ground conditions and the proposed structure type. Additional disturbance at each structure site may be required to facilitate structure assembly and stringing.
Transmission line easements	The easements for the 500 kV transmission lines are typically 70 m wide. However, a number of locations may require wider easements of up to 110 m wide at transposition locations[1] and up to 130 m wide where the new transmission line would parallel the relocated section of Line 51. The easement provides a right of access to construct, maintain and operate the transmission line and other operational assets. The easement also generally identifies the zone of initial vegetation clearance and ongoing vegetation management to ensure safe electrical clearances during the operation of the lines. Vegetation management beyond the easement may also occur where nearby trees have the potential to fall and breach safety clearances.
Telecommunications hut	Telecommunications huts, which contain optical repeaters, would be required to boost the signal in the optical fibre ground wire (OPGW). One telecommunications hut would be required for the project. The telecommunications hut would be located adjacent to existing transmission line structures. Cables would be installed between the transmission line structure and the local power supply. The telecommunications hut

[1] Transposition is the periodic swapping of positions of the conductors of a transmission line in order to improve transmission reliability.

Component	Description
	would be surrounded by a security fence. A new easement would be established for the telecommunications hut power connection. The project also involves a telecommunications connection of OPGW between two proposed transmission line structures and the future Rye Park Wind Farm substation (SSD-6693). This removes the need for an additional telecommunications hut in this area of the project.
Substation activities	
Construction of the proposed Gugaa 500 kV substation	A new 500/330 kV substation would be constructed at Gregadoo, about 11 km south-east of the Wagga 330 kV substation. The substation would include seven new 500/330 kV transformers and three 500 kV reactors.
Modification of the existing Bannaby 500 kV substation	The existing Bannaby 500 kV substation on Hanworth Road, Bannaby would be expanded to accommodate connections for new 500 kV transmission line circuits. The modification would include changes to the busbars, line bays, bench and associated earthworks, steelwork, drainage, external fence, internal/external substation roads, secondary containment dams, sediment containment dams, cabling, and secondary systems. All of the works would be restricted to the existing substation property.
Modification of the existing Wagga 330 kV substation	The existing Wagga 330 kV substation on Ashfords Road, Gregadoo would be reconfigured to accommodate new bays for two new 500 kV transmission line circuits within the existing substation property. This would include modifications to the busbars, line bays, existing line connections, bench and associated earthworks, relocation of existing high voltage equipment, drainage, external fence, internal substation roads, steelwork, cabling, and secondary systems.
Connection to the future Maragle 500 kV substation	The project would connect to the future Maragle 500 kV substation approved under the Snowy 2.0 Transmission Connection Project (SS1-9717). Construction of the Maragle substation is proposed to be undertaken between 2023 and 2026. Further detail on the Snowy 2.0 Transmission Connection project is available at the Department of Planning and Environment's Major Projects website: www.planningportal.nsw.gov.au/major-projects/project/10591.
Ancillary facilities	
Access tracks	Access to the transmission line structures and the substations would be required during construction and operation. Wherever possible, existing roads, tracks and other existing disturbed areas would be used to minimise vegetation clearing or disturbance. Upgrades to existing access tracks may be required. In areas where there are no existing roads or tracks, suitable access would be constructed. This may include waterway crossings.
Construction compounds	Construction compounds would be required during construction to support staging and equipment laydown, concrete batching, temporary storage of materials, plant and equipment and worker parking required to construct the various elements of the project. Fourteen potential construction compound locations have been identified. The proposed use of the construction compounds and their proposed boundaries/layout would be refined as the project design develops in consultation with relevant stakeholders and the construction contractors.
Worker accommodation facility	Existing accommodation facilities within towns adjacent to the project would provide temporary accommodation for the majority of the construction workers. However, a potential shortage in accommodation has been identified close to the project footprint. A potential option to provide additional temporary worker accommodation during the construction period is the establishment of a temporary worker accommodation facility at the corner of Courabyra Road and Alfred Street, Tumbarumba to accommodate about 200 construction workers. The worker accommodation facility would consist of demountable cabins and would be connected to existing utilities. All required amenities for the accommodation facility would be provided including services and worker parking for light and heavy vehicles. However, the ultimate delivery of the project may include multiple temporary worker accommodation facilities in various forms, which would be outlined in the Worker Accommodation Strategy for the project. The strategy will be developed in consultation with councils, and other relevant stakeholders. Any new or changed worker accommodation facility would be subject to additional environmental assessment, as required.

Component	Description
Helipad/helicopter facilities	To facilitate construction of the project, helicopters may be used to deliver materials/equipment and transfer personnel to construction areas particularly within high alpine regions. To enable helicopters to operate safely and allow easy access to the site, a helicopter landing pad would be required. The helipad is expected to occupy an area of around 30 m by 30 m, and would be remediated after construction. These areas would typically be located on existing disturbed land not subject to inundation and a reasonable distance from waterways, sensitive receivers and drainage lines. Eight locations have been identified and assessed as potential helipad locations. The exact locations to be used would be confirmed during detailed design by the construction contractors. In addition to this, the existing facilities at the Wagga Wagga Airport and Tumut Airport may be used.
Utility connections, adjustments and protection	The project would require utility connections, adjustments and protection. Such works include interfaces with other transmission lines and connections to existing services for temporary facilities . Potential impacts to existing services and utilities would be confirmed during detailed design and any proposed relocation and/or protection works would be determined in consultation with the relevant asset owners.

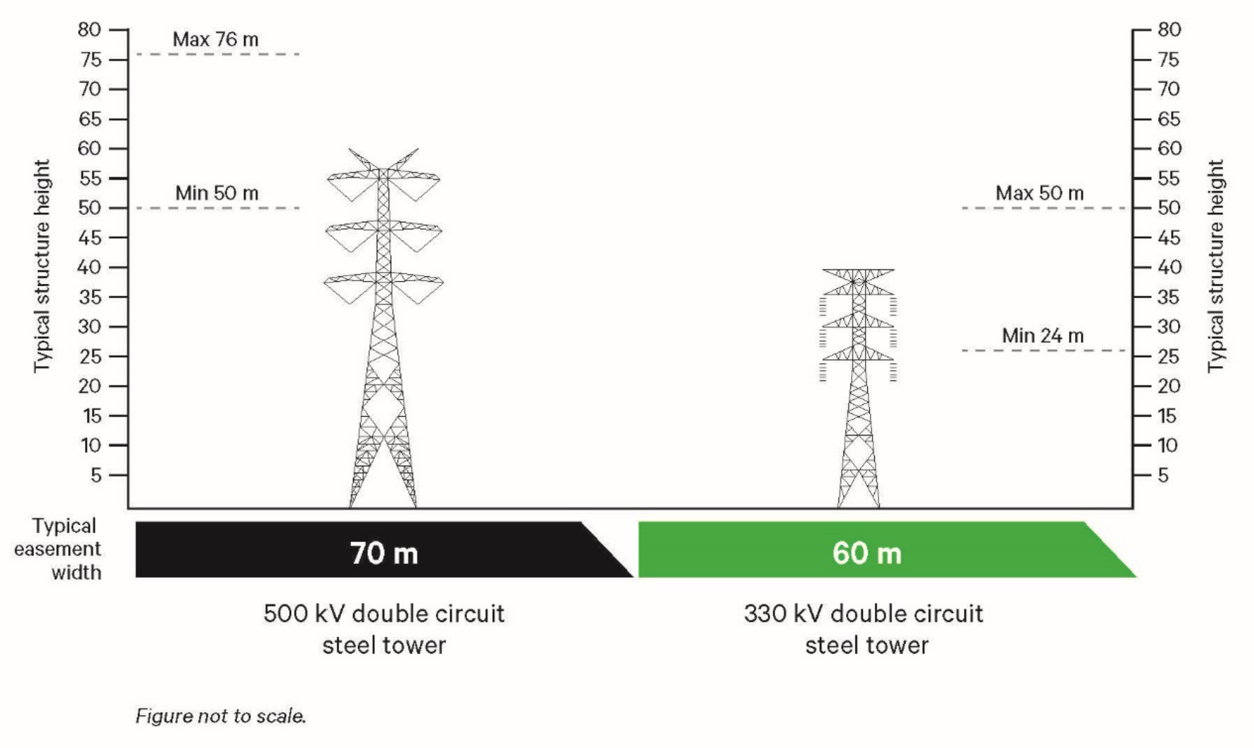

Figure 2-1: Indicative transmission line structures

2.2 Construction of the project

2.2.1 Construction activities

Key construction activities would generally include (but are not limited to):

- site establishment work, such as:
  - clearing of vegetation and topsoil
  - establishment of construction compounds and helipad/helicopter facilities
  - utility relocations and/or adjustments
  - construction of new access tracks and waterway crossings and/or upgrade of existing access tracks to transmission line structures
  - road improvement work
  - establishment of environmental management measures and security fencing
  - construction of temporary worker accommodation
- construction of the transmission lines, including:
  - earthworks and establishment of construction benches and brake and winch sites for each transmission line structure
  - construction of footings and foundation work for the new transmission line structures including boring and/or excavation, steel fabrication works and concrete pours
  - erection of the new transmission line structures
  - stringing of conductors, overhead earth wires and OPGW
  - installation of associated transmission line structure fittings inclusive of all earthing below ground level
- relocation of a section of Line 51, including:
  - demolition of the existing section of Line 51

  - erection of new transmission line structures for the rebuild of Line 51 in a new location
  - stringing of conductors, overhead earth wires and OPGW
  - installation of associated transmission line structure fittings inclusive of all earthing below ground level
- construction of the proposed Gugaa 500 kV substation, including:
  - bulk earthworks to form the substation bench, access roads, drainage and oil containment structures
  - installation of concrete foundations, bund walls, fire walls, noise walls and kerbs including excavation
  - installation of reinforced concrete and piled foundations for the electrical equipment and associated steel support structures
  - installation of electrical conduits, electrical trenches, site stormwater drainage, oil containment work and associated concrete pits, pipes and tanks including excavation
  - installation of new ancillary and equipment control buildings
  - erection of galvanised steel structures to support electrical equipment
  - installation of electrical equipment on foundations and/or steel support structures
  - installation of conductors, cabling, wiring, electrical panels and electrical equipment
  - erection of the substation site boundary security fencing, including site access gates
  - connection of the proposed transmission lines to the substation
- modification of the existing Wagga 330 kV substation to enable the proposed connection and operation of the new transmission lines, including:
  - demolition and removal of redundant electrical equipment, fencing and cabling
  - bulk earthworks to form the extended substation bench and modified drainage structures
  - installation of concrete foundations and kerbs including excavation
  - installation of reinforced concrete and piled foundations for the electrical equipment and associated steel support structures
  - erection of galvanised steel structures to support electrical equipment
  - installation of electrical equipment on foundations and/or steel support structures
  - installation of electrical conduits, electrical trenches, and modified site stormwater drainage including excavation
  - installation of conductors, cabling, wiring, electrical panels and electrical equipment
  - installation of fencing, lighting and other security features
  - testing and commissioning
  - connection of the proposed transmission lines to the substation
- modification of the existing Bannaby 500 kV substation to enable the proposed connection and operation of the new transmission lines, including:
  - bulk earthworks to form the extended substation bench, new access road, modified stormwater drainage, modified oil containment and modified sediment control structures
  - installation of concrete foundations, retaining walls, bund walls, fire walls and kerbs including excavation
  - installation of reinforced concrete and piled foundations for the electrical equipment and associated steel support structures
  - erection of galvanised steel structures to support electrical equipment
  - installation of electrical equipment on foundations and/or steel support structures
  - installation of electrical conduits, electrical trenches, site stormwater drainage, oil containment works and associated concrete pits, pipes and tanks including excavation
  - installation of conductors, cabling, wiring, electrical panels and electrical equipment

  - installation of fencing, lighting and other security features
  - demolish redundant fencing including footings and kerbs
  - testing and commissioning
  - connection of the proposed transmission lines to the substation
- connection of the proposed transmission lines to the future Maragle 500 kV substation, including:
  - stringing conductors between transmission line structures and the future Maragle 500 kV substation gantry (including overhead earth wire (OHEW) and OPGW)
  - installing droppers from the future substation gantry to the switchgear
- construction of the telecommunications hut, including:
  - bulk earthworks to form the pad for the hut
  - excavation and preparation for concrete foundations
  - installation of reinforced concrete and piled foundations
  - excavation and installation of electrical equipment conduits, trenches and general site drainage work
  - installation of the building, site wiring and electrical equipment
  - installation of security fencing and site access gates
- installation of buried cabling from the 500 kV transmission line structures to Rye Park Wind Farm substation
- testing and commissioning of new electrical infrastructure
- demobilisation and rehabilitation of areas disturbed by construction activities.

A number of activities are expected to commence in accordance with the project conditions of approval before the key construction activities outlined above. These activities are considered pre-construction minor work and would comprise low impact activities that would begin after planning approval but prior to approval of the Construction Environmental Management Plan.

2.2.2 Construction program

Construction of the project is targeted to commence in 2024, and is estimated to take about 2.5 years to complete. The project is expected to be fully operational by the end of 2026 (refer to Figure 2-2).

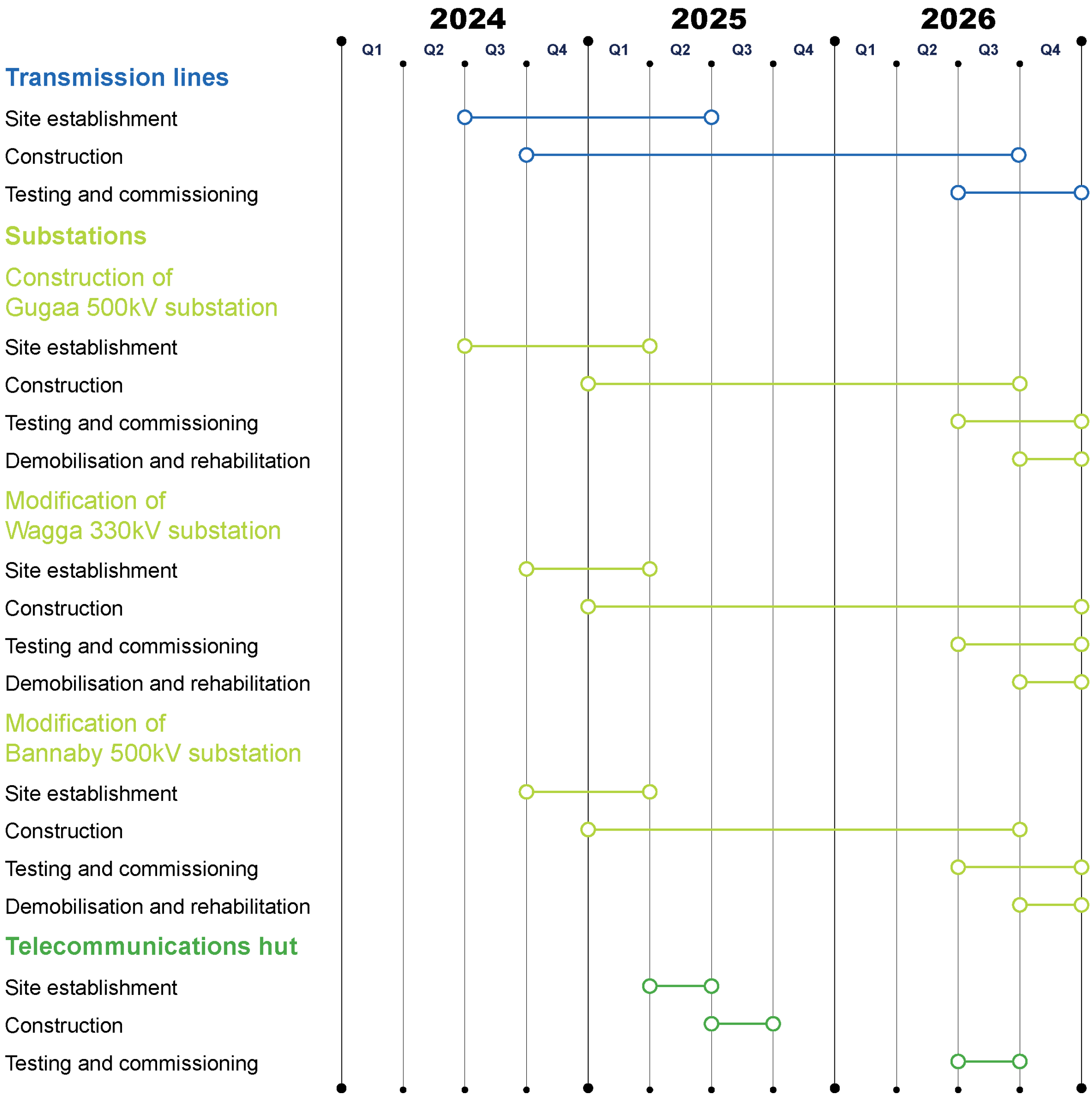

Figure 2-2 HumeLink indicative construction program

Indicative duration of construction activities

Construction at each transmission line structure would be intermittent and construction activities would not occur for the full duration at any one location. Durations of any particular construction activity, and inactive/respite periods, may vary for a number of reasons including (but not limited to):

- multiple work fronts
- resource and engineering constraints
- work sequencing and location.

Figure 2-3 presents an indicative duration of construction activities associated with an individual transmission line structure.

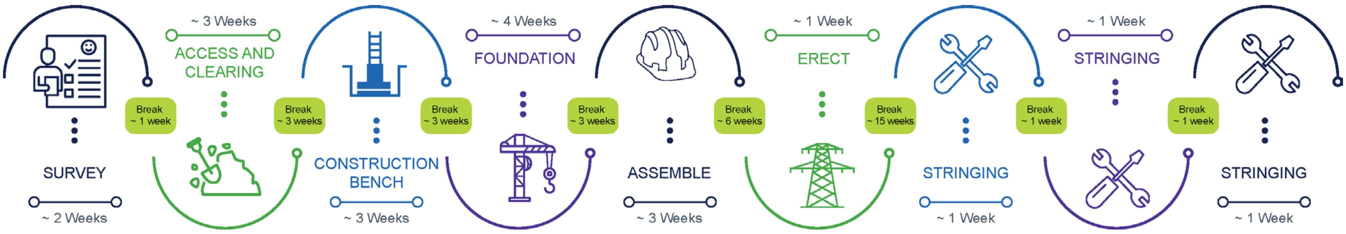

Figure 2-3 Indicative duration and sequence of construction activities for transmission line structures

Construction of the proposed Gugaa 500 kV substation could take up to 2.5 years.

2.2.3 Construction hours

It is expected that construction activities would largely be undertaken during standard construction hours. However, there would be times when working outside of standard construction hours would be required (as defined by the *Interim Construction Noise Guideline* (DECC, 2009)), subject to approval. As the details of construction methodology and project needs are developed, these hours will be refined for certain activities.

Where extended hours are proposed for activities in proximity to sensitive receivers, additional measures would be implemented and the work would be managed through an out-of-hours work protocol.

A series of work outside the standard construction hours is anticipated to include (but is not limited to) the following:

- transmission line construction at crossings of a main road or railway as these locations are expected to have restricted construction hours requiring some night work for activities such as conductor stringing over the crossing(s)
- work where a road occupancy licence (or similar) is required, depending on licence conditions
- transmission line cutover and commissioning
- the delivery of equipment or materials outside standard hours requested by police or other authorities for safety reasons (such as the delivery of transformer units)
- limited substation assembly work (eg oil filling of the transformers)
- connection of the new assets to existing assets under outage conditions (eg modification and/or connection work at Bannaby 500 kV substation, Wagga 330 kV substation and Maragle 500 kV substation), which is likely to require longer working hours
- emergency work to avoid the loss of lives and/or property and/or to prevent environmental harm
- work timed to correlate with system planning outages
- situations where agreement is reached with affected sensitive receivers
- activities that do not generate noise in excess of the applicable noise management level at any sensitive receiver.

2.2.4 Construction plant and equipment

An indicative list of construction plant and equipment likely to be required during construction is provided below.

- air compressor
- backhoe
- bobcat
- bulldozers
- concrete agitator
- concrete pump
- cranes (various sizes up to 400 tonnes)
- crawler crane with grab attachments
- drill and blast units and associated support plant/equipment
- drones
- dumper trucks
- elevated working platforms
- excavators (various sizes)
- flatbed hiab trucks
- fuel trucks
- generators
- graders
- helicopters and associated support plant/equipment
- mulchers
- piling rig
- pneumatic jackhammers
- rigid tippers
- rollers (10 to 15 and 12-15 tonnes)
- semi-trailers
- tilt tray trucks
- trenchers
- transport trucks
- watercarts
- winches.

2.2.5 Construction traffic

Construction vehicle movements would comprise vehicles transporting equipment, waste, materials and spoil, as well as workers' vehicles. A larger number of heavy vehicles would be required during the main civil construction work associated with the substations. Non-standard or oversized loads would also be required for the substation work (eg for transformer transport) and transportation of transmission line structure materials and conductors.

Hume Highway, Sturt Highway, Snowy Mountains Highway, Batlow Road and Gocup Road are the main national and state roads proposed to provide access to the project footprint. These roads would be supported by regional and local roads throughout the Local Government Areas (LGAs) of Wagga Wagga City, Snowy Valleys, Yass Valley, Cootamundra-Gundagai Regional and Upper Lachlan Shire that connect to the project footprint.

2.2.6 Construction workers

The construction worker numbers would vary depending on the stage of construction and associated activities. During peak construction activities, the project could employ up to 1,200 full time equivalent construction workers across multiple work fronts. It is expected that the maximum number of construction workers at any one location would not exceed 200.

2.3 Testing and commissioning

Prior to energisation of the infrastructure, a series of pre-commissioning activities would be conducted. This would include testing the new transmission lines and substation earthing, primary and secondary equipment.

2.3.1 Demobilisation and rehabilitation

Demobilisation and site rehabilitation would be undertaken progressively throughout the project footprint and would include the following typical activities:

- demobilisation of construction compounds and worker accommodation facility
- removal of materials, waste and redundant structures not required during operation of the project
- removal of temporary fencing and environmental controls.

2.4 Operation and maintenance of the project

The design life of the project is 50 years, which can be extended to more than 70 years for some assets.

The substations and transmission lines would be inspected by field staff and contractors on a regular basis, with other operational activities occurring in the event of an emergency (as required). The project would require about five workers (in addition to Transgrid's existing workers) during operation for ongoing maintenance activities. Likely maintenance activities would include:

- regular inspection (ground and aerial) and maintenance of electrical equipment
- general building, asset protection zone (APZ) and access road/track
- vegetation clearing/trimming within the easement
- fire detection system inspection and maintenance
- stormwater drainage systems maintenance.

It is expected that these activities would only require light vehicles and/or small to medium plant (depending on the work required).

3 Legislation and policy context

This chapter provides an outline of the key biodiversity legislative requirements and policy guidelines relating to the project.

3.1 Commonwealth government

3.1.1 Environment Protection and Biodiversity Conservation Act 1999

An approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is required for the project due to identified impacts on listed MNES. A Referral was submitted to the Commonwealth DCCEEW in accordance with the requirements of Part 8 of the EPBC Act. The Commonwealth declared the project a Controlled Action (EPBC 2021/9121) on 13 April 2022.

This BDAR has addressed the Commonwealth assessment requirements for the project in relation to the following controlling provisions:

- listed terrestrial and aquatic threatened species and communities
- listed migratory species.

3.2 NSW State government

3.2.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and Environmental Planning and Assessment Regulation 2021 (EP&A Regulation) generally set the framework for planning and environmental assessment in NSW and work with the BC Act for the consideration of impacts to biodiversity including threatened biodiversity.

The project has been declared as Critical State Significant Infrastructure (CSSI) (SSI-36656827) under Section 5.13 of the EP&A Act and Schedule 5 of the State Environmental Planning Policy (SEPP) (Planning Systems) 2021. Approval for the project would be sought under Part 5, Division 5.2 of the EP&A Act, which requires proponents to use the BAM and the NSW Biodiversity Offset Scheme (BOS) to prepare a BDAR under the BC Act.

3.2.2 Biodiversity Conservation Act 2016

The BC Act, together with the BC Regulation, outlines the framework for assessment and approval of biodiversity impacts associated with developments that require consent under the EP&A Act. It includes a BOS, a framework to avoid, minimise and offset impacts on biodiversity from development and clearing. The proponent for a development to which the BOS applies is required to prepare a BDAR in support of an application for approval to undertake that development. The BDAR uses the BAM to provide a methodology for determining the number and type of biodiversity credits required to offset unavoidable impacts to biodiversity.

3.2.3 Biosecurity Act 2015

The broad objectives for biosecurity in NSW under the *Biosecurity Act 2015* (Biosecurity Act) are to manage biosecurity risks from animal and plant pests and diseases, weeds and contaminants.

Under the Biosecurity Act, any person who deals with biosecurity matters (including landowners) and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter, has a biosecurity duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised.

Declared pests and weeds are listed in Schedule 3 of the Biosecurity Regulation 2017. Declared weeds recorded within the project footprint are addressed in Section 6.4. Likely pest animals are addressed in Section 7.5.

3.2.4 Fisheries Management Act 1994

The FM Act aims to conserve, develop and share the fishery resources of the State for the benefit of present and future generations to:

- conserve fish stocks and KFH
- conserve threatened species, populations and ecological communities of fish and marine vegetation
- promote ecologically sustainable development, including the conservation of biological diversity.

Protection is provided by integrating the conservation of threatened species, endangered populations and Endangered Ecological Communities (EECs) /Critically Endangered Ecological Communities (CEECs) into development control processes under the EP&A Act.

As described in Section 5.23 of the EP&A Act, any requirements for a permit under Sections 201, 205 or 219 of the FM Act do not apply to the project as it is classified as CSSI under Section 5.13 of the EP&A Act.

This BDAR assesses the potential impact of the project on threatened species, populations and ecological communities listed under the FM Act, in response to the project SEARs. An assessment of potential impacts to areas of KFH and Key Threatening Processes also forms part of this assessment.

3.2.5 Local Land Services Act 2013

The LLS Act was introduced to provide direction around programs and services associated with agricultural production, biosecurity, natural resource management and emergency management. It aims to ensure the proper management of natural resources in the social, economic and environmental interests of the State, consistent with the principles of ecologically sustainable development. One of the ways that it intends to achieve this is through the regulation of clearing of native vegetation.

Part 5A of the LLS Act sets out the ways in which the regulating of activities (in connection with land management) would occur and the areas of the State to which it would apply. Section 60A applies Part 5A to rural areas including lands associated with the project footprint.

Land categories are defined under the LLS Act and mapped on the Native Vegetation Regulatory Map (NVR map), which underpin the legislative framework for native vegetation clearing in rural areas. The NVR map is to be published by the Environment Agency Head. The current NVR Map is incomplete and transitional arrangements are in place, during which landowners are responsible for determining the categorisation of their land in accordance with section 60F of the LLS Act and the published NVR method statement called “Native vegetation regulatory map: method statement” (OEH 2017).

Category 1- exempt land is defined under the LLS Act (Part 5A Division 2 Section 60H) as land that meets the following criteria:

- Land is to be designated as Category 1-exempt land if the Environment Agency Head reasonably believes that:
  - the land was cleared of native vegetation as of 1 January 1990, or
  - the land was lawfully cleared of native vegetation between 1 January 1990 and the commencement of this Part.
- Land is to be designated as Category 1-exempt land if the Environment Agency Head reasonably believes that:
  - the land contains low conservation value grasslands, or
  - the land contains native vegetation that was identified as regrowth in a property vegetation plan referred to in Section 9 (2) (b) of the *Native Vegetation Act 2003*, or
  - the land is of a kind prescribed by the regulations as Category 1-exempt land.

Section 1.5 (1d) of the BAM (DPIE, 2020a) and Part 6, Division 2, Section 6.8(3) of the BC Act excludes any clearing of native vegetation and loss of habitat on Category 1- exempt land from requiring a biodiversity assessment, other than impacts prescribed by the regulations under Section 6.3 (prescribed impacts).

3.2.6 National Parks and Wildlife Act 1974

Applying the principles of ecologically sustainable development throughout the landscape and not just land reserved under the Act, the objects of the *National Parks and Wildlife Act 1974* (NPW Act) include:

- the conservation of nature including the conservation of:
  - habitat, ecosystems and ecosystem processes
  - biological diversity at the community, species and genetic levels
  - landforms of significance, including geological features and processes
  - landscapes and natural features of significance including wilderness and wild rivers
- the conservation of objects, places or features of cultural value (including biological diversity) within the landscape including:
  - places, objects and features of significance to Aboriginal people
  - places of social value to the people of New South Wales
  - places of historic, architectural or scientific significance
- provide for the management of land reserved under the NPW Act in accordance with the management principles applicable to each type of reservation (eg national parks and historic sites, state conservation areas, regional parks and nature reserves).

The project is situated near Tarlo River National Park, approximately 30 kilometres north-east of Goulburn. Tarlo River National Park was gazetted in 1982 with adjacent lands subsequently reserved bringing the total area to 8,074 hectares (NSW National Parks and Wildlife Service, 1998). The Park is known to support significant plant communities including *Allocasuarina nana* (Dwarf She-oak) heathland (NSW National Parks and Wildlife Service, 1998). Several threatened species including Powerful Owl (*Ninox strenua*), Squirrel Glider (*Petaurus norfolcensis*) and Koala (*Phascolarctos cinereus*) have also been historically recorded within the park (NSW National Parks and Wildlife Service, 1998).

The project footprint also abuts the eastern boundary of Minjary National Park, approximately 10 kilometres north-west of Tumut in the Inland Slopes Interim Biogeographic Regionalisation for Australia (IBRA) subregion. The Park was gazetted on 1 January 2001 given its significance in providing a vegetated link between larger tracts of forest to the south (in Kosciuszko National Park), the Tumut River Valley and nearby Ellerslie Nature Reserve and Tumblong Reserve to the north-west of Tumut (NSW National Parks and Wildlife Service, 2004).

The southern portion of the project footprint (near Maragle State Forest) is within two to eight kilometres and is well-connected with Kosciuszko National Park. Kosciuszko National Park is known to support several endemic flora and fauna species, including but not limited to: Southern Corroboree Frog (*Pseudophryne corroboree*), Mountain Pygmy-possum (*Burramys parvus*), and Broad-toothed Rat (*Mastacomys fuscus)*.

This BDAR addresses direct, indirect and prescribed impacts to biodiversity associated with these national parks including any likely adverse interactions with prescribed management outcomes as outlined within NPWS management plans.

3.2.7 Forestry Act 2012

Forestry is regulated by several different laws in NSW, however, forestry operations on Crown land are predominately regulated under the *Forestry Act 2012* (Forestry Act) and associated Forestry Regulation 2012. The Forestry Act provides for the dedication, management and use of State forests and other Crown-timber land for forestry and other purposes. It also outlines the objectives and functions of the Forestry Corporation of New South Wales.

State mapping of Forestry Management Zones (FMZs) supports the facilitation of the Forestry Act and identifies the accepted use and management intent for forestry lands within NSW.

State forests are primarily reserved for timber production. However, forestry lands may also be managed for biodiversity conservation such as through the dedication of flora reserves or the declaration of special management zones where forestry operations such as general-purpose logging are prohibited.

The project footprint intersects with the following State forests occurring within the project footprint:

- Green Hills State Forest, approximately 16 kilometres south-west of Tumut
- Bago State Forest, approximately 20 kilometres south of Tumut
- Red Hill State Forest, approximately 18 kilometres north-east of Tumut.

Forestry Management Zones (FMZs) that would be impacted within these forests include:

- Zone 2 Special Management Zone
- Zone 3A Harvesting Exclusions Zone
- Zone 3B Special Prescription Zone
- Zone 4 General Management Zone
- Zone 6 Softwood Plantations Zone
- Zone 7 Non-Forestry Use Zone.

Direct and indirect impacts to native vegetation and threatened species associated with State forests are documented within this BDAR (refer to Section 12.3 and 12.4). Prescribed impacts, including non-native vegetation providing habitat for threatened species, are also addressed (refer to Section 12.5).

3.2.8 State Environmental Planning Policy (Koala Habitat Protection) 2020 and State Environmental Planning Policy (Koala Habitat Protection) 2021

SEPP (Koala Habitat Protection) 2021 (Koala SEPP 2021) commenced in March 2021. It applies across all zones in metropolitan Sydney LGAs and the Central Coast LGA and to zones other than RU1 Primary Production, RU2 Rural Landscape and RU3 Forestry for the remaining 74 LGAs, including the LGAs encompassed by this project (Wagga Wagga City, Snowy Valleys, Cootamundra-Gundagai Regional, Upper Lachlan Shire and Yass Valley). As with Koala SEPP 2020, Koala SEPP 2021 applies to projects that require development consent under Part 4 of the EP&A Act on land with an area of more than one hectare or adjoining land in the same ownership of more than one hectare.

Additionally, both Koala SEPP 2020 and Koala SEPP 2021 provide for the preparation of Koala Plans of Management (KPoM) for the part of or a whole LGA and for individual development sites. There are currently nine approved KPoMs across NSW, however, none apply to the LGAs encompassed by this project.

Approval for the project would be sought under Part 5, Division 5.2 of the EP&A Act. It is noted that both Koala SEPP 2020 and Koala SEPP 2021 apply to activities under Part 4 of the EP&A Act that require Development Consent. Consequently, the provisions of Koala SEPP 2020 and Koala SEPP 2021 do not apply to the project as it is CSSI under Section 5.13 of the EP&A Act.

3.2.9 State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017 and State Environmental Planning Policy (Vegetation in Non-Rural Areas) Further Amendment 2021

SEPP (Vegetation in Non-rural Areas) 2017 (Vegetation SEPP 2017) and SEPP (Vegetation in Non-rural Areas) Further Amendment 2021 (Vegetation SEPP 2021) set the rules for clearing of native vegetation on land zoned for urban and environmental purposes that is not associated with a development application.

Approval for the project would be sought under Part 5, Division 5.2 of the EP&A Act which requires proponents to use the BAM and the NSW BOS to prepare a BDAR under the BC Act. It is noted that both Vegetation SEPP 2017 and Vegetation SEPP 2021 apply to activities under Part 4 of the EP&A Act that do not require development consent. Consequently, the provisions of Vegetation SEPP 2017 and Vegetation SEPP 2021 do not apply to the project.

3.2.10 Water Management Act 2000

The object of the Water Management Act 2000 (WM Act) is the sustainable and integrated management of the state's water for the benefit of both present and future generations.

Under the WM Act, an approval is required to undertake controlled activities on waterfront land, unless that activity is otherwise exempt. Applicants that are not exempt must obtain a controlled activity approval from Natural Resources Access Regulator (NRAR)/DPE Water before commencing the controlled activity.

Waterfront land is the bed of any river, lake or estuary and any land within 40 metres of the highest bank of the river, the lake shore or the mean high-water mark of the estuary. Under the WM Act, controlled activities include:

- erecting a building
- carrying out work
- removing material from waterfront land, such as plants or rocks
- depositing material on waterfront land, such as gravel or fill
- any activity which affects the quantity or flow of water in a water source.

According to the WM Act, the carrying out of controlled activities must avoid or minimise land degradation, including soil erosion, compaction, decline of native vegetation and where possible land must be rehabilitated.

As the project has been determined as having CSSI status, the activities are exempt from requiring a controlled activity approval, under Chapter 5.23(1) of the EP&A Act. While exempt from controlled activity approvals, according to the project SEARs, where the project involves work within waterfront land the assessment is required to identify the likely impacts to the waterfront land and describe how the activities are to be designed and implemented in accordance with the *Guidelines for controlled activities on waterfront land - Riparian corridors* (DPE 2022).

The WM Act is supported by a series of guidelines, including the *Guidelines for controlled activities on waterfront land - Riparian corridors* (DPE 2022). This guideline defines the widths of vegetated riparian zones (VRZs), based upon stream order according to the Strahler System of ordering watercourses, measured from the top of the highest bank on both sides of the watercourse. The guideline also includes design principles and overarching management measures for work on waterfront land. Other supporting guidelines considered in the development of this assessment include:

- *Guidelines for instream works on waterfront land* (NSW Office of Water 2012a)
- *Guidelines for watercourse crossings on waterfront land* (NSW Office of Water 2012b).

4 Assessment methods

This chapter details the methodology implemented to assess biodiversity values within the project footprint and surrounding locality. The assessment was undertaken in accordance with BAM (DPIE, 2020a) and associated methodologies as detailed in Section 4.1. Key methodologies used for the assessment are detailed in the following sections and included:

- a desktop review of available data and existing reports relevant to existing vegetation (Section 4.4.1), threatened flora (Section 4.5.1) and threatened fauna (Section 4.6.1) within the locality (ie the project footprint and surrounds)
- field surveys carried out within accessible lands to:
  - verify vegetation communities present and develop a map of vegetation zones as detailed in Section 4.4.2
  - assess habitat suitability for threatened fauna including the presence/ absence of known habitat constraints (Section 4.6.2)
  - carry out BAM plots within vegetation zones to calculate vegetation integrity (Section 4.4.3 and 4.4.4)
  - assess and survey bushfire affected lands (Section 4.3)
  - undertake targeted surveys for candidate threatened flora (Section 4.5)
  - undertake targeted surveys for candidate threatened fauna (Section 4.6)
  - assess aquatic habitat condition and suitability for threatened fish (Section 4.8)
- supplementary assessments undertaken to address information and data gaps (required primarily due to land access constraints) (Section 4.10).

Figure 4-1 and Figure 4-2 (Attachment 1) show the extent of field surveys relative to the project footprint and associated IBRA subregions for flora and fauna respectively. Field survey dates and observed weather conditions are documented in Section 4.7. Section 4.9 outlines important field survey limitations which are addressed in detail in Section 4.10.

4.1 Site context methods

Methods adopted as a part of this assessment to establish the site context are detailed further below. This includes the approach to estimating native vegetation cover and assigning patch size classes to vegetation zones. In accordance with the BAM, site context for a linear project is generally assessed within a 500 metre buffer to the project centreline.

4.1.1 Native vegetation cover

Under the BAM (DPIE, 2020a), native vegetation cover estimates are based on the cover of native woody and non-woody vegetation (including regrowth, derived native grasslands and plantations) that are comprised of plants native to NSW. Native vegetation cover is estimated for all lands within 1,500 metres of a non-linear project and applied as a filter within the BAM-C for informing habitat suitability for candidate fauna species (Section 5.2.1(2)(d)).

Although not generally applied to linear projects, it is reasoned that so long as native vegetation cover can be accurately estimated then it can be applied to assess habitat suitability for candidate fauna species under the BAM. This is based on the understanding that a species would inhabit vegetation patches based on the intactness of the landscape, independent of the type of project proposed (ie linear versus non-linear).

As native vegetation cover cannot be applied as a filter for linear projects within the BAM-C, it was instead incorporated into the ESRI ArcGIS habitat mapping process[2] that was adopted to delineate suitable habitats for candidate threatened fauna species, as detailed in Section 7.1 and Attachment 12. Consultation with the BCD regarding the proposed approach was undertaken and is documented in Section 1.8 and Attachment 2.

A number of different methods were trialled to find the best approach to mapping native vegetation cover across the project footprint so as to ensure:

- sufficient sensitivity to capture localised changes in vegetation cover likely to influence habitat suitability
- sufficient accuracy through correlation with aerial imagery and field-based data.

This included a review of different publicly available spatial datasets to assess their accuracy and suitability in informing the location of woody and non-woody vegetation beyond the project footprint. It also involved a comparison of native vegetation cover estimates obtained for a 1,500 metre buffer area as opposed to the standard 500 metre buffer typically applied to linear projects.

An ultimate approach was adopted in ESRI ArcGIS using the following data inputs:

- Niche Vegetation zone mapping, developed through field and desktop vegetation assessments
- NSW Native Vegetation Extent 5 metre Raster v1.2 (DPE, 2019).

Native vegetation cover estimates were limited to woody vegetation only, given the limited availability of reliable data to inform native non-woody vegetation extent beyond the project footprint and a general lack of grassland/ grassy woodland candidate species with higher vegetation cover thresholds.

The process for estimating native vegetation cover was as follows:

1. extract Woody vegetation from “NSW_Native_Vegetation_Extent_v1p2_5m_2017.tif” where type is Tree Cover (pixel value is 1) within the project footprint
2. convert raster to simplified polygons
3. extract woody vegetation from Niche vegetation zone map and clip to the project footprint
4. clip simplified polygon from Step 1 to a 1,500 metre buffer around the project footprint
5. delete polygons where they are situated within the project footprint and merge remaining data with the Niche woody veg extract from Step 3
6. dissolve and explode into separate contiguous polygons
7. buffer each of the polygons by 1,500 metres (this is pretending that each vegetation polygon is a stand-alone impact area, that is treated like a BAM 2020 non-linear impact). This creates many overlapping buffers, since some of the Tree Cover polygons are small
8. calculate buffer size
9. calculate native vegetation within each buffer:
   - intersect the initial native vegetation layer (step 5) with the 1,500 metre buffers
   - dissolve by buffer ID and retain buffer size (first)

[2] Vegetation polygons that did not meet the vegetation cover threshold for a species were considered degraded (in accordance with Section 5.2.3 Step 3 of the BAM and Section 4.4.3 of the BAM 2020 Ops Manual) and were removed from the species polygons.

- calculate native vegetation areas within each buffer
- join native vegetation layer (step 5) back to buffer to populate native veg size and buffer size
- calculate per cent Native Vegetation using formula: *(native vegetation (ha) / Buffer area (ha)) *100*

10. create new field and allocate native vegetation cover categories:
    - 0–10 per cent, relictual (with 10 per cent or less habitat retained)
    - >10–30 per cent, fragmented (between 11 and 30 per cent habitat retained)
    - >30–70 per cent, variegated (between 31 and 70 per cent habitat retained)
    - >70 per cent, intact (> 70 per cent natural habitat retained)
11. separate polygon layers are then generated for native woody vegetation cover as follows for use in the ESRI ArcGIS habitat mapping process:
    - all >70 per cent cover
    - all >30 per cent cover
    - all >10 per cent cover
    - all Tree Cover.

Native woody vegetation cover estimates and assigned cover classes are summarised in Table 5-8 for each IBRA subregion.

4.1.2 Patch size

Under the BAM (DPIE, 2020a), a patch is an area of native vegetation that occurs on the subject land and includes native vegetation that has a gap of less than 100 metres from the next area of native vegetation (or less than 30 metres for non-woody vegetation). A patch may extend onto adjoining land.

Patch size was assessed for each vegetation zone, which may be assigned to one or more patch size classes as follows: <5 hectares; 5 to <25 hectares; 25 to <100 hectares; >100 hectares. The patch size analysis was limited to the consideration of woody vegetation only given the limited availability of reliable data to inform native non-woody vegetation extent beyond the project footprint and a general lack of grassland/ grassy woodland candidate fauna species with higher patch size thresholds. As such, a patch size of >100 hectares was conservatively prescribed as for all non-woody PCTs within the BAM-C.

Patch size was calculated for woody PCTs within the project footprint by means of the following steps:

- Extract Woody vegetation from “NSW_Native_Vegetation_Extent_v1p2_5m_2017.tif” where type is Tree Cover (pixel value is 1) and convert to simplified polygon.
- Clip to an arbitrary 10 kilometres radius of the project footprint to reduce the number of polygons.
- Replace woody polygons within the project footprint with the Niche woody vegetation polygons.
- Buffer the polygons by 50 metres (ie 100 metres from patch to patch).
- Dissolve and explode the buffers into contiguous polygons.
- Calculate patch size and allocate to one of the following categories:
    - <5 hectares
    - 5–<25 hectares
    - 25–<100 hectares
    - ≥100 hectares.

When undertaking the patch size analysis, it was noted that some riparian vegetation extended a significant distance from the project footprint before reaching the greater than 100 hectare category. To ensure the patch size assigned to this vegetation was correct, a visual check of each patch was undertaken to identify any potential for the patch to extend beyond the arbitrary 10 kilometre radius forming the limit of the analysis.

4.2 Determination of Category 1 - exempt land

4.2.1 Method for determining Category 1 – exempt land (overview)

The process for establishing Category 1 - exempt land for the project footprint followed section 60F of the LLS Act and the published NVR method statement called *Native vegetation regulatory map: method statement* (DPE 2022). This approach was recommended by the BCD with final mapping products provided to the BCD for review and feedback on 30 March 2022.

The following mapping layers and datasets were utilised to support the spatial mapping process:

- *NSW Land use Mapping (DPE 2017)*
- *NSW Woody Vegetation Extent Mapping (DPE 2017)*
- *NSW Historical Imagery (DCS 2022)*
- *NSW Native Vegetation Regulations Map: Transitional – Excluded, and Sensitive Regulated Land (DPE 2021) Transitional - Excluded Land (DPE 2021).*

The Category 1 lands process described below considers all land within the project footprint and excludes lands from Category 1 classification (therefore retaining all other land for full consideration within the BDAR for the purposes of ecosystem and species credit offset obligations) based on a two-step process described in Sections 4.2.2 and 4.2.3 respectively.

4.2.2 Step 1 of Category 1 - exempt land method: GIS process to follow the NVR method statement

Based on a review of the aforementioned datasets, the following areas were excluded from consideration as Category 1- exempt land (ie deemed not meet the Category 1- exempt land definition):

- vegetation mapped as Excluded Land, ie where pixel value is 1 in the NVR map "naluma_nsw_2017_abel0".
- vegetation mapped as Category 2 vulnerable and/or sensitive land, ie where pixel value is 3, 4 or 6 in the NVR map "naluma_nsw_2017_abkl0".
- woody vegetation, ie where pixel value is 1 in the "NSW_Native_Vegetation_Extent_v1p2_5m_2017.tif"
- land use polygons where the secondary ALUM class is one of the following (as per Figure 7 of the NVR method statement [DPE, 2022]):
  - 1.1 Nature conservation (Excluded)
  - 1.2 Managed resource protection (Category 2 regulated)
  - 1.3 Other minimal use (Category 2 regulated)
  - 2.1 Grazing native vegetation (Category 2 regulated)
  - 2.2 Production forestry (Excluded)
  - 5.7 Transport and Communication (Category 2 regulated).
- land use polygons where the tertiary ALUM class is one of the following (as per Figure 7 of the NVR method statement [DPE, 2022]):
  - 5.4.3 Rural residential without agriculture (Category 2 regulated)
  - 6.1.1 Lake – conservation (Category 2 regulated)
  - 6.1.4 Lake – saline (Category 2 regulated)
  - 6.3.1 River – conservation (Category 2 regulated)
  - 6.5.1 Marsh/wetland – conservation (Category 2 regulated)

- 6.5.4 Marsh/wetland – saline (Category 2 regulated)
- 6.6.1 Estuary/coastal waters – conservation (Category 2 regulated).

4.2.3 Step 2 of Category 1 - exempt land method: manual correction and filtering of remaining lands

Following implementation of Step 1, some manual correction and filtering of remaining lands was then undertaken where necessary to exclude any additional areas that might not meet Category 1 -exempt land definitions; the following process was undertaken:

- review of the draft NVR Category 1 – exempt lands mapping (DPE 2021), released under a provisional data licence to support the HumeLink EIS. The dataset was compared with the results of the Niche process identified above to ensure general consistency. . Where any inconsistencies were found, a precautionary approach was adopted whereby lands were excluded from Category 1 - exempt land classification.
- ensure consistency with the Niche vegetation zone boundaries and to exclude any of the following where identified:
  - native woody vegetation, including scattered paddock trees
  - derived grasslands that are critically endangered ecological communities.

An overview of Category 1 - exempt land mapping as determined for the project footprint is presented in Figure 4-3 (Attachment 1). Attachment 3 details the vegetation zones mapped within Category 1 - exempt land and their associated vegetation condition. The proportion of area mapped as Category 1 – exempt land within the project footprint.

4.3 Bushfire impacts and identification of severely burnt vegetation

The NSW government developed the 'Guideline for applying the Biodiversity Assessment Method at severely burnt sites' (DPIE, 2020e) following the 2019-2020 bushfires. The aim of the guideline is to provide assessors with a reasonable, evidence-based and transparent process for identifying severely burnt native vegetation. The guideline provides a range of approaches for applying the BAM where severe or catastrophic bushfire (ie bushfire of high to extreme severity) has resulted in significant modification of vegetation structure and composition such that the original vegetation type and condition is no longer identifiable.

This section outlines the methodology applied to assess bushfire severity, map vegetation zones and assess vegetation integrity within the project footprint in accordance with the DPIE (2020e) guideline.

Fire Extent Severity Mapping (FESM) developed by the DPIE (2020f) was used to inform the extent of bushfire affected lands within the project footprint and to make decisions about whether the standard BAM (DPIE, 2020a) could be applied for vegetation assessment. Consultation with NSW Forestry Corporation was also undertaken to obtain any additional on-ground knowledge where relevant to the evaluation of severely burnt lands. Feedback received from the NSW Forestry Corporation indicated that the FESM mapping was fairly consistent with conditions observed on the ground (refer to Chapter 9 for detailed consideration of bushfire impacts and assessment considerations).

To assess bushfire severity across the extent of burnt lands, 39 sites within the project footprint were surveyed by ELA between October 2020 and February 2021. Another 58 sites were subsequently surveyed by Niche from March 2022 to September 2022. A summary of the Niche burnt area assessments is provided in Attachment 4. The location of these assessments is shown in Figure 9-1 (Attachment 1).

Native vegetation was evaluated at each site to confirm if it was severely burnt in accordance with the criteria outlined in Table 1 of the DPIE (2020e) guideline (refer to Table 4-1). According to the DPIE (2020e) guideline, the assessor must 'use their judgement to determine if the combination of the features described constitutes severely burnt'. The vegetation formation, condition and land use prior to the bushfire were considered as a part of the assessment and informed where relevant by observed conditions in adjacent unburnt areas of vegetation zones.

Chapter 9 addresses severely burnt lands within the project footprint and important considerations for the assessment. Data supporting the identification and mapping of severely burnt lands is provided in Attachment 4.

Table 4-1: Decision support criteria to assess if native vegetation is severely burnt (DPIE, 2020e)

Feature	Descriptive characteristics for severely burnt vegetation
Species richness	The range of species present before the fire are burnt and / or cannot be identified. Dominant species cannot be easily identified until regeneration occurs.
Growth form: trees	Canopy trees are killed and/or canopy is consumed or largely consumed with most leaf material charred/ scorched. Epicormic growth, if present, is not well developed (<1 m long).
Growth form: shrubs, forbs, ferns and other	All understorey plants are consumed or largely consumed (some charred). Regrowth, if present, is immature (very few species have attained full height).
Growth form, grasses and grass-like	Ground cover is consumed, or largely consumed. Evidence of ground scorch is present. Regrowth, if present, consists predominantly of new resprouting growth (native vegetation).
Logs	Logs (if expected to have been previously on site) are absent or largely consumed.
Litter cover	Pre-fire surface litter (if expected) is consumed. Soil organic layer is consumed or largely consumed. New leaf may be occurring where the canopy was burnt but not scorched.
Ash	White ash deposition and charred organic matter is present to several cm depth.

4.4 Native vegetation mapping and classification

4.4.1 Review of existing information

A number of existing spatial datasets were used to inform the initial extent and classification of vegetation communities within the project footprint (refer to Table 4-2). The coverage and reliability of these datasets varied across the extent of the project footprint with western and southern parts of the project footprint more extensively mapped using the NSW Plant Community Type classification method. Coverage of the eastern portions of the project footprint was generally poor with existing datasets limited to the South-east Local Land Services Biometric Vegetation Map (DPE, 2015c) VISID4211.

A number of existing spatial datasets were also referenced to support the delineation and field validation of threatened ecological communities (TECs) within the project footprint, as detailed in Table 4-2. The layers mentioned below were intersected with the working Niche vegetation mapping layer to assist in addressing the criteria outlined in the Final Determination (BC Act) and the Species Profile and Threats Database (SPRAT) (EPBC Act) for each TEC.

Table 4-2: Information sources used to inform the delineation of vegetation and threatened ecological communities

Information source
• BioNet Vegetation Classification Database (DPE, 2022)

Information source
• Preliminary vegetation mapping (Eco Logical Australia, 2021) • Riverina Bioregion Extant Vegetation Map (DPIE, 2019) VISID 4175 • South-East Local Land Services Biometric Vegetation Map (DPE, 2015c) VISID4211 • Peat-forming bogs and fens of the Snowy Mountains (DPIE, 2021) • Grasslands, Pre-Settlement, South-eastern Highlands (DPIE, 2019) VISID 4099 • Mitchell Landscapes (DECC, 2002) • Rainfall (Bureau of Meteorology (BoM) 2022) • NSW Elevation and Depth Theme (Spatial Services, 2021a) • NSW Seamless Geology dataset (Phillips *et al.,* 2015) • NSW Hydrography (Spatial Services, 2021b) • Aerial imagery (Esri, 2022).

4.4.2 Native vegetation verification and stratification

The verification and stratification of vegetation communities across the project footprint incorporated the following key tasks:

- preparation of a preliminary vegetation map using existing regional vegetation mapping
- field validation of vegetation
- data review and analysis and post-field refinement of vegetation mapping to align to best fit PCTs and condition states.

The preliminary vegetation map was provided to the field teams in a spatially georeferenced format in Enterprise Field Maps. A list of PCTs mapped for the region along with their associated descriptions was compiled and provided to the field teams for reference.

Field validation of vegetation was carried out by Eco Logical Australia and Niche for all accessible lands within the project footprint and to assign vegetation condition within the project footprint in accordance with the criteria outlined in Table 4-3.

Table 4-3: Vegetation zone condition class criteria

Condition class	Description
Very Low	Cleared paddocks with sparse or complete lack of canopy or mid layer vegetation. Ground cover generally <30% native. Includes cropping and highly improved pasture or weed infested areas likely to be considered Category 1 – exempt land and/or below the threshold required for offsetting (VI score 15 or below).
Low	Cleared paddocks with limited canopy or mid layers (ie thinned or under scrubbed). Ground cover generally 30-50% native. Includes grazing land that has long history of heavy grazing and some pasture improvement.
	Natural temperate grassland with 30-50% native groundcover but limited diversity and structure. Active grazing and pasture improvement occurring.
	Regenerating bushland with some structural elements present. Recently or repeatedly cleared and/or with ongoing disturbance or other soil profile damage preventing good recovery.
Moderate	Paddocks with canopy and midstorey layers present either as remnant or advanced regeneration. Generally thinned but with some older habitat attributes present and ground cover generally 30-50% native. Can include areas with limited canopy or mid layers and where groundcover is >50% native.
	Regenerating bushland with most structural elements present. Disturbance is typically recurrent which has impacted diversity of species/ structure and habitat availability.
High	Paddocks with canopy and midstorey layers either well developed or remnant. Moderately treed with some older habitat features. Ground cover generally >50% native. Includes grazing land with limited pasture improvement and moderate clearing/grazing history.
	Natural temperate grassland with >50% ground cover and good diversity but limited structure/habitat. Active grazing occurring but not exceptionally heavy or well managed.
	Regenerating bushland with most structural elements present and limited disturbance. Limited development of habitat elements and old growth characteristics. Disturbance history is typically once off or limited in severity which has not limited diversity of species/ structure.
Very High	Paddocks with canopy and midstorey layers remnant. Moderate to well treed with older habitat attributes present including fallen logs. Good native diversity and native cover >50%. Includes land subject to low levels of historic clearing/ grazing.
	Remnant bushland with all structural elements present and generally good habitat availability with limited disturbance history. Good native diversity and cover with old growth characteristics present.

4.4.3 Vegetation integrity plot survey methods

The BAM (DPIE, 2020a) prescribes a standardised approach for assessing the vegetation integrity of vegetation zones within subject lands. The BAM (DPIE, 2020a) specifies the data collection and effort requirements using standardised plots and transects. Data relating to three key attributes (composition, structure and function of native vegetation) is collected within a 20 by 50 metre plot, a 20 by 20 metre nested quadrat and five one by one metre sub-plots arranged along the 50 metre plot centreline (Table 4-4).

A summary of the vegetation integrity plot survey effort achieved for the project is documented in Section 4.4.4.

Table 4-4: Attributes recorded in the BAM plot and transect

Plot/ transect	Data collected
20 by 20 m quadrat	Flora species common and scientific name, stratum, growth form, cover, abundance and native/exotic/high threat weed status
20 by 50 m plot	The number of large trees, tree stem size class, tree regeneration, total length of fallen logs and number of trees with hollows
1 by 1 m plot	Per cent litter cover

4.4.4 Vegetation integrity plot survey effort

A total of 310 vegetation integrity plots were sampled in accordance with the BAM (DPIE, 2020a) methodology as described in Section 4.4.3. The minimum number of vegetation integrity plots required per vegetation zone for each IBRA subregion intersecting the project footprint is presented in Table 4-5 to Table 4-10. It is noted that for linear developments, where there may be a short fall in plot data, data from other IBRA subregions within the same IBRA bioregion (DPIE, 2020b) may be used as surrogate data. However, this process was avoided unless required. Floristic structure and habitat function data for each plot are provided within Attachment 5 and 6.

Plot surveys were undertaken throughout the concept design phase and formed a key data input for project footprint and indicative disturbance area refinement, and the development of design avoidance measures. While this has ultimately facilitated a reduced project impact scenario, design changes to avoid high condition vegetation has, in some instances, led to BAM plots being situated outside of the indicative disturbance area or project footprint. BAM plot data gathered within the indicative disturbance area was used where available to inform the vegetation integrity score of vegetation zones within each IBRA subregion. Where this was not possible, BAM plot data gathered within the project footprint and surrounds (ie within 500 metres) was used from the same vegetation zones mapped within the indicative disturbance area. Following this and where a plot shortfall remained for vegetation zones, the following hierarchical process was applied to obtain the requisite plot data:

1. Surrogate plot data gathered from the same vegetation zone but situated within an adjacent IBRA subregion (where present within the same IBRA region). It is considered that this process is allowed for under the BAM (see section 2.2.1 of DPIE, 2022b). Accordingly, a single asterisk "*" in the tables below indicates where these plots have been used.
2. Surrogate plot in the same condition state, in the same Vegetation Class as the deficient Vegetation Zone (despite potentially being a different PCT). This decision was based on the benchmarks in the BAM-C being the same for all PCTs within a Vegetation Class in the same IBRA Bioregion. Accordingly, a double asterisk "**" in the tables below indicates where these plots have been used.

3. Where no plot data was available from the above process benchmark data was used (i.e. best possible condition). Vegetation zones are highlighted pink in the relevant tables below where benchmark data was adopted (a single zone, being PCT 314 in very high condition).

Where multiple duplicate or surrogate plots were available from one vegetation zone, all were used to enable calculation of 'best estimate' vegetation integrity for the given zone. Vegetation zones for which the above steps were applied are indicated in bold in Table 4-5 below using the symbology as indicated. Attachment 7 provides a detailed overview of BAM plot data used to assess vegetation integrity for each of these vegetation zones, including surrogate plot codes.

Table 4-5: Vegetation integrity plot requirements for the Bungonia IBRA subregion

PCT	Condition	Disturbance area (ha)	Minimum plots required	Plots completed
283	**Very low**	**0.14**	**1**	**5****
283	Moderate	0.26	1	2
870	Very high	1.69	1	3
1093	Low	0.3	1	3
1093	**Moderate**	**0.58**	**1**	**2***
1093	**High**	**0.38**	**1**	**5***
1093	Very high	1.96	1	3
1097	Very low	0.34	1	2
1097	**Moderate**	**0.01**	**1**	**4****
1107	High	0.31	1	2
1150	**Very low**	**0.28**	**1**	**1****
1150	**Low**	**0.23**	**1**	**3****
1150	Moderate	0.67	1	1
1150	**High**	**11.01**	**3**	**1, 2***
1330	**Very low**	**0.02**	**1**	**3****
1330	Low	14.7	3	5
1330	Very high	1.29	1	6

Table 4-6: Vegetation integrity plot requirements for the Crookwell IBRA subregion

PCT	Condition	Disturbance area (ha)	Minimum plots required	Plots completed
280	**Low**	**0.22**	**1**	**2***
280	Moderate	1.54	1	2
283	**Very low**	**1.85**	**1**	**1****
283	Low	0.01	1	3
283	**Moderate**	**0.45**	**1**	**2***
283	High	0.85	1	1
335	High	0.61	1	2
679	Low	0.38	1	1
679	Moderate	0.11	1	1
679	High	0.06	1	1
727	Very low	1.25	1	2
727	Moderate	0.98	1	2
727	Very high	1.09	1	3
731	Low	2.4	2	5
731	Moderate	3.58	2	5
731	High	0.65	1	1
952	**Very low**	**2.28**	**2**	**1***
952	Low	0.39	1	3
952	Moderate	0.41	1	2
1093	**Very low**	**2.3**	**2**	**1***
1093	Low	2.15	2	5
1093	Moderate	0.55	1	2
1093	High	7.07	3	5
1151	Very low	0.1	1	1
1151	Low	0.46	1	3
1151	Moderate	0.9	1	1
1151	High	4.47	2	3
1151	Very high	4.88	2	2
1191	Low	1.15	1	2
1256	Low	0.19	1	1
1330	Very low	17.79	3	6
1330	Low	10.03	3	8
1330	High	5.68	3	7

Table 4-7: Vegetation integrity plot requirements for the Murrumbateman IBRA subregion

PCT	Condition	Disturbance area (ha)	Minimum plots required	Plots completed
266	**Low**	**2.75**	**2**	**2***
266	Moderate	0.26	1	1
278	Very low	0.05	1	1
280	**Very low**	**0.34**	**1**	**1***
280	Low	9.7	2	2
280	Moderate	1.68	1	3
280	High	1.9	1	5
283	Moderate	0.12	1	2
283	High	0.23	1	1
283	Very high	1.23	1	2
287	Very low	0.14	1	1
287	Low	0.67	1	3
287	High	0.43	1	2
322	Very low	0.01	1	1
322	High	0.51	1	1
349	Low	0.84	1	2
349	Moderate	1.7	2	7
349	High	0.41	1	3
351	Very low	0.33	1	1
351	Low	0.45	1	2
351	Moderate	2.72	2	2
352	Very low	1.66	1	1
352	Low	0.38	1	1
352	Moderate	1.43	1	2
731	High	0.47	1	2
1093	**Very low**	**0.05**	**1**	**1***
1093	Low	0.8	1	4
1093	Moderate	2.93	2	3
1093	High	5.95	3	5
1093	Very high	3.14	2	6
1330	**Very low**	**33.28**	**4**	**3, 3***
1330	Low	12.31	3	5
1330	Moderate	5.65	3	7
1330	High	1.45	1	3
1330	Very high	2.14	2	2

Table 4-8: Vegetation integrity plot requirements for the Inland Slopes IBRA subregion

PCT	Condition	Disturbance area (ha)	Minimum plots required	Plots completed
5	Low	0.77	1	1
5	High	1.82	1	2
266	Low	22.93	4	2, **2***
266	Moderate	2.16	2	1
266	High	7.64	3	8
268	Low	10.65	3	10
268	Moderate	0.15	1	3
268	High	6.08	3	7
277	Very low	53.34	5	5
277	Low	10.33	3	8
277	Moderate	2.29	2	5
277	High	4.1	2	7
278	Very low	6.99	3	5
278	Moderate	4.4	2	1*
278	High	2.2	2	3
280	Very low	19.4	2	1*
280	Low	0.04	1	2*
280	Moderate	8.94	3	4
280	High	14.56	3	7
287	Very low	0.27	1	2*
287	Low	0.06	1	1
287	Moderate	0.83	1	1
290	Very low	2.1	2	2
290	Low	2.06	1	3
290	High	1.31	1	1
294	Moderate	0.04	1	4
297	Low	0.48	1	6
297	Moderate	0.6	1	6
299	Very low	1.09	1	1*
299	Low	0.33	1	2*
301	Low	0.63	1	4
301	Moderate	0.42	1	2
301	High	0.37	1	4
306	Very low	3.21	2	2**
306	Low	2.84	2	5**
306	High	0.64	1	2**
314	Very low	4.53	2	2
314	Low	1.78	1	6**
314	Moderate	11.32	3	5
314	Very high	5.87	3	1**
316	Low	2.69	2	2

PCT	Condition	Disturbance area (ha)	Minimum plots required	Plots completed
316	Moderate	1.17	1	1
316	High	1.12	1	4**
316	Very high	7.95	3	4
319	Low	0.63	1	2
319	High	0.69	1	2
343	Very low	3.27	2	3
343	Low	0.04	1	1**
343	Moderate	2.39	2	3
352	Very low	3.25	2	2*
352	Low	0.94	1	1*
731	Very low	1.1	1	3**
731	Low	0.34	1	5*
1191	Moderate	0.14	1	1*

Table 4-9: Vegetation integrity plot requirements for the Bondo IBRA subregion

PCT	Condition	Disturbance area (ha)	Minimum plots required	Plots completed
285	**Low**	**0.74**	**1**	**1****
295	**Low**	**0.12**	**1**	**2****
295	Moderate	1.66	1	4
296	**Low**	**0.02**	**1**	**2****
299	Very low	1.24	1	1
299	Moderate	1.38	1	3
953	**Very low**	**2.98**	**2**	**2****
953	**Low**	**2.33**	**2**	**7***
953	High	28.11	4	4
953	**Very high**	**0.26**	**1**	**12***

Table 4-10: Vegetation integrity plot requirements for the Snowy Mountains IBRA subregion

PCT	Condition	Disturbance area (ha)	Minimum plots required	Plots completed
300	Low	0.52	1	2
300	Moderate	0.38	1	1
300	High	22.93	4	6
638	High	30.55	4	9
679	Low	0.22	1	1
679	High	3.38	2	1
939	Very high	0.56	1	2
953	Low	4.43	2	7
953	**Moderate**	**0.02**	**1**	**3****
953	**High**	**0.06**	**1**	**1***
953	Very high	81.99	5	20
1196	Low	0.68	1	2
1196	High	31	4	4
1224	High	0.25	1	3

4.5 Threatened flora survey methods

4.5.1 Review of existing information

A review of relevant public databases, existing reports and literature was undertaken for a 20-kilometre radius of the project footprint (the locality) to identify potentially occurring threatened flora species listed under both NSW and Commonwealth legislation (refer to Table 4-11).

Table 4-11: Information sources used to inform potentially occurring threatened flora species

Information source
NSW BioNet Atlas Database (DPE, 2021/2022) for: • spatial records of threatened flora listed under the BC Act within the locality • threatened biodiversity database collection (TBDC) information.
DPIE (not dated) BAM – Important Areas viewer. https://webmap.environment.nsw.gov.au/Html5Viewer291/index.html?viewer=BAM_ImportantAreas
EPBC Act Protected Matters Search Tool (PMST) (DCCEEW, 2021/2022) for threatened flora species identified as MNES known from or with potential habitat within the locality.
BAM-C (Department of Primary Industries (DPI) 2021/2022) (using benchmark condition for previously mapped PCTs) to identify candidate flora species credit species known or predicted to occur within the IBRA subregions intersecting the project footprint as follows: Bungonia, Crookwell, Murrumbateman, Inland Slopes, Bondo, Snowy Mountains.
The following documentation as relevant for candidate threatened flora species: • conservation advice • species Profile and Threats Database (SPRAT) • final determinations • recovery plans.
Landscape information: • Niche vegetation mapping • Mitchell Landscapes (DECC, 2002) used to inform the soil and geology of potential habitat • NSW Hydrography (Spatial Services, 2021b) • NSW Seamless Geology dataset (Phillips *et al.,* 2015).

4.5.2 Habitat constraints assessment

Suitable habitat for potentially occurring candidate threatened flora species was delineated and mapped for the project footprint using a combination of:

- landscape information (refer to Chapter 5)
- known PCT associations (as identified within the BioNet Atlas Database (DPE, 2021/22))
- vegetation mapping and BAM plot surveys
- available desktop data including soil and surface geology mapping (Section 4.5.1)
- supplementary approaches documented in Section 4.10.1.

Section 7.1 details the adopted approach to mapping habitat for candidate threatened species and the associated justification under the BAM (DPIE, 2020a). Suitable habitat identified within the project footprint was subject to targeted survey in accordance with the methods detailed in Section 4.5.3. Where lands could not be accessed for field surveys, the candidate species were assumed to be present.

4.5.3 Targeted threatened flora surveys

Field surveys for threatened flora were carried out using a combination of parallel field traverses and a two-phase grid-based systematic survey approach as set out in the DPIE (2020c) Guideline for Surveying threatened plants and their habitats.

Parallel field traverses involved searching along a grid of parallel transects at a set distance apart according to the lifeform and density of habitat for target candidate flora species. Each traverse was surveyed at walking pace by one ecologist (ELA, 2021).

Two-phase systematic surveys involved a grid spaced at 100-square-metres nested within a one-square-kilometre grid from a topographic map image and then overlayed onto the project footprint using a geographic information system (GIS). Surveys were undertaken where the 100-square-metre gridlines intersected with suitable habitat for a target species. At each grid-based flora survey location (grid intersect), a 40-metre diameter area (ie 1,256 square-metres) was systematically surveyed for the target species by at least two ecologists.

Where two-phase systematic surveys were mapped on land with no consent to enter, surveys were not conducted. If possible, a visual assessment was done over the fence to identify any conspicuous threatened flora species and/or suitability of habitat. The habitat mapping as described in Section 7.1 was used to determine where species presence has been assumed in inaccessible lands.

Survey for multiple target species occurred concurrently where species had similar habitat preferences, the same life form/habit, and the same optimal survey time, as specified by the Threatened Biodiversity Data Collection (TBDC). When a target species was located, finer-scale grid surveys were undertaken to locate the population extent, which helped define the species polygon extent. This subsequent phase ensured a greater intensity of survey effort in locations where the target species occurs (McGarvey et al., 2016).

Where threatened species were in high density (ie greater than 50 stems), the mean density was extrapolated by sampling over the observed area of occupancy. To adequately sample a dense population, two 30 metre transect lines were established one metre apart, and a stem count was then conducted within the area (30 square metres). The count recorded within the 30 square metre area was then extrapolated across the larger area. For larger areas of occupancy (ie more than 400 square metres) this count method was used multiple times to produce a more reliable estimate. This methodology was applied in accordance with the Guideline for Surveying threatened plants and their habitats (DPIE, 2020c).

A summary of total threatened flora survey effort by IBRA subregion is shown in Table 4-12. Table 4-13 and Table 4-14 further detail the threatened flora survey effort for each species and Figure 4-1 (Attachment 1) shows the location of targeted threatened flora surveys within the project footprint. Targeted surveys were conducted for 60 candidate flora species. Specific dates of survey and associated weather conditions are provided in Attachment 8. Relevant survey limitations are documented in Section 4.9. Adequacy of survey effort conducted is discussed in Section 7.2.2.

Table 4-12: Total threatened flora survey effort per IBRA subregionIBRA subregion (two phase grid-based and parallel field traverse survey approaches)

Method	IBRA subregionIBRA subregion					
	Bungonia	Crookwell	Murrumbateman	Inland Slopes	Bondo	Snowy Mountains
Two-phase grid-based survey approach (total person hours surveyed)	122.60 hrs	276.47 hrs	463.37 hrs	433.77 hrs	4.93 hrs	77.73 hrs
Parallel field traverse survey approach (total km surveyed)	Nil	167.89 km	Nil	132.96 km	30.04 km	309.19 km

Table 4-13: Threatened flora two-phase grid-based systematic survey effort

Scientific Name	Common name	BC Act status	EPBC Act status	Months of survey	IBRA subregion					
					Bungonia	Crookwell	Murrumbateman	Inland Slopes	Bondo	Snowy Mountains
Acacia ausfeldii	Ausfeld's Wattle	V	-	Aug-Oct	N/A	N/A	N/A	147 surveys in Oct-21 (191.32 person hours)	N/A	N/A
Acacia bynoeana	Bynoe's Wattle	E	V	Jan-Dec	10 surveys in Jan-22; 24 in Feb-22; 1 in May-22; 51 Sep-21; 9 in Oct-21 (122.27 person hours)	26 surveys in Jan-22; 86 in Feb-22; 7 in Mar-22; 5 in May-22; 50 in Sep-21; 32 in Oct-21 (276.47 person hours)	N/A	N/A	N/A	N/A
Acacia clunies-rossiae	Kanangra Wattle	V	-	Jan-Dec	10 surveys in Jan-22; 24 in Feb-22; 1 in May-22; 51 in Sep-21; 9 in Oct-21 (122.27 person hours)	N/A	N/A	N/A	N/A	N/A
Acacia flocktoniae	Flockton Wattle	V	V	Jul-Sep	51 surveys in Sep-21 (70.67 person hours)	N/A	N/A	N/A	N/A	N/A
Acacia phasmoides	Phantom Wattle	V	V	Sep	N/A	N/A	N/A	No surveys conducted	N/A	N/A
Ammobium craspedioides	Yass Daisy	V	V	Sep-Nov	N/A	50 surveys in Sep-21 (63.33 person hours)	138 surveys in Sep-21; 72 in Oct-21; 89 in Nov-21 (345.38 person hours)	147 surveys in Oct-21; 47 in Nov-21 (261.07 person hours)	5 surveys in Nov-21 (4.93 person hours)	N/A
Amphibromus fluitans	Floating Swamp Wallaby-grass	V	V	Dec-Mar	N/A	26 surveys in Jan-22; 86 in Feb-22; 7 in Mar-22 (160.46 person hours)	N/A	7 surveys in Jan-22; 4 in Feb-22; 41 in Mar-22; 14 in Dec-21 (52.69 person hours)	N/A	N/A

Scientific Name	Common name	BC Act status	EPBC Act status	Months of survey	IBRA subregion					
					Bungonia	Crookwell	Murrumbateman	Inland Slopes	Bondo	Snowy Mountains
Baloskion longipes	Dense Cord-rush	V	V	Jan-Dec	10 surveys in Jan-22; 24 in Feb-22; 1 in May-22; 51 Sep-21; 9 in Oct-21 (122.27 person hours)	N/A	N/A	N/A	N/A	N/A
Bossiaea fragrans	-	CE	CE	Jan-Dec	N/A	N/A	N/A	7 surveys in Jan-22; 4 in Feb-22; 41 in Mar-22; 11 in May-22; 69 in Sept; 147 in Oct-21; 47 in Nov-21; 14 in Dec-21 (433.77 person hours)	N/A	N/A
Bossiaea oligosperma	Few-seeded Bossiaea	V	V	Jan-Dec	10 surveys in Jan-22; 24 in Feb-22; 1 in May-22; 51 Sep-21; 9 in Oct-21 (122.27 person hours)	N/A	N/A	N/A	N/A	N/A
Caesia parviflora var. *minor*	Small Pale Grass-lily	E	-	Oct-Feb	N/A	N/A	N/A	7 surveys in Jan-22; 4 in Feb-22; 41 in Mar-22; 11 in May-22; 69 in Sept; 147 in Oct-21; 47 in Nov-21; 14 in Dec-21 (433.77 person hours)	N/A	N/A
Caladenia concolor	Crimson Spider Orchid	E	V	Sep	N/A	N/A	138 surveys in Sep-21 (136.33 person hours)	No surveys conducted	No surveys conducted	N/A

Scientific Name	Common name	BC Act status	EPBC Act status	Months of survey	IBRA subregion					
					Bungonia	Crookwell	Murrumbateman	Inland Slopes	Bondo	Snowy Mountains
Caladenia tessellata	Thick Lip Spider Orchid	E	V	Sep-Oct	51 surveys in Sep-21 (70.67 person hours)	N/A	N/A	N/A	N/A	N/A
Calotis glandulosa	Mauve Burr-daisy	V	V	Oct-Mar	N/A	N/A	N/A	N/A	N/A	19 surveys in Jan-22; 1 survey in Feb-22; 9 in Mar-22; 32 in Nov-21 (77.73 person hours) 7.93 km of random meander in Feb-21 (ELA)
Calotis pubescens	Max Mueller's Burr-daisy	E	-	Oct-Feb	N/A	N/A	N/A	N/A	N/A	19 surveys in Jan-22; 1 survey in Feb-22; 9 in Mar-22; 32 in Nov-21 (77.73 person hours)
Commersonia prostrata	Dwarf Kerrawang	E	E	Jan-Dec	N/A	26 surveys in Jan-22; 86 in Feb-22; 7 in Mar-22; 5 in May-22; 50 in Sep-21; 32 in Oct-21 (276.47 person hours)	N/A	N/A	N/A	N/A
Cullen parvum	Small Scurf-pea	E	-	Dec-Jan	N/A	N/A	N/A	7 surveys in Jan-22; 14 surveys in Dec-21 (17.33 person hours)	N/A	N/A

Scientific Name	Common name	BC Act status	EPBC Act status	Months of survey	IBRA subregion					
					Bungonia	Crookwell	Murrumbateman	Inland Slopes	Bondo	Snowy Mountains
Dillwynia glaucula	Michelago Parrot-pea	E	-	Sep-Dec	51 surveys in Sep-21; 9 in Oct-21 (84.17 person hours)	N/A	N/A	N/A	N/A	N/A
Diuris aequalis	Buttercup Doubletail	E	E	Oct-Nov	No surveys conducted	No surveys conducted	N/A	N/A	N/A	N/A
Diuris ochroma	Pale Golden Moths	E	V	Dec-Jan	N/A	N/A	N/A	N/A	N/A	19 surveys in Jan-22 (6.3 person hours)
Diuris tricolor	Pine Donkey Orchid	V	-	Sep-Oct	N/A	N/A	N/A	147 surveys in Oct-21 (191.32 person hours)	N/A	N/A
Eucalyptus aggregata	Black Gum	V	V	Jan-Dec	N/A	26 surveys in Jan-22; 86 in Feb-22; 7 in Mar-22; 5 in May-22; 50 in Sep-21; 32 in Oct-21 (276.47 person hours)	30 surveys in Feb-22; 3 in Mar-22; 3 in May-22; 138 in Sep-21; 72 in Oct-21; 89 in Nov-21; 150 in Dec-62 1 (463.37 person hours)	7 surveys in Jan-22; 4 in Feb-22; 41 in Mar-22; 11 in May-22; 69 in Sept; 147 in Oct-21; 47 in Nov-21; 14 in Dec-21 (433.77 person hours)	N/A	2.16 km of random meander in Feb-21 (Snowy Mountains in is not an associated IBRA subregion for this species) (ELA)
Eucalyptus alligatrix subsp. *Alligatrix*	-	V	V	Jan-Dec	N/A	N/A	N/A	7 surveys in Jan-22; 4 in Feb-22; 41 in Mar-22; 11 in May-22; 69 in Sept; 147 in Oct-21; 47 in Nov-21; 14 in Dec-21 (433.77 person hours)	N/A	N/A
Eucalyptus cannonii	Capertee Stringybark	V	-	Jan-Dec	N/A	N/A	N/A	7 surveys in Jan-22; 4 in Feb-22; 41 in	N/A	N/A

Scientific Name	Common name	BC Act status	EPBC Act status	Months of survey	IBRA subregion					
					Bungonia	Crookwell	Murrumbateman	Inland Slopes	Bondo	Snowy Mountains
								Mar-22; 11 in May-22; 69 in Sept; 147 in Oct-21; 47 in Nov-21; 14 in Dec-21 (433.77 person hours)		
Eucalyptus macarthurii	Paddys River Box	E	E	Jan-Dec	10 surveys in Jan-22; 24 in Feb-22; 1 in May-22; 51 Sep-21; 9 in Oct-21 (122.27 person hours)	N/A	N/A	N/A	N/A	N/A
Eucalyptus robertsonii subsp. *hemisphaerica*	Robertson's Peppermint	V	V	Jan-Dec	N/A	26 surveys in Jan-22; 86 in Feb-22; 7 in Mar-22; 5 in May-22; 50 in Sep-21; 32 in Oct-21 (276.47 person hours)	N/A	7 surveys in Jan-22; 4 in Feb-22; 41 in Mar-22; 11 in May-22; 69 in Sept; 147 in Oct-21; 47 in Nov-21; 14 in Dec-21 (433.77 person hours)	N/A	N/A
Euphrasia arguta	-	CE	CE	Nov-Mar	N/A	N/A	N/A	7 surveys in Jan-22; 4 in Feb-22; 41 in Mar-22; 11 in May-22; 69 in Sept; 147 in Oct-21; 47 in Nov-21; 14 in Dec-21 (433.77 person hours)	N/A	N/A
Euphrasia scabra	Rough Eyebright	E	-	Feb-Apr	N/A	N/A	N/A	N/A	N/A	9 surveys in Mar-22 (13.5 person hours)

Scientific Name	Common name	BC Act status	EPBC Act status	Months of survey	IBRA subregion					
					Bungonia	Crookwell	Murrumbateman	Inland Slopes	Bondo	Snowy Mountains
Genoplesium superbum	Superb Midge Orchid	E	-	Feb-Mar	24 surveys in Feb-22 (23.6 person hours)	N/A	N/A	N/A	N/A	N/A
Glycine latrobeana	Clover Glycine	CE	V	Nov-Jan	N/A	N/A	N/A	N/A	N/A	19 surveys in Jan-22; 32 in Nov-21 (62.73 person hours)
Grevillea iaspicula	Wee Jasper Grevillea	CE	E	Jan-Dec	N/A	N/A	30 surveys in Feb-22; 3 in Mar-22; 3 in May-22; 138 in Sep-21; 72 in Oct-21; 89 in Nov-21; 150 in Dec-69 (463.37 person hours)	N/A	5 surveys in Nov-21 (4.93 person hours)	N/A
Grevillea wilkinsonii	Tumut Grevillea	CE	CE	Oct	N/A	N/A	N/A	147 surveys in Oct-21 (191.32 person hours)	N/A	N/A
Hakea dohertyi	Kowmung Hakea	E	E	Jan-Dec	10 surveys in Jan-22; 24 in Feb-22; 1 in May-22; 51 Sep-21; 9 in Oct-21 (122.27 person hours)	N/A	N/A	N/A	N/A	N/A
Irenepharsus magicus	Elusive Cress	E	-	Dec-May	N/A	N/A	N/A	N/A	N/A	19 surveys in Jan-22; 9 in Mar-22 (32.40 person hours)
Kunzea cambagei	Cambage Kunzea	V	V	Oct-Nov	No surveys conducted	N/A	N/A	N/A	N/A	N/A

Scientific Name	Common name	BC Act status	EPBC Act status	Months of survey	IBRA subregion					
					Bungonia	Crookwell	Murrumbateman	Inland Slopes	Bondo	Snowy Mountains
Lepidium hyssopifolium	Aromatic Peppercress	E	E	Oct-Dec	N/A	32 surveys in Oct-21 (48 person hours)	N/A	N/A	N/A	N/A
Leucochrysum albicans var. *tricolor*	Hoary Sunray	-	E	Sep-Apr	10 surveys in Jan-22; 24 in Feb-22; 1 in May-22; 51 Sep-21; 9 in Oct-21 (122.27 person hours)	26 surveys in Jan-22; 86 in Feb-22; 7 in Mar-22; 5 in May-22; 50 in Sep-21; 32 in Oct-21 (276.47 person hours)	30 surveys in Feb-22; 3 in Mar-22; 3 in May-22; 138 in Sep-21; 72 in Oct-21; 89 in Nov-21; 150 in Dec-69 (463.37 person hours)	7 surveys in Jan-22; 4 in Feb-22; 41 in Mar-22; 11 in May-22; 69 in Sept; 147 in Oct-21; 47 in Nov-21; 14 in Dec-21 (433.77 person hours)	5 surveys in Nov-21 (4.93 person hours)	19 surveys in Jan-22; 1 survey in Feb-22; 9 in Mar-22; 32 in Nov-21 (77.73 person hours) 10.08 km of random meander in Feb-21
Persoonia marginata	Clandulla Geebung	V	V	Jan-Mar	N/A	N/A	N/A	7 surveys in Jan-22; 4 in Feb-22; 41 in Mar-22 (42.19 person hours)	N/A	N/A
Persoonia mollis subsp. *revoluta*	-	V	-	Jan-Dec	10 surveys in Jan-22; 24 in Feb-22; 1 in May-22; 51 Sep-21; 9 in Oct-21 (122.27 person hours)	N/A	N/A	N/A	N/A	N/A
Phyllota humifusa	Dwarf Phyllota	V	V	Nov-Jan	10 surveys in Jan-22; 9 in Oct-21 (28 person hours)	N/A	N/A	N/A	N/A	N/A
Pomaderris cotoneaster	Cotoneaster Pomaderris	E	E	Oct-Nov	No surveys conducted	N/A	N/A	N/A	5 surveys in Nov-21 (4.93 person hours)	N/A
Pomaderris delicata	Delicate Pomaderris	CE	CE	Jan-Dec	10 surveys in Jan-22; 24 in Feb-22; 1 in May-22; 51 Sep-	N/A	N/A	N/A	N/A	N/A

Scientific Name	Common name	BC Act status	EPBC Act status	Months of survey	IBRA subregion					
					Bungonia	Crookwell	Murrumbateman	Inland Slopes	Bondo	Snowy Mountains
					21; 9 in Oct-21 (122.27 person hours)					
Pomaderris pallida	Pale Pomaderris	V	V	Jan-Dec	N/A	N/A	30 surveys in Feb-22; 3 in Mar-22; 3 in May-22; 138 in Sep-21; 72 in Oct-21; 89 in Nov-21; 150 in Dec-69 (463.37 person hours)	N/A	N/A	N/A
Prasophyllum bagoense	Bago Leek Orchid	CE	CE	Dec	N/A	N/A	N/A	N/A	N/A	No surveys conducted
Prasophyllum innubum	Brandy Marys Leek-orchid	CE	CE	Feb-Mar	N/A	N/A	N/A	N/A	N/A	9 surveys in Mar-22 (13.5 person hours)
Prasophyllum keltonii	Kelton's Leek Orchid	CE	CE	Dec-Jan	N/A	N/A	N/A	N/A	N/A	19 surveys in Jan-22 (18.90 person hours)
Prasophyllum petilum	Tarengo Leek Orchid	E	E	Sep-Dec	N/A	N/A	138 surveys in Sep-21; 72 in Oct-21; 89 in Nov-21; 69 in Dec-21 (414.75 person hours)	147 surveys in Oct-21; 47 in Nov-21; 14 in Dec-21 (271.57 person hours)	N/A	N/A
Prasophyllum sp. Wybong	-	-	CE	Sep-Oct	N/A	N/A	N/A	147 surveys in Oct-21 (191.32 person hours) 1.2 km of random meander in Oct-20 (ELA)	N/A	N/A

Scientific Name	Common name	BC Act status	EPBC Act status	Months of survey	IBRA subregion					
					Bungonia	Crookwell	Murrumbateman	Inland Slopes	Bondo	Snowy Mountains
Pterostylis alpina	Alpine Greenhood	V	-	Aug, Sep, Nov	N/A	N/A	N/A	N/A	N/A	32 surveys in Nov-21 (43.83 person hours)
Pterostylis foliata	Slender Greenhood	V	-	Oct-Nov	N/A	N/A	N/A	N/A	N/A	32 surveys in Nov-21 (43.83 person hours) 61.31 km of random meander in Nov-20 (ELA)
Pterostylis oreophila	Blue-tongued Greenhood	CE	CE	Dec-Jan	N/A	N/A	N/A	N/A	N/A	19 surveys in Jan-22 (18.90 person hours)
Pultenaea humilis	Dwarf Bush-pea	V	-	Oct-Dec	N/A	N/A	N/A	147 surveys in Oct-21; 70 in Nov-21; 135 in Dec-21 (271.57 person hours)	N/A	N/A
Rutidosis leiolepis	Monaro Golden Daisy	V	V	Oct-Mar	N/A	N/A	N/A	N/A	N/A	19 surveys in Jan-22; 1 survey in Feb-22; 9 in Mar-22; 32 in Nov-21 (77.73 person hours)
Senecio garlandii	Woolly Ragwort	V	-	Jan-Dec	N/A	N/A	30 surveys in Feb-22; 3 in Mar-22; 3 in May-22; 138 in Sep-21; 72 in Oct-21; 89 in Nov-21; 150 in Dec-69	7 surveys in Jan-22; 4 in Feb-22; 41 in Mar-22; 11 in May-22; 69 in Sept; 147 in Oct-21; 47 in Nov-21; 14 in Dec-	5 surveys in Nov-21 (4.93 person hours)	N/A

Scientific Name	Common name	BC Act status	EPBC Act status	Months of survey	IBRA subregion					
					Bungonia	Crookwell	Murrumbateman	Inland Slopes	Bondo	Snowy Mountains
							(463.37 person hours)	21 (433.77 person hours)		
Solanum armourense	-	E	-	Aug-May	10 surveys in Jan-22; 24 in Feb-22; 1 in May-22; 51 Sep-21; 9 in Oct-21 (122.27 person hours)	N/A	N/A	N/A	N/A	N/A
Swainsona recta	Small Purple-pea	E	E	Sep-Nov	N/A	N/A	138 surveys in Sep-21; 72 in Oct-21; 89 in Nov-21; 69 in Dec-21 (414.75 person hours)	147 surveys in Oct-21; 47 in Nov-21 (261.07 person hours)	N/A	N/A
Swainsona sericea	Silky Swainson-pea	V	-	Sep-Nov	51 surveys in Sep-21 (70.67 person hours)	N/A	138 surveys in Sep-21; 72 in Oct-21; 89 in Nov-21; 69 in Dec-21 (414.75 person hours)	147 surveys in Oct-21; 47 in Nov-21 (261.07 person hours)	N/A	N/A
Thelymitra alpicola	Alpine Sun-orchid	V	-	Nov-Jan	N/A	N/A	N/A	N/A	N/A	19 surveys in Jan-22; 32 in Nov-21 (62.73 person hours)
Thesium australe	Austral Toadflax	V	V	Nov-Feb	10 surveys in Jan-22; 24 in Feb-22 (38.1 person hours)	26 surveys in Jan-22; 86 in Feb-22 (152.73 person hours)	30 surveys in Jan Feb-22; 89 in Nov-21; 69 in Dec-21 (235.47 person hours)	N/A	5 surveys in Nov-21 (4.93 person hours)	19 surveys in Jan-22; 32 in Nov-21 (62.73 person hours); 7.93 km of random meander in Feb-21 (ELA)

Scientific Name	Common name	BC Act status	EPBC Act status	Months of survey	IBRA subregion					
					Bungonia	Crookwell	Murrumbateman	Inland Slopes	Bondo	Snowy Mountains
Xerochrysum palustre	Swamp Everlasting	-	V	Sep-May	N/A	N/A	N/A	N/A	N/A	19 surveys in Jan-22; 1 survey in Feb-22; 9 in Mar-22; 32 in Nov-21 (77.73 person hours); 7.93 km of random meander in Feb-21 (ELA)
Zieria obcordata	Granite Zieria	E	E	Sep-Oct	N/A	N/A	N/A	147 surveys in Oct-21 (191.32 person hours)	N/A	N/A

Note: V = Vulnerable, E = Endangered, CE = Critically Endangered, Ex = Extinct

N/A = Not Applicable. Species does not occur in the IBRA subregion

Person hours = duration (typically 10 minutes) multiplied by number of people (typically 2).

Where distances are provided this represents the walked length of random meander instead of time spent searching (ELA).

Table 4-14: Threatened flora parallel field traverse survey effort

Scientific name	Common name	BC Act status	EPBC Act status	Months of survey	IBRA subregion					
					Bungonia	Crookwell	Murrumbateman	Inland Slopes	Bondo	Snowy Mountains
Acacia bynoeana	Bynoe's Wattle	E	V	Jan-Dec	N/A	11.42 km in Mar-21	N/A	N/A	N/A	N/A
Ammobium craspedioides	Yass Daisy	V	V	Sep-Nov	N/A	N/A	N/A	64.74 km in Nov-20	1.86 km in Nov-20	N/A
Caladenia concolor	Crimson Spider Orchid	E	V	Sep	N/A	N/A	N/A	4.73 km in Oct-20	N/A	N/A
Calotis glandulosa	Mauve Burr-daisy	V	V	Oct-Mar	N/A	31.3 km in Mar-21 (Crookwell in is not an associated IBRA	N/A	N/A	N/A	13.92 km in Feb-21; 28.78 km in Mar-21

Scientific name	Common name	BC Act status	EPBC Act status	Months of survey	IBRA subregion					
					Bungonia	Crookwell	Murrumbateman	Inland Slopes	Bondo	Snowy Mountains
						subregion for this species)				
Diuris aequalis	Buttercup Doubletail	E	E	Oct-Nov	N/A	N/A	N/A	N/A	N/A	4.46 km in Oct-20 (Snowy Mountains is not an associated IBRA subregion for this species)
Eucalyptus aggregata	Black Gum	V	V	Jan-Dec	N/A	4.63 km in Mar-21	N/A	N/A	N/A	2.1 km in Feb-21; 10.5 km in Mar-21 (Snowy Mountains in is not an associated IBRA subregion for this species)
Eucalyptus macarthurii	Paddy's River Box	E	E	Jan-Dec	N/A	11.49 km in Mar-21 (Crookwell in is not an associated IBRA subregion for this species)	N/A	N/A	N/A	N/A
Grevillea iaspicula	Wee Jasper Grevillea	CE	E	Jan-Dec	N/A	3.31 km in Mar-21 (Crookwell in is not an associated IBRA subregion for this species)	N/A	3.07 km in April; 1.61 km in May-21 (Inland Slopes is not an associated IBRA subregion for this species)	N/A	N/A
Grevillea wilkinsonii	Tumut Grevillea	CE	CE	Oct	N/A	N/A	N/A	4.69 km in Oct-20	6.78 km in Oct-20	N/A
Leucochrysum albicans var. *tricolor*	Hoary Sunray		E	Sep-Apr	N/A	105.74 km in Mar-21	No ELA surveys completed	10.3 km in Mar-21; 4.94 km in Apr-21	N/A	48.69 km in Feb-21; 27.01 km in Mar-21; 54.82 km in Apr-21; 35.63 km in May-21

Scientific name	Common name	BC Act status	EPBC Act status	Months of survey	IBRA subregion					
					Bungonia	Crookwell	Murrumbateman	Inland Slopes	Bondo	Snowy Mountains
Lysimachia vulgaris var. *davurica*	Yellow Loosestrife	E		Dec-Mar	N/A	N/A	N/A	N/A	N/A	3.13 km in Mar-21 (Snowy Mountains in is not an associated IBRA subregion for this species)
Pomaderris cotoneaster	Cotoneaster Pomaderris	E	E	Oct-Nov	N/A	N/A	N/A	N/A	N/A	20.21 km in Nov-20 (Snowy Mountains is not an associated IBRA subregion for this species)
Prasophyllum sp. Wybong	-		CE	Sep-Oct	N/A	N/A	N/A	5.47 km in Oct-20 (Inland Slopes is not an associated IBRA subregion for this species)	6.78 km in Oct-20 (Bondo is not an associated IBRA subregion for this species)	N/A
Pterostylis foliata	Slender Greenhood	V		Oct-Nov	N/A	N/A	N/A	N/A	N/A	23.43 km in Nov-20
Senecio garlandii	Woolly Ragwort	V		Jan-Dec	N/A	N/A	N/A	3.07 km in Apr-21; 22.58 km in May-21	N/A	N/A
Swainsona recta	Small Purple-pea	E	E	Sep-Nov	N/A	N/A	N/A	3.08 km in Oct-20	5.94 km in Oct-20; 0.95 km in Nov-20 (Bondo is not an associated IBRA subregion for this species)	N/A
Swainsona sericea	Silky Swainson-pea	V		Sep-Nov	N/A	N/A	N/A	4.69 km in Oct-20	6.78 km in Oct-20; 0.95 km in Nov-20 (Bondo is not an	4.46 km in Oct-20 (Snowy Mountains is not an associated

Scientific name	Common name	BC Act status	EPBC Act status	Months of survey	IBRA subregion					
					Bungonia	Crookwell	Murrumbateman	Inland Slopes	Bondo	Snowy Mountains
									associated IBRA subregion for this species)	IBRA subregion for this species)
Thesium australe	Austral Toadflax	V	V	Nov-Feb	N/A	N/A	N/A	N/A	No ELA surveys completed	19 surveys in Jan-22; 9.6 km in Feb-21
Xerochrysum palustre	Swamp Everlasting		V	Sep-May	N/A	N/A	N/A	N/A	N/A	3.98 km in Feb-21; 18.47 km in Mar-21

Note: V = Vulnerable, E = Endangered, CE = Critically Endangered, Ex = Extinct

N/A = Species does not occur in the IBRA subregion

4.6 Threatened fauna survey methods

4.6.1 Review of existing information

A review of relevant public databases, existing reports and literature was undertaken for a 20-kilometre radius of the project footprint (the locality) to identify potentially occurring threatened fauna species listed under both NSW and Commonwealth legislation(refer to Table 4-15).

Table 4-15: Information sources used to inform potentially occurring threatened fauna species

Information source
NSW BioNet Atlas Database (DPE 2021/22) for: • Spatial records of threatened fauna listed under the BC Act within a 20 km radius of the project footprint • Threatened Biodiversity Database Collection (TBDC) information.
DPIE (not dated) BAM – Important Areas viewer. https://webmap.environment.nsw.gov.au/Html5Viewer291/index.html?viewer=BAM_ImportantAreas
Ecological information and spatial data provided by Dr Rohan Bilney of the NSW Forestry Corporation on 14 July 2022, relating to threatened flora and fauna within State forests.
EPBC Act PMST (DCCEEW 2021/22) for threatened fauna species and migratory species identified as MNES known from or with potential habitat within the locality
BAM-C (DPI, 2021/22) (using benchmark condition for PCTs mapped by previous vegetation community mapping projects) to identify candidate species credit species and predicted ecosystem credit species known or predicted to occur within the IBRA subregions intersecting the project footprint: Bungonia, Crookwell, Murrumbateman, Inland Slopes, Bondo, Snowy Mountains.
The following documentation as relevant for candidate threatened fauna species: • conservation advice • SPRAT profiles • final determinations • recovery plans.

4.6.2 Habitat constraints assessment

Fauna habitat assessments were undertaken for all accessible lands within the project footprint to assess habitat suitability for threatened fauna species (those species known or predicted to occur within the locality from previous data collection, literature and database review). Fauna habitat characteristics assessed included, but were not limited to:

- the structure and floristics of the canopy, understorey, and groundcover vegetation, including the presence of flowering and fruiting trees providing potential foraging resources for a range of species
- physical aspects such as geology, soils, slope, elevation, drainage and aspect
- identification and mapping of reptile habitat such as outcropping rock with exfoliations, rocky hillslopes (potential habitat for Pink-tailed Legless Lizard *(Aprasia parapulchella)* and Striped Legless Lizard *(Delma impar)*), crevice habitat or termite mounds (ie habitat for Broad-headed Snake *(Hoplocephalus bungaroides)* and Rosenberg's Goanna *(Varanus rosenbergi)*)
- identification and mapping of large canopy stick nests, ground refugia, feed trees and hollow-bearing trees of different size classes that could potentially support threatened microbats, gliders, owls, cockatoos or raptors
- presence and abundance of groundcover vegetation, leaf litter, fallen timber and man-made structures as potential to provide shelter for invertebrates, ground-dwelling mammals, reptiles and amphibians
- presence and profiling of waterways (ephemeral or permanent) and water bodies.

Opportunistic sightings of animals were recorded. Indirect evidence of animal activity, such as scats, diggings, scratch marks, nests/dreys, burrows etc was also noted.

Section 7.1 details the adopted approach to mapping habitat for candidate threatened fauna species and the associated justification under the BAM (DPE, 2020a). Suitable habitat identified within the project footprint was subject to targeted survey in accordance with the methods detailed in Section 4.6.3. Where habitats could not be accessed for field survey, the candidate species were assumed present.

4.6.3 Targeted threatened fauna surveys

Survey methods were selected to detect target candidate threatened fauna species, as well as to employ a broad range of survey techniques that allowed for detection of the variety of fauna species groups. Relevant threatened species guidelines and the TBDC (DPE, 2022) were consulted to assist in determining appropriate survey methods, effort, and timing (refer to Table 4-15). Survey methods utilised are outlined in Table 4-16. Targeted fauna survey effort is summarised in Table 4-17 and shown in Figure 4-2 (Attachment 1).

Adequacy of survey effort conducted is discussed in Section 7.3.3.

Table 4-16: Fauna survey methods implemented for the assessment

Survey method	Description
Diurnal bird surveys	Formal 20-minute diurnal bird searches were completed typically by two ecologists. Bird surveys were completed by actively walking through the nominated site (transect) over a period of 20 minutes. All birds were identified to the species level, either through direct observation or identification of calls. Bird surveys were completed during different times of the day, but generally occurred during early morning hours or approaching evening. Birds were also recorded opportunistically during all other surveys. The candidate bird species (where relevant to the IBRA-subregions) targeted during diurnal bird surveys included: • Superb Parrot (*Polytelis swainsonii*) • Pink Robin (*Petroica rodinogaster)* • Major Mitchell's Cockatoo (*Lophochroa leadbeateri*) • Glossy-Black Cockatoo (*Calyptorhynchus lathami*) • Gang-gang Cockatoo (*Callocephalon fimbriatum*) • White-bellied Sea-Eagle (*Haliaeetus leucogaster*) • Square-tailed Kite (*Lophoictinia isura*) • Little Eagle (*Haliaeetus morphnoides*). Targeted survey effort conducted for the above list of candidate species is outlined in Table 4-17.
Acoustic microbat surveys	Passive ultrasonic bat detectors (Anabat Swift/ Anabat Express – Titley Scientific, Brendal QLD; or SM4Bat - Wildlife Acoustics, Inc., Maynard, MA USA) were used to record and identify the echolocation calls of microchiropteran bats foraging at each survey site. Passive monitoring of survey sites was achieved by setting bat detectors to record throughout the night. Calls were analysed by Greg Ford using AnalookW (Version 4.7) software with reference to 'Bat Calls of NSW: Region Based Guide to the Echolocation Calls of Microchiropteran Bats' (Pennay et al., 2004). Targeted survey effort for threatened microbat species is outlined in Table 4-17.
Microbat harp trapping	Although many microchiropteran bat species are detectable through call detection methodologies, the vocal differences between species such as *Nyctophilus sp*. are sometimes too subtle to reliably differentiate between the various species occurring in a given locality. In addition, harp trapping can provide additional information on sex, age, reproductive status, and other characteristics that can be assessed. Such information is required for surveys targeting breeding habitat for dual credit species. Site selection for the setting of harp traps included several considerations including suitable flyways and target species roosting and foraging habitat requirements. Harp traps were set at each location over a two-night period between spring and summer months (surveys best conducted between October and April for most species). Captured bats were identified to species level, sexed, measured, and weighed. Bats were released immediately after processing during dark conditions. Targeted survey effort for harp trapping is outlined in Table 4-17.

Survey method	Description
	Species targeted included: Southern Myotis (*Myotis Macropus*), Large-eared Pied Bat (*Chalinolobus dwyeri*), Little Bent-winged Bat (*Miniopterus australis*) and Large Bent-winged Bat (*Miniopterus orianae oceanensis*).
Stagwatching	Stagwatching is primarily used to detect hollow-dependant arboreal mammals, owls, cockatoos and microchiropteran bat species emerging or returning to tree hollows. Observations were usually conducted just before dusk (30 minutes before) and for a short time afterwards (30 to 60 minutes after) and involved stationing observers near dead or living hollow-bearing trees so that they could identify and count the nocturnal species that emerged. Targeted survey effort for stagwatching is outlined in Table 4-17.
Nocturnal call playback	Call playback surveys (broadcasting) were conducted in conjunction with stagwatching and spotlight surveys. The broadcasting of pre-recorded calls of target species (Owls, Koala and Gliders) was undertaken intermittently for five minutes, followed by a listening period for 10 minutes. Following on from the listening period, observers inspected the immediate vicinity with a spotlight to see if non-vocalising fauna were attracted to the calls (for a minimum of 10 minutes). Targeted survey effort for Nocturnal call playback is outlined in Table 4-17.
Spotlighting	Spotlighting surveys were completed on foot by pairs of ecologists, targeting arboreal, flying, and large ground-dwelling mammals, as well as nocturnal birds, reptiles, and amphibians. At least one person hour of survey effort was completed per site. Spotlighting survey effort is outlined in Table 4-17.
Remote cameras	Remote cameras were deployed within the project footprint, targeted within areas of good quality habitat. Cameras were baited with peanut butter, honey, and oats. Camera traps were deployed between early spring and summer months. Remote camera trap survey effort is outlined in the summary survey effort table below (Table 4-17).
Koala Spot Assessment Technique (SAT)	Koala SAT (Phillips and Callaghan, 2011) survey was undertaken in areas with listed Koala feed trees (DPE 2022). SAT surveys involved survey of thirty trees with a Diameter at Breast Height (DBH) of 20 cm or more from a central tree. In accordance with Phillips and Callaghan (2011), the central tree may be a recorded use tree (observed or pellets) but may also be a tree species of known food value to Koala. The assessment was undertaken by two observers at a time, and the duration of the assessment was a minimum of 30 minutes (average of two minutes per tree). Recording of secondary signs of presence (specifically pock marks and scratches on tree trunks) were also undertaken. Koala SAT survey effort is outlined in Table 4-17.
Golden Sun Moth habitat transects	A total of 212 100 m step-point transects were undertaken throughout areas of potential Golden Sun Moth habitat. Microhabitats and habitat suitability were characterised at each 1 m interval of the transect, based on the presence of following: • Bare earth/soils • Cryptogams • Litter/dead vegetation • Perennial native grass – Other • Perennial native grass – *Austrostipa* spp. • Perennial native grass – *Rytidosperma* spp. • Other native grass (non-Golden Sun Moth food) • Exotic Golden Sun Moth food plants – Other • Exotic Golden Sun Moth food plants – Chilean Needle Grass • Exotic Golden Sun Moth food plants – Serrated Tussock • Perennial exotic grass (non-Golden Sun Moth food) • Annual exotic grass • Exotic forbs. The overall suitability of a patch for Golden Sun Moth was determined by surveyor(s) upon completion of the 100 m transect based on general availability and connectivity of suitable microhabitats. Golden Sun Moth habitat was mapped within the project footprint based on the field survey results and supplementary information provided within an expert report (Section 7.3.4). The final habitat calculation represents the synthesis of the field survey data (incorporating the results of expert review

Survey method	Description
	and validation), vegetation plot data and habitat parameters considered to reliably indicate potential habitat. Golden Sun Moth habitat transect effort is outlined in Table 4-17. Additional survey effort completed as a part of the expert report is documented in Attachment 9.
Reptile searches	Areas within the project footprint that contained shallow embedded surface rocks and native grassy ground-layer, were subject to active searches (rock rolling) for species such as Pink-tailed Legless Lizard and Striped Legless Lizard. In the specified habitat most rocks that could be up-turned were checked (150–200 rocks need to be turned to be reasonably confident of determining the species' presence) (DSEWPC, 2011b). Searches were conducted between spring and early summer on warm days (DSEWPAC, 2011b). Surveyors ensured rocks, logs and other refugia were placed back in the same position to minimise disturbance. Reptile searches and habitat mapping were then used to refine and map habitat for these candidate reptile species within the project footprint. Reptile search survey effort is outlined in Table 4-17.
Elliot trapping	Elliot traps were deployed within Bago State Forest in April 2021 targeting Broad-toothed Rat (*Mastacomys fuscus*) and Smoky Mouse (*Pseudomys fumeus*). The traps were placed on the ground and baited with peanut butter, honey, and oats.
Active frog searches	Aural-visual surveys were conducted constituting a combination of listening for the calls of frogs and searching for individuals along a transect. Visual searches included searches along a 500 m transect in breeding habitat along, around or through a suitable waterbody. Where there was insufficient habitat to accommodate a 500 m transect a pro-rata effort was applied to all available habitats being searched. Aural-visual surveys commenced with the surveyors listening for calls (in silence and darkness) for a minimum of five minutes. The visual survey aimed to detect frogs via 'eyeshine'. Suitable habitat was scanned along the transect, around and between aural survey points. Aural-visual frog survey effort is outlined in Table 4-17.
Call playback (frogs)	Call-playback was undertaken using a loudspeaker to broadcast the advertisement calls of target threatened frogs to elicit either an advertisement or territorial response call. Call playbacks were completed during active frog searches, immediately after the five-minute listening period and at the same location. A call was broadcast continuously for a period of no less than two minutes (responses are typically heard within the first minute). The playback period was followed by a two-minute listening period to detect any late responses or responses masked by the sound of the broadcast call. Not all species are known to be responsive to call playback (eg Giant Burrowing Frog) and some species may respond to calls of other species (eg Stuttering Frog). Frog survey effort is outlined in Table 4-17.
Hair tubes	Baited terrestrial and arboreal hair tubes arrays were deployed by ELA (2021) in suitable habitats for the following candidate small mammal species: • Eastern Pygmy-possum (All IBRA subregions) • Broad-toothed Rat (Bondo and Snowy Mountains IBRA subregion) • Smoky Mouse (Bondo, Bungonia and Snowy Mountains IBRA subregions) • Squirrel Glider (All IBRA subregions) • Greater Glider (All IBRA subregions). Double-sided tape was attached to the inside of the tube near the bait (universal bait of oats, peanut butter, and honey), to collect hair samples on entry and departure of the tube. Hair tubes were placed in appropriate habitats. The tubes were checked regularly and not removed for at least four days and nights. Hair tube survey effort is outlined in Table 4-17.

Table 4-17: Threatened fauna survey effort

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details	Survey date range	Optimal survey period
Diurnal bird surveys							
Bungonia	Eight, 20-minute, 2-ha bird surveys were conducted across the Bungonia IBRA subregion portion of the project footprint.	Total effort: 5.67 person hours (340 minutes).	All candidate bird species with a focus on hollow dwelling bird species within project footprint.	Standard 20-minute 2 ha bird surveys were conducted across the project footprint in areas with an abundance of flowering eucalypts.	Niche – Eight bird survey 2 ha (5.67 person hours) (340 minutes)	May 2021 January-March 2022	All year
Crookwell	A total of 43, 20-minute, 2-ha bird surveys were conducted across the Crookwell IBRA subregion portion of the project footprint.	Total effort: 22.15 person hours (1,329).	All candidate bird species with a focus on hollow dwelling bird species within project footprint.	Standard 20-minute 2 ha bird surveys were conducted across the project footprint in areas with an abundance of flowering eucalypts.	ELA – 29 Bird survey 2 ha (15.58 person hours) (935 minutes)	February- July 2021	All year
					Niche – 14 Bird survey 2 ha (6.57 person hours) (394 minutes)	January – March 2022	
Murrumbateman	A total of 25, 20-minute, 2-ha bird surveys were conducted across the Murrumbateman IBRA subregion portion of the project footprint.	Total effort: 25.45 person hours (1,527 minutes).	All candidate bird species with a focus on hollow dwelling bird species within project footprint.	Standard 20-minute 2 ha bird surveys were conducted across the project footprint in areas with an abundance of flowering eucalypts.	ELA – 12 Bird survey 2 ha (6.58 person hours) (395 minutes)	March 2021	All year
					Niche – 26 Bird survey 2 ha (18.87 person hours) (1,132 minutes)	October-December 2021; February – March 2022	
Inland Slopes	A total of 73, 20-minute 2-ha bird surveys were conducted across the Inland Slopes IBRA subregion portion of the project footprint	Total effort: 44.47 person hours (2,668 minutes).	All candidate bird species with a focus on hollow dwelling bird species within project footprint.	Standard 20-minute 2 ha bird surveys were conducted across the project footprint in areas with an abundance of flowering eucalypts.	ELA – 34 Bird survey 2 ha (24.40 person hours) (1,464 minutes)	February- April 2021; July-August 2021	All year
					Niche – 39 Bird survey 2 ha (20.07 person hours) (1,204 minutes)	October -December 2021; February- March 2022	

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details	Survey date range	Optimal survey period
Snowy Mountains	A total of 47, 20-minute 2-ha bird surveys were conducted across the Snowy Mountains IBRA subregion portion of the project footprint	Total effort: 43.72 person hours (2,623 minutes).	All candidate bird species with a focus on hollow dwelling bird species within project footprint.	Standard 20-minute 2 ha bird surveys were conducted across the project footprint in areas with an abundance of flowering eucalypts.	ELA – 39 Bird survey 2 ha (40.68 person hours)	February- April 2021; August 2021	All year
					Niche – Eight bird survey 2 ha (2.67 person hours)	March 2022	
Bondo	Six 20-minute 2-ha bird surveys were conducted across the Bondo IBRA subregion portion of the project footprint	Total effort: 3.33 person hours (200 minutes).	All candidate bird species with a focus on hollow dwelling bird species within project footprint.	Standard 20 minutes 2 ha bird surveys were conducted across the project footprint in areas with an abundance of flowering eucalypts.	Niche – Six bird survey 2 ha (3.33 person hours) (200 minutes)	January 2022	All year
Acoustic microbat surveys							
Bungonia	Ultrasonic recording devices were deployed in five locations across the Bungonia IBRA subregion portion of the project footprint.	Total effort: 72 trap nights.	Threatened microchiropteran bats	Cliff line habitat, gullies, on the edge of vegetated corridors (potential flyways) and riparian habitat.	Niche – Anabat deployment (72 trap nights)	October 2021; January – February 2022	October to March
Crookwell	Ultrasonic recording devices were deployed in three locations across the Crookwell IBRA subregion portion of the project footprint.	Total effort: 21 trap nights.	Threatened microchiropteran bats	Cliff line habitat, gullies, on the edge of vegetated corridors (potential flyways) and riparian habitat.	ELA – Anabat deployment (eight trap nights)	February 2021	October to March
					Niche – Anabat deployment (13 trap nights)	January – February 2022	
Murrumbateman	Ultrasonic recording devices were deployed in nine locations across the Murrumbateman IBRA subregion portion of the project footprint.	Total effort: 54 trap nights.	Threatened microchiropteran bats	Cliff line habitat, gullies, on the edge of vegetated corridors (potential flyways) and riparian habitat.	Niche – Anabat deployment (54 trap nights)	November 2021 – February 2022	October to March

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details	Survey date range	Optimal survey period
Inland Slopes	Ultrasonic recording devices were deployed in 12 locations across the Inland Slopes IBRA subregion portion of the project footprint.	Total effort: 151 trap nights.	Threatened microchiropteran bats	Cliff line habitat, gullies, on the edge of vegetated corridors (potential flyways) and riparian habitat.	ELA – Anabat deployment (63 trap nights)	March 2021; April 2021 (3 trap nights outside of recommended survey period)	October to March
					Niche – Anabat deployment (88 trap nights)	October 2021 – March 2022; April 2022 (1 trap night outside of recommended survey period)	
Snowy Mountains	Ultrasonic recording devices were deployed in 26 locations across the Snowy Mountains IBRA subregion portion of the project footprint.	Total effort: 109 trap nights.	Threatened microchiropteran bats	Cliff line habitat, gullies, on the edge of vegetated corridors (potential flyways) and riparian habitat.	ELA – Anabat deployment (100 trap night)	March 2021	October to March
					Niche – Anabat deployment (9 trap nights)	January 2022	
Bondo	Ultrasonic recording devices were deployed in two locations across the Inland Slopes IBRA subregion portion of the project footprint.	Total effort: 8 trap nights.	Threatened microchiropteran bats	Cliff line habitat, gullies, on the edge of vegetated corridors (potential flyways) and riparian habitat.	Niche – Anabat deployment (8 trap nights)	March 2022	October to March
Microbat harp trapping							

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details	Survey date range	Optimal survey period
Bungonia	Harp traps were deployed in two locations across the Bungonia IBRA subregion portion of the project footprint.	Total effort: 9 trap nights.	Microchiropteran bats (Southern Myotis, Large-eared Pied Bat, Little Bent-winged Bat and Large Bent-winged Bat)	Trapping targeted to flyways within vegetated areas, riparian areas or cliff lines within the project footprint.	Niche – Harp trapping (9 trap nights)	January 2022	October to March
Crookwell	No harp trapping undertaken.	N/A	N/A	N/A	N/A	N/A	N/A
Murrumbateman	Harp traps were deployed in 4 locations across the Murrumbateman IBRA subregion portion of the project footprint.	Total effort: 2 trap nights.	Microchiropteran bats (Southern Myotis, Large-eared Pied Bat, Little Bent-winged Bat and Large Bent-winged Bat)	Trapping targeted to flyways within vegetated areas, riparian areas or cliff lines within the project footprint.	Niche – Harp trapping (2 trap nights)	December 2021	October to March
Inland Slopes	Harp traps were deployed in 6 locations across the Inland Slopes IBRA subregion portion of the project footprint.	Total effort: 9 trap nights.	Microchiropteran bats (Southern Myotis, Large-eared Pied Bat, Little Bent-winged Bat and Large Bent-winged Bat)	Trapping targeted to flyways within vegetated areas, riparian areas or cliff lines within the project footprint.	Niche – Harp trapping (9 trap nights)	October - December 2021	October to March
Snowy Mountains	No harp trapping undertaken.	N/A	N/A	N/A	N/A	N/A	N/A
Bondo	No harp trapping undertaken.	N/A	N/A	N/A	N/A	N/A	N/A
Stagwatching							
Bungonia	5 stagwatching survey was undertaken within the Bungonia IBRA subregion portion of the project footprint.	Total effort: 5 person hours.	Candidate Cockatoos, Owls, Squirrel Glider and Greater Glider	Stag watches at hollow-bearing trees with hollows over 20 cm, from approximately 30 minutes before sunset to 30 minutes after sunset.	Niche – Stagwatching (5 person hours)	February 2022	**Glossy-Black Cockatoo:** January to September (breeding) **Gang-gang Cockatoo:** October to January (breeding) **Owls:** May to August (breeding), **Squirrel Glider and Greater Glider:** All year

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details	Survey date range	Optimal survey period
Crookwell	5 stagwatching surveys was undertaken within the Crookwell IBRA subregion portion of the project footprint.	Total effort: 7.97 person hours.	Candidate Cockatoos, Owls, Squirrel Glider and Greater Glider	Stag watches at hollow-bearing trees with hollows over 20 cm, from approximately 30 minutes before sunset to 30 minutes after sunset.	Niche – Stagwatching (7.97 person hours)	February- March 2022	**Glossy-Black Cockatoo:** January to September (breeding) **Gang-gang Cockatoo:** October to January (breeding) **Owls:** May to August (breeding) **Squirrel Glider and Greater Glider:** All year
Murrumbateman	8 stagwatching surveys were undertaken within the Murrumbateman IBRA subregion portion of the project footprint.	Total effort: 10.20 person hours.	Candidate Cockatoos, Owls, Squirrel Glider and Greater Glider	Stag watches at hollow-bearing trees with hollows over 20 cm, from approximately 30 mins before sunset to 30 minutes after sunset.	Niche – Stagwatching (10.20 person hours)	October - November 2021	**Glossy-Black Cockatoo:** January to September (breeding), **Gang-gang Cockatoo:** October to January (breeding), **Owls:** May to August (breeding), **Squirrel Glider and Greater Glider:** All year.
Inland Slopes	3 stagwatching surveys were undertaken within the Murrumbateman IBRA subregion portion of the project footprint.	Total effort: 3.18 person hours.	Candidate Cockatoos, Owls, Squirrel Glider, and Greater Glider	Stag watches at hollow-bearing trees with hollows over 20 cm, from approximately 30 minutes before sunset to 30 minutes after sunset.	Niche – Stagwatching (3.18 person hours)	November 2021	**Glossy-Black Cockatoo:** January to September (breeding) **Gang-gang Cockatoo:** October to January (breeding), **Owls:** May to August (breeding), **Squirrel Glider and Greater Glider:** All year
Snowy Mountains	6 stagwatching surveys were undertaken within the Snowy Mountains	Total effort: 7.15 person hours.	Candidate Cockatoos, Owls, Squirrel Glider, and Greater Glider	Stag watches at hollow-bearing trees with hollows over 20 cm, from	Niche – Stagwatching (7.15 person hours)	January 2022; March 2022	**Glossy-Black Cockatoo:** January to September (breeding)

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details	Survey date range	Optimal survey period
	IBRA subregion portion of the project footprint.			approximately 30 minutes before sunset to 30 minutes after sunset.			**Gang-gang Cockatoo:** October to January (breeding), **Owls:** May to August (breeding), Squirrel Glider and Greater Glider: All year
Bondo	No stagwatching was undertaken.	N/A	N/A	N/A	N/A	N/A	N/A
Nocturnal call playback							
Bungonia	2 x 30-minute Owl call playback surveys were conducted (at sites BY-010-00, and BY-016), with two observers in suitable habitat.	Total effort: 2 person hours	Candidate owls and Koala	Call broadcasting was undertaken in areas of suitable habitat for Candidate Owls and/or Koala.	Niche - Nocturnal call playback (2 person hours)	January - February 2022	Outside breeding period for Owls (winter)
Crookwell	3 x Owl call playback surveys were conducted in suitable habitat within the Crookwell IBRA subregion of the project footprint.	Total effort: 1.87 person hours	Candidate owls and Koala	Call broadcasting was undertaken in areas of suitable habitat for Candidate Owls and/or Koala.	Niche - Nocturnal call playback (1.87 person hours)	February- March 2022	Outside breeding period for Owls (winter)
Murrumbateman	4 x 30-minute Owl call playback surveys were conducted within the Murrumbateman IBRA subregion, within the project footprint and in suitable habitat.	Total effort: 3.75 person hours	Candidate owls and Koala	Call broadcasting was undertaken in areas of suitable habitat for Candidate Owls and/or Koala.	Niche - Nocturnal call playback (3.75 person hours)	November - December 2021; February 2022	Outside breeding period for Owls (winter)

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details	Survey date range	Optimal survey period
Inland Slopes	4 x 30-minute Owl call playback surveys were conducted within the Inland Slopes IBRA subregion, within the project footprint and in suitable habitat.	Total effort: 4.53 person hours	Candidate owls and Koala	Call broadcasting was undertaken in areas of suitable habitat for Candidate Owls and/or Koala.	Niche - Nocturnal call playback (4.53 person hours)	October - November 2021; January 2022	Outside breeding period for Owls (winter)
Snowy Mountains	4 x 30-minute Owl call playback surveys were conducted within the Inland Slopes IBRA subregion, within the project footprint and in suitable habitat.	Total effort: 5 person hours	Candidate owls and Koala	Call broadcasting was undertaken in areas of suitable habitat for Candidate Owls and/or Koala.	Niche - Nocturnal call playback (5 person hours):	January 2022; March 2022	Outside breeding period for Owls (winter)
Bondo	No nocturnal call playback undertaken.	N/A	N/A	N/A	N/A	N/A	N/A
Spotlighting							
Bungonia	7 spotlighting surveys were undertaken across the Bungonia IBRA subregion, within the project footprint.	Total effort: 10.03 person hours.	All relevant candidate species (Greater Glider, Squirrel Glider, and other candidate nocturnal fauna)	Spotlighting was undertaken on foot for a minimum of 1 km transects, targeting arboreal and terrestrial mammals and other nocturnal fauna.	ELA – Spotlighting (3.8 person hours)	May 2021	All year
					Niche – Spotlighting (6.23 person hours)	January-February 2022	
Crookwell	53 spotlighting surveys were undertaken across the Crookwell IBRA subregion, within the project footprint.	Total effort: 82.40 person hours.	All relevant candidate species (Greater Glider, Squirrel Glider, and other candidate nocturnal fauna)	Spotlighting was undertaken on foot for a minimum of 1 km transects, targeting arboreal and terrestrial mammals and other nocturnal fauna.	ELA – Spotlighting (59.67 person hours)	February - May 2021; July 2021	All year
					Niche – Spotlighting (22.73 person hours)	October 2021; January-March 2022	

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details	Survey date range	Optimal survey period
Murrumbateman	29 spotlighting surveys were undertaken across the Murrumbateman IBRA subregion, within the project footprint.	Total effort: 100.33 person hours.	All relevant candidate species (Greater Glider, Squirrel Glider, and other candidate nocturnal fauna)	Spotlighting was undertaken on foot for a minimum of 1 km transects, targeting arboreal and terrestrial mammals and other nocturnal fauna.	ELA – Spotlighting (24 person hours)	April 2021	All year
					Niche – Spotlighting (76.33 person hours)	October - December 2021; February 2022	
Inland Slopes	42 spotlighting surveys were undertaken across the Inland Slopes IBRA subregion, within the project footprint.	Total effort: 54.33 person hours.	All relevant candidate species (Greater Glider, Squirrel Glider, and other candidate nocturnal fauna)	Spotlighting was undertaken on foot for a minimum of 1 km transects, targeting arboreal and terrestrial mammals and other nocturnal fauna.	ELA – Spotlighting 38.4 person hours)	March-April 2021; July-August 2021	All year
					Niche – Spotlighting (15.93 person hours)	October-November 2021; January 2022; March 2022	
Snowy Mountains	29 spotlighting surveys were undertaken across the Snowy Mountains IBRA subregion, within the project footprint.	Total effort: 43.24 person hours.	All relevant candidate species (Greater Glider, Squirrel Glider, and other candidate nocturnal fauna)	Spotlighting was undertaken on foot for a minimum of 1 km transects, targeting arboreal and terrestrial mammals and other nocturnal fauna.	ELA – Spotlighting (27.47 person hours)	February - April 2021; August 2021	All year
					Niche – Spotlighting (15.77 person hours)	January 2022; March 2022	
Bondo	No spotlighting undertaken.	N/A	N/A	N/A	N/A		N/A
Remote cameras							
Bungonia	30 baited remote cameras were deployed (arboreal and terrestrial) across the Bungonia IBRA subregion, within the project footprint.	Total effort: 265 trap nights.	All relevant candidate species (Eastern Pygmy Possum, Greater Glider, Squirrel Glider, Koala and other candidate terrestrial fauna)	Baited remote cameras were set in pockets of good quality habitat, with half on the ground or near suitable ground refugia, and half arboreally deployed or in low in Banksias and other proteaceous subcanopy species.	ELA - Camera traps (105 trap nights): Terrestrially deployed (8 trap nights)	May 2021	All year
					Arboreal deployed (97 trap nights)		
					Niche – Camera traps (303 trap nights): Arboreal deployed (96 trap nights)	September-October 2021, January-February 2022	
					Terrestrially deployed (65 trap nights)		

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details		Survey date range	Optimal survey period
Crookwell	21 baited camera traps were deployed in ground habitat for a minimum of 183 trap nights across the project footprint, to target small mammals within the Crookwell IBRA subregion.	Total effort: 888 trap nights.	All relevant candidate species (Eastern Pygmy Possum, Greater Glider, Squirrel Glider, Koala and other candidate terrestrial fauna)	Baited remote cameras were set in pockets of good quality habitat, with half on the ground or near suitable ground refugia, and half arboreally deployed or in low in Banksias and other proteaceous subcanopy species.	ELA - Camera traps (587 trap nights)	Terrestrially deployed (151 trap nights):	February-May 2021; July-August 2021	All Year
						Arboreal deployed (436 trap nights):		
	68 baited camera traps were deployed in arboreal habitat (705 trap nights) across the project footprint (within Crookwell), to target threatened gliders, and other arboreal mammals.				Niche – Camera traps (301 trap nights)	Arboreal deployed (269 trap nights):	October 2021	
						Terrestrially deployed (32 trap nights):		
Murrumbateman	46 baited remote cameras were deployed (arboreal and terrestrial) across the Murrumbateman IBRA subregion, within the project footprint.	Total effort: 2,113 trap nights.	All relevant candidate species (Eastern Pygmy Possum, Greater Glider, Squirrel Glider, Koala and other candidate terrestrial fauna)	Baited remote cameras were set in pockets of good quality habitat, with half on the ground or near suitable ground refugia, and half arboreally deployed or in low in Banksias and other proteaceous subcanopy species.	ELA - Camera traps (408 trap nights)	Terrestrially deployed (202 trap nights):	April -May 2021	All year
						Arboreal deployed (206 trap nights):		
					Niche - Camera traps (1,705 trap nights)	Terrestrially deployed (765 trap nights):	October-November 2021; January - February 2022	
						Arboreal deployed (940 trap nights)	September-November 2021	
Inland Slopes	93 baited remote cameras were deployed	Total effort: 2,258 trap nights.	All relevant candidate species (Eastern Pygmy Possum,	Baited remote cameras were set in pockets of		Terrestrially deployed	March-May 2021	All year

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details		Survey date range	Optimal survey period
	(arboreal and terrestrial) across the Inland Slopes IBRA subregion, within the project footprint.		Greater Glider, Squirrel Glider, Koala and other candidate terrestrial fauna)	good quality habitat, with half on the ground or near suitable ground refugia, and half arboreally deployed or in low in Banksias and other proteaceous subcanopy species.	ELA - Camera traps (1,136 trap nights)	(646 trap nights):		
						Arboreal deployed (490 trap nights):	March-May 2021; August 2021	
					Niche – Camera traps (1,122 trap nights)	Arboreal deployed (915 trap nights):	October 2021-April 2022	
						Terrestrially deployed (207 trap nights):		
Snowy Mountains	61 baited remote cameras were deployed (arboreal and terrestrial) across the Snowy Mountains IBRA subregion, within the project footprint.	Total effort: 692 trap nights.	All relevant candidate species (Eastern Pygmy Possum, Greater Glider, Squirrel Glider, Koala and other candidate terrestrial fauna)	Baited remote cameras were set in pockets of good quality habitat, with half on the ground or near suitable ground refugia, and half arboreally deployed or in low in Banksias and other proteaceous subcanopy species.	ELA - Camera traps (375 trap nights)	Arboreal deployed (103 trap nights):	February - March 2021	All year
						Terrestrially deployed (272 trap nights):		
					Niche – Camera traps (317 trap nights)	Arboreal deployed (297 trap nights):	January 2022; November-December 2021	
						Terrestrially deployed (20 trap nights):	January 2022	
Bondo	4 baited remote cameras were deployed (arboreal and terrestrial) across the	Total effort: 155 trap nights.	All relevant candidate species (Eastern Pygmy Possum, Greater Glider, Squirrel Glider,	Baited remote cameras were set in pockets of good quality habitat, with half on the ground or near	Niche – Camera traps (155 trap nights)	Arboreal deployed (117 trap nights)	January 2022	All year

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details	Survey date range	Optimal survey period
	Bondo IBRA subregion, within the project footprint.		Koala and other candidate terrestrial fauna)	suitable ground refugia, and half arboreally deployed or in low in Banksias and other proteaceous subcanopy species.	Terrestrially deployed (38 trap nights)		
Koala SAT survey							
Bungonia	26 SAT plots were conducted across the Bungonia subregion in suitable Koala habitat.	Total effort: 1471.10 person hours (88,266 minutes)	Koala	Survey performed in accordance with SAT guidelines (Phillips & Callaghan 2011).	Niche SAT surveys (1471.10 person hours)	September-October 2021, January-February 2022	All year
Crookwell	2 SAT plots were conducted across the Crookwell IBRA subregion in suitable Koala habitat	Total effort: 3 person hours (180 minutes).	Koala	Survey performed in accordance with SAT guidelines (Phillips & Callaghan 2011).	Niche SAT surveys (3 person hours)	March 2022	All year
Murrumbateman	4SAT plot was undertaken within the Murrumbateman IBRA subregion in suitable Koala habitat within the project footprint.	Total effort: 6 person hours (360 minutes).	Koala	Survey performed in accordance with SAT guidelines (Phillips & Callaghan 2011).	Niche SAT surveys (6 person hours)	September 2021	All year
Inland Slopes	No SAT plots were conducted across the Inland Slopes IBRA subregion in suitable Koala habitat.	N/A	N/A	N/A	N/A	N/A	N/A
Snowy Mountains	3 SAT plots were conducted across the Snowy Mountains IBRA subregion in suitable Koala habitat (MA-002, MA-004, MA-007).	Total effort: 4.50 person hours (270 minutes).	Koala	Survey performed in accordance with SAT guidelines (Phillips & Callaghan 2011).	Niche SAT surveys (4.50 person hours)	May 2021	All year

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details	Survey date range	Optimal survey period
Bondo	2 SAT plots were conducted across the Bondo IBRA subregion in suitable Koala habitat. No signs of Koala presence identified.	Total effort: 3 person hours (180 minutes).	Koala	Survey performed in accordance with SAT guidelines (Phillips & Callaghan 2011).	Niche SAT surveys (3 person hours)	January 2022	All year
Golden Sun Moth habitat transects							
Crookwell	No survey required as species is not known to occur within this IBRA subregion, however one Golden Sun Moth habitat assessment transect was undertaken in one holding on the border of Crookwell and Murrumbateman.	Total effort: 1.5 person hours.	Golden Sun Moth	100 m transects were undertaken through areas of potential Golden Sun Moth habitat (grassland habitats).	One Golden Sun Moth habitat transects (1.5 person hours)	N/A	
Murrumbateman	139 Golden Sun Moth habitat assessment transects undertaken across the IBRA subregion.	Total effort: 197.55 person hours.	Golden Sun Moth	100 m transects were undertaken through areas of potential Golden Sun Moth habitat (grassland habitats).	139 Golden Sun Moth habitat assessments (197.55 person hours)	N/A	
Inland Slopes	72 Niche Golden Sun Moth habitat assessment transects undertaken across the IBRA subregion.	Total effort: 99.63 person hours.	Golden Sun Moth	100 m transects were undertaken through areas of potential Golden Sun Moth habitat (grassland habitats).	72 Golden Sun Moth habitat assessments (99.63 person hours)	N/A	
Snowy Mountains	No survey required as species is not known to occur within this IBRA subregion.	N/A	N/A	N/A	N/A	N/A	

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details	Survey date range	Optimal survey period
Bondo	No survey required as species is not known to occur within this IBRA subregion.	N/A	N/A	N/A	N/A	N/A	
Reptile searches							
Bungonia	5 reptile searches surveys were undertaken in suitable rocky habitat within the Bungonia IBRA subregion portion of the project footprint.	Total effort for Reptile searches 6.70 person hours (outside of recommended survey period).	Pink-tailed Legless Lizard, and Striped Legless Lizard	Rock rolling in accordance with the guidelines, was undertaken in suitable legless lizard habitat. Additional surveys of rocky outcrops to locate Broad-headed Snake throughout infrastructure areas if habitat present and within wider project footprint.	Niche (6.70 person hours)	January-February 2022 (outside of recommended survey period)	September to December
Crookwell	4 reptile searches surveys were undertaken in suitable rocky habitat within the Crookwell IBRA subregion portion of the project footprint.	Total effort for Reptile searches 9.73 person hours (outside of recommended survey period).	Pink-tailed Legless Lizard, and Striped Legless Lizard.	Rock rolling in accordance with the guidelines, was undertaken in suitable legless lizard habitat.	Niche (9.73 person hours)	February - March 2021 (outside of recommended survey period)	September to December
Murrumbateman	39 reptile searches surveys were undertaken in suitable rocky habitat within the Crookwell IBRA subregion portion of the project footprint.	Total effort for Reptile searches 51.97 person hours.	Pink-tailed Legless Lizard, and Striped Legless Lizard.	Rock rolling in accordance with the guidelines, was undertaken in suitable legless lizard habitat.	Niche (51.97 person hours)	November-December 2021; February- March 2022 (outside of recommended survey period)	September to December
Inland Slopes	30 reptile searches surveys were undertaken in suitable rocky habitat within the Crookwell IBRA subregion portion of the project footprint.	Total effort for Reptile searches 26.02 person hours.	Pink-tailed Legless Lizard, and Striped Legless Lizard.	Rock rolling in accordance with the guidelines, was undertaken in suitable legless lizard habitat.	ELA (50 minutes)	March 2021 (outside of recommended survey period)	September to December
					Niche (25.18 person hours)	November-December 2021; February- March	

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details	Survey date range	Optimal survey period
						2022 (outside of recommended survey period)	
Snowy Mountains	25 reptile searches surveys were undertaken in suitable rocky habitat within the Snowy Mountains IBRA subregion portion of the project footprint.	Total effort for Reptile searches 59 person hours.	Threatened reptiles (Pink-tailed Legless Lizard, and Striped Legless Lizard are not known to occur in this region).	Rock rolling in accordance with the guidelines, was undertaken in suitable legless lizard habitat.	ELA (3.83 person hours)	February 2021 (outside of recommended survey period)	September to December
					Niche (24.25 person hours)	January 2022; March 2022 (all outside of recommended survey period)	
Bondo	5 reptile searches surveys were undertaken in suitable rocky habitat within the Bondo IBRA subregion portion of the project footprint.	Total effort for Reptile searches 5.30 person hours.	Pink-tailed Legless Lizard, and Striped Legless Lizard.	Rock rolling in accordance with the guidelines, was undertaken in suitable legless lizard habitat.	Niche (5.30 person hours)	January 2022; March 2022 (all outside of recommended survey period	September to December
Frog census							
Bungonia	3 frog census surveys were undertaken within the Crookwell IBRA subregion portion of the project footprint.	Total effort: 3.70 person hours (222 minutes).	Booroolong Frog	Frog call playback (frog census) was undertaken in suitable aquatic habitats to elicit a call response from any frogs which may be present. Call broadcast was undertaken via a loudspeaker for a period of no less than 2 minutes and responses are typically heard within the first minute.	Niche (3.70 person hours)	January 2022	**Booroolong Frog:** October to December **Yellow-spotted Tree Frog:** November to December
Crookwell	16 frog census surveys were undertaken within the Crookwell IBRA subregion portion of the project footprint.	Total effort: 29.13 person hours.	Booroolong Frog Yellow-spotted Tree Frog.	Frog call playback (frog census) was undertaken in suitable aquatic habitats to elicit a call response from any frogs which may be	ELA (5 person hours)	January 2022	**Booroolong Frog:** October to December

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details	Survey date range	Optimal survey period
				present. Call broadcast was undertaken via a loudspeaker for a period of no less than 2 minutes and responses are typically heard within the first minute.	Niche (24.13 person hours)	February 2022	**Yellow-spotted Tree Frog:** November to December
Murrumbateman	31 frog census surveys were undertaken within the Murrumbateman IBRA subregion portion of the project footprint	Total effort: 45.57 person hours.	Booroolong Frog	Frog call playback (frog census) was undertaken in suitable aquatic habitats to elicit a call response from any frogs which may be present. Call broadcast was undertaken via a loudspeaker for a period of no less than 2 minutes and responses are typically heard within the first minute.	Niche (45.57 person hours)	November-December 2021; February 2022	**Booroolong Frog:** October to December
			Yellow-spotted Tree Frog.				**Yellow-spotted Tree Frog:** November to December
Inland Slopes	34 frog census surveys were undertaken within the Inland Slopes IBRA subregion portion of the project footprint.	Total effort: 6.66 person hours.	Booroolong Frog, Sloane's Froglet	Frog call playback (frog census) was undertaken in suitable aquatic habitats to elicit a call response from any frogs which may be present. Call broadcast was undertaken via a loudspeaker for a period of no less than 2 minutes and responses are typically heard within the first minute.	ELA (24.50 person hours)	July 2021	**Booroolong Frog:** October to December
					Niche (28.32 person hours)	November 2021; March 2022	**Sloane's Froglet:** July to August
Snowy Mountains	27 frog census surveys were undertaken within the Snowy Mountains IBRA subregion portion of the project footprint.	Total effort: 47.90 person hours)	Yellow-spotted Tree Frog	Frog call playback (frog census) was undertaken in suitable aquatic habitats to elicit a call response from any frogs which may be present. Call broadcast was undertaken via a	Niche (38.57 person hour)	January 2022	**Yellow-spotted Tree Frog:** November to December

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details	Survey date range	Optimal survey period
				loudspeaker for a period of no less than 2 minutes and responses are typically heard within the first minute.	ELA (9.33 person hours)		
Bondo	No frog census surveys were undertaken in Bondo.	N/A	N/A	N/A	N/A	N/A	N/A
Active frog searches							
Bungonia	No active frog searches were undertaken in Bungonia.	N/A	N/A	N/A	N/A	N/A	N/A
Crookwell	One active frog searches was undertaken within the Crookwell IBRA subregion portion of the project footprint.	Total effort: 3.03 person hours.	Primarily Booroolong Frog, and Yellow-spotted Tree Frog.	A visual search along a 500 m transects in breeding habitat along, around or through a suitable waterbody. Where there is insufficient habitat to accommodate a 500 m transect a pro-rata effort was applied to all available habitats being searched.	Niche (3.03 person hours)	January - February 2022; May 2022	**Booroolong Frog:** October to December **Yellow-spotted Tree Frog:** November to December
Murrumbateman	One active frog searches were undertaken within			A visual search along a 500 m transects in breeding	Niche (3.03 person hours)		

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details	Survey date range	Optimal survey period
	the Murrumbateman IBRA subregion portion of the project footprint.	Total effort: 3.03 person hours.	Primarily Booroolong Frog, and Yellow-spotted Tree Frog	habitat along, around or through a suitable waterbody. Where there is insufficient habitat to accommodate a 500 m transect a pro-rata effort was applied to all available habitats being searched.		October- December 2021	**Booroolong Frog:** October to December
							Yellow-spotted Tree Frog: November to December
Inland Slopes	No active frog searches were undertaken in Inland Slopes.	N/A	N/A	N/A	N/A	N/A	N/A
Snowy Mountains	3 active frog searches were undertaken within the Snowy Mountains IBRA subregion portion of the project footprint.	Total effort: 9 person hours.	Primarily Yellow-spotted Tree Frog.	A visual search along a 500 m transects in breeding habitat along, around or through a suitable waterbody. Where there is insufficient habitat to accommodate a 500 m transect a pro-rata effort was applied to all available habitats being searched.	ELA (3 person hours)	March 2021	**Yellow-spotted Tree Frog:** November to December
					Niche (6 person hours)	January 2022; March 2022	
Bondo	No Active frog searches were undertaken in Bondo.	N/A	N/A	N/A	N/A	N/A	N/A
Hair tubes							

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details		Survey date range	Optimal survey period
Bungonia	12 baited hair tubes were deployed (arboreal and terrestrial) across the Bungonia IBRA subregion, within the project footprint.	Total effort: 90 trap nights.	Eastern Pygmy Possum, Greater Glider, and Squirrel Glider.	Baited hair tubes arrays were set in pockets of good quality habitat, with half on the ground or near suitable ground refugia, and half arboreally deployed or in low in Banksias and other proteaceous subcanopy species.	ELA – Hair tubes (90 trap nights)	Arboreal hair tubes (70 trap nights)	May 2021	All year
						Terrestrial hair tubes (20 trap nights)		
Crookwell	61 baited hair tubes were deployed (arboreal and terrestrial) across the Crookwell IBRA subregion, within the project footprint.	Total effort: 454 trap nights.	Eastern Pygmy Possum, Greater Glider, and Squirrel Glider.	Baited hair tubes were set in pockets of good quality habitat, with half on the ground or near suitable ground refugia, and half arboreally deployed or in low in Banksias and other proteaceous subcanopy species.	ELA – Hair tubes (454 trap nights)	Arboreal hair tubes (357 trap nights)	February 2021; April-May 2021; July 2021	All year
						Terrestrial hair tubes (97 trap nights)	February 2021; April-May 2021	
Murrumbateman	18 baited hair tubes were deployed (arboreal and terrestrial) across the Murrumbateman IBRA subregion, within the project footprint.	Total effort: 372 trap nights.	Eastern Pygmy Possum, Greater Glider, and Squirrel Glider.	Baited hair tubes were set in pockets of good quality habitat, with half on the ground or near suitable ground refugia, and half arboreally deployed or in low in Banksias and other proteaceous subcanopy species.	ELA – Hair tubes (372 trap nights)	Arboreal hair tubes (198 trap nights)	April- May 2021	All year
						Terrestrial hair tubes (174 trap nights)		
Inland Slopes	72 baited hair tubes were deployed (arboreal and terrestrial) across the Inland Slopes IBRA subregion, within the project footprint.	Total effort: 1,166 trap nights.	Eastern Pygmy Possum, Greater Glider, and Squirrel Glider.	Baited hair tubes were set in pockets of good quality habitat, with half on the ground or near suitable ground refugia, and half arboreally deployed or in low in Banksias and other proteaceous subcanopy species.	ELA – Hair tubes (1,166 trap nights)	Arboreal hair tubes (503 trap nights)	March -May 2021	All year
						Terrestrial hair tubes (663 trap nights)		

IBRA subregion	Summary	Total survey effort	Target species	Habitat surveyed and other notes	Survey details		Survey date range	Optimal survey period
Snowy Mountains	43 baited hair tubes were deployed (arboreal and terrestrial) across the Snowy Mountains IBRA subregion, within the project footprint.	Total effort: 277 trap nights.	Eastern Pygmy Possum, Smoky Mouse, Greater Glider, and Squirrel Glider.	Baited hair tubes were set in pockets of good quality habitat, with half on the ground or near suitable ground refugia, and half arboreally deployed or in low in Banksias and other proteaceous subcanopy species.	ELA – Hair tubes (277 trap nights)	Arboreal hair tubes (71 trap nights) Terrestrial hair tubes (206 trap nights)	February- March 2021	All year
Bondo	12 baited hair tubes were deployed (arboreal and terrestrial) across the Bondo IBRA subregion, within the project footprint.	Total effort: 120 trap nights.	Eastern Pygmy Possum, Greater Glider, and Squirrel Glider.	Baited hair tubes were set in pockets of good quality habitat, with half on the ground or near suitable ground refugia, and half arboreally deployed or in low in Banksias and other proteaceous subcanopy species.	ELA – Hair tubes (120 trap nights)	Arboreal hair tubes (70 trap nights): Terrestrial hair tubes (50 trap nights)	February-March 2021	All year
Elliot trapping								
Snowy Mountains	84 baited Elliot traps were deployed on the ground within the Bago State Forest section of the alignment	Total effort: 252 trap nights	Smoky Mouse and Broad-toothed Rat	Potential habitat within PCT 639, 1196 and 953.	ELA- 84 baited Elliot traps deployed for three nights each.		April 2021	**Broad-toothed Rat:** October to May **Smoky Mouse:** September to April

4.7 Survey dates and conditions

Field surveys were undertaken over several separate campaigns from December 2018 to November 2022 as summarised in Table 4-18. Attachment 8 details weather observations (BOM, 2022) for the dates of field surveys. This data is intended to provide a general overview of weather conditions at the time of field survey. Given the broad geographic extent of the project, localised survey conditions may vary slightly from those documented.

Section 4.9 highlights important survey limitations as a result of observed weather conditions and other factors potentially influencing the outcome of the surveys.

Table 4-18: Field survey dates

Field survey activities	Date										
	Summer 2018 (Dec)	Summer 2019 (Dec)	Summer 2020 (Jan/Feb)	Spring 2020 (16 Oct-27 Nov)	Summer 2021 (22-26 Feb)	Autumn 2021 (1 Mar-28 May)	Winter 2021 (21 Jul – 12 Aug)	Spring 2021 (13 Sept – 30 Nov)	Summer 2021 (1 Dec-28Feb)	Autumn 2022 (1 Mar – 31 May)	Spring 2022 (1 Sep – 31 Nov)
Active frog search						ELA	ELA	Niche	Niche	Niche	
Anabat deployment					ELA	ELA	ELA	Niche	Niche	Niche	
BAM Plots				ELA	ELA		ELA	Niche	Niche		Niche
Burn area assessments				ELA	ELA						
Call playback								Niche	Niche	Niche	
Diurnal bird surveys				ELA	ELA	ELA	ELA	Niche	Niche	Niche	
Elliot traps						ELA					
Frog census										Niche	
Golden Sun Moth habitat assessment								Niche		Niche	Species expert
Hair tube sampling					ELA	ELA	ELA				
Harp trap								Niche	Niche	Niche	
Koala SPOT assessment								Niche	Niche	Niche	
Microbat survey			ELA								
Remote camera traps					ELA	ELA	ELA	Niche	Niche	Niche	
Rock rolling for threatened reptiles				ELA	ELA	ELA		Niche	Niche	Niche	
Spotlighting					ELA	ELA	ELA	Niche	Niche	Niche	
Stag watch								Niche	Niche	Niche	
Stick nest survey				ELA							
Targeted surveys for candidate threatened flora				ELA	ELA	ELA	ELA	Niche	Niche	Niche	
Targeted threatened orchid surveys	ELA	ELA									
Vegetation validation				ELA	ELA	ELA	ELA	Niche	Niche		Niche
Visual stream inspections targeting potential microbat habitat				ELA							

4.8 Aquatic habitat assessment methods

Aquatic habitats have been assessed primarily through a detailed desktop assessment of high-resolution aerial imagery and other data sources, augmented by opportunistic field assessment of aquatic habitats within accessible lands. The habitat-based assessment includes identification and mapping of any sensitive fluvial geomorphological features or significant aquatic ecological habitats in perennial or ephemeral streams within the project footprint. This approach is considered suitable given the limited scope of potential impacts to aquatic habitats associated with the project and low likelihood of impacts to any threatened aquatic species.

The desktop assessment of aquatic habitats has been designed to address project SEARs as well assessing biodiversity impacts of the project in relation to the two relevant aims of the FM Act, namely the conservation of threatened species, populations or ecological communities, as well the conservation of KFHs.

The desktop assessment initially identified all waterways that intersected with the project footprint. A desktop inspection of these waterways coupled with field observations was completed to achieve a general understanding of aquatic habitat conditions and potential existing catchment-wide impacts within the project footprint. Building on this preliminary overview, a specific assessment of potential impacts to streams within areas of potential threatened aquatic species distribution was completed, followed by an assessment of potential impacts to streams within areas mapped as being KFH (DPI 2022a).

4.8.1 Field aquatic habitat recording

Field teams collected relevant data on stream condition at streams with well-defined channels (generally a Strahler stream order of two or above) on an opportunistic basis, where access was available to Niche field teams. A total of 153 visual assessments of aquatic habitats were made during field surveys by Niche. Field observations included the completion of a proforma visual aquatic assessment form. Data collection involved the assessment of aquatic habitat features and landscape factors, including:

- topography
- water quality
- water level
- shade level
- fish habitat types
- aquatic habitat types
- disturbance
- stream width
- bank condition
- moss and algae cover
- land use
- riparian and aquatic vegetation
- stream substrates.

4.8.2 Desktop assessment of threatened aquatic species habitats

Indicative distribution mapping of threatened aquatic species (DPI 2022a) was reviewed to identify areas intersecting waterways in the project footprint. Instances where these indicative distributions of threatened aquatic species intersected with the project footprint were identified as ‘threatened aquatic species desktop assessment points’ and subject to further assessment.

One EPBC Act listed threatened aquatic species (Murray Cod [*Maccullochella peelii*]) that was not included in the indicative DPI Fisheries habitat distribution mapping (DPI 2022a) was identified as having the potential to occur within the project footprint. In this case, distribution information available through the PMST and the species Recovery Plan was used to guide the assessment.

The indicative distribution mapping provided in the fisheries spatial data portal DPI (2022a) is considered conservative. It is important to note that the indicative distribution mapping should not be considered to represent the known range or extent of occurrence of the species. These distributions are modelled and while they may include stream segments where the species has been recorded, individual records and associated information such as date and survey type are not made available. The indicative distribution modelling also includes stream segments where environmental conditions are the same as a stream segment where the species is known to occur (predicted occurrence based upon MaxEnt analysis, modelling that predicts species occurrences by identifying the greatest spread of distribution using limits of the environmental variables of locations where the species has been recorded), as well as expert opinion (DPI N.D., DPI 2016a).

The threatened aquatic species desktop assessment points are considered to represent potential habitats for threatened aquatic species and were also representative of the most sensitive aquatic habitats present with the project footprint. At each of these locations a specific desktop assessment was completed to describe habitat conditions and environmental stressors present. This desktop assessment included an assessment of:

- high resolution aerial imagery
- stream order mapping
- indicative threatened species distribution mapping (DPI 2022a)
- fish community status mapping (DPI 2022a), ranging between “Very Poor” and “Good”
- KFH mapping (DPI 2022a)
- assessment of channel form and flow status eg ephemeral, intermittent or perennial
- identification of habitat features eg aquatic macrophytes, riparian vegetation, coarse woody debris
- identification of condition factors or stressors eg landscape modification, dams, grazing, riparian clearing
- outcomes of available field assessments and geotagged photos.

The outcomes of the desktop assessment of threatened aquatic species desktop assessment point are provided in Section 10.1. Where relevant, the location and age of records as published in Lintermans (2007) were also considered. These descriptions were then assessed against the available information on the known range of the species and habitat requirements as published in available profiles, conservation documents and publications to assess the likelihood of species occurring and being impacted.

The desktop assessment was also used to identify whether any of these threatened aquatic species desktop assessment points would be sensitive receivers or significant habitats for threatened species that would warrant any further field investigation. The purpose of the field investigation would be to determine the presence of any threatened aquatic species or guide additional avoidance or mitigation measures. No sites warranting further field assessment were identified.

4.8.3 Desktop assessment of waterway crossings and Key Fish Habitats

The construction of waterway crossings associated with access tracks has been identified as the primary pathway of potential impact to aquatic habitats generally. The proposed access tracks would predominantly cross small streams (stream order of two or lower) within the project footprint.

The desktop assessment has utilised the most up to date indicative access track mapping provided by Transgrid. The exact locations of the waterway crossings within the project footprint may be subject to change (following detailed design). The point-based assessment provides a basis for the assessment of the waterways to be crossed as the most likely location of crossings, however conditions within the project footprint surrounding these points are also considered, in addition to observational and desktop data sources from the broader landscape. The findings should therefore not be considered as limited to the point of assessment, rather as representative of the stream section within the project footprint.

This desktop assessment included an assessment of the same factors applied in the desktop assessment of threatened aquatic species desktop assessment points. Namely, the list of all waterways that intersected the project footprint was filtered to identify those that have also been mapped as KFH by DPI (2022a). At each of these sites a specific desktop assessment was completed to identify whether any of these locations would be considered sensitive aquatic habitats or habitats for threatened species that would warrant further field investigation to guide additional avoidance or mitigation measures. It should be noted that first and second order streams on gaining stream networks, as well as farm dams on first and second order streams or unmapped gullies are not considered KFH unless identified as habitat of a threatened aquatic species (Fairfull 2013).

Additionally, an assessment against KFH assessment classification as detailed in Fairfull (2013) was conducted. This was completed to assign each site a classification of waterways for fish passage (CLASS) rating. This additional assessment assists in evaluating the importance and sensitivity of habitats and fish passage with regards to waterway crossings in accordance with relevant guidelines.

The outcomes of the desktop assessment of waterway crossings are provided in Section 10.3. No sites warranting further field assessment were identified.

Table 4-19: DPI CLASS classification and recommended crossing type (adapted from Fairfull 2013)

CLASS	Description of Key Fish Habitat (KFH)	Minimum recommended crossing type	Additional design information
CLASS 1	Major Key Fish Habitat - Marine or estuarine waterway or permanently flowing or flooded freshwater waterway (eg river or major creek), habitat of a threatened or protected fish species or 'critical habitat'.	Bridge, arch structure or tunnel.	Bridges are preferred to arch structures.
CLASS 2	Moderate Key Fish Habitat - Non-permanently flowing (intermittent) stream, creek or waterway (generally named) with clearly defined bed and banks with semi-permanent to permanent waters in pools or in connected wetland areas. Freshwater aquatic vegetation is present. TYPE 1 and 2 habitats present.	Bridge, arch structure, culvert or ford.	Bridges are preferred to arch structures, box culverts and fords (in that order).
CLASS 3	Minimal Key Fish Habitat - Named or unnamed waterway with intermittent flow and sporadic refuge, breeding or feeding areas for aquatic fauna (eg fish, yabbies). Semi- permanent pools form within the waterway or adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or other.	Culvert or ford.	Box culverts are preferred to fords and pipe culverts (in that order).
CLASS 4	Unlikely Key Fish Habitat - Waterway (generally unnamed) with intermittent flow following rain events only, little or no defined drainage channel, little or no flow or free standing water or pools post rain events (eg dry gullies or shallow floodplain depressions with no aquatic flora present).	Culvert, causeway or ford.	Culverts and fords are preferred to causeways (in that order).

4.8.4 Riparian corridors

A combination of hydro line spatial data (DPIE, 2018b) and digitisation from high resolution aerial imagery was used to map waterways within the project footprint. Any larger streams (typically stream order 3 and above) that deviated substantially from that mapped in the hydro line dataset within the project footprint were digitised following the channel morphology apparent in the aerial imagery. This included the use of polygons to map defined bank extents, rather than polylines to map the centreline of the stream. These layers were then combined to create a single waterway layer, the key aim being to better represent the extent of larger and more permanent streams within the project footprint.

Bank extents were mapped according to the accuracy of the high-resolution aerial imagery. Where complex geomorphic planforms exist (such as over-widened macro channels, benches, inset low flow channels or chain of ponds systems) typically the channel extent or wetted perimeter of streams under baseflow conditions was mapped. This represents an improved basis for the accurate mapping of waterfront land and VRZs for the larger and higher ecological value waterways. The primary focus of this mapping was to identify major rivers with significant bank width, which is most relevant for presenting accurate VRZs, rather than present an exhaustive coverage of all streams. On-line dams (dams that are part of existing stream networks or linked by channels) were included this waterway mapping, with off-line dams (isolated dams) excluded. The waterway layer was used as the basis of the waterfront land and VRZ mapping completed for the assessment.

Adopted riparian corridor VRZ widths for this assessment are those detailed in the *Guidelines for controlled activities on waterfront land - Riparian corridors* (NRAR, 2018), as these are required to be addressed by the project SEARs. The VRZs specified in NRAR (2018) are similar to those outlined in Attachment E of the BAM (DPIE, 2020a) (Table 4-20).

To further assess impacts to riparian corridors, native riparian PCTs were identified from a review of PCTs mapped within the project footprint, selecting those identified as being primarily formed by riparian vegetation. Total areas of native vegetation within the VRZs (all PCTs, excluding 0 - Not Native, 9996 - Not Native (Road), 9997 - Not Native (Waterbody), 9998 - Planted Vegetation) have also been considered. Details of the assessment are presented in Section 14.7.4.

Table 4-20: Riparian corridor widths (VRZs)

Stream order	Riparian corridor width in metres (each side of waterway)	
	BAM (DPIE, 2020a)*	NRAR (2018)**
Unmapped and 1st order streams	10	10
2nd order stream	20	20
3rd order stream	30	30
4th and 5th order streams and above	40	40
6th order stream and above	50	-
Wetland	20	40
Important wetland	50	40
Estuarine area	50	40

* If the top of the bank is defined, riparian buffer distances are measured on both sides of the stream. Otherwise, buffer distances are measured from the edge of the stream; they are only measured from the centre of the stream if the edge is not defined. If a stream has more than one bank on either side, the bank closest to the main channel is used.

** Waterfront land and VRZs include the channel zone and are measured from the highest bank of the river, lake or estuary.

4.9 Limitations

4.9.1 Land access

Private land access posed a considerable constraint to the assessment by restricting the location, number and timing of field surveys undertaken in many parts of the project footprint. Whilst the level of field survey is considered adequate for the purpose of informing project impacts, land access could not be facilitated for a large number of landholdings within the Tumut region. Section 4.10.2 outlines supplementary approaches to address information and data gaps within inaccessible landholdings or other lands where survey effort was considered insufficient to meet guideline requirements. An expert report was also used to inform the assessment for the Golden Sun Moth, as documented in Section 7.3.4 and Attachment 9.

4.9.2 Weather and season

Numerous plant and animal species are cryptic or difficult to detect. Some cryptic plant species are more easily detected at certain times of the year, such as during flowering events. Some fauna species can only be detected during certain seasons (eg migration patterns or intra-torpor periods). As such, for the species that could not be surveyed, potential presence was determined based on the suitability of validated or modelled habitat (based on PCT associations and other attributes) in the project footprint.

For some of the fauna survey methods detailed in Section 4.6, anomalous climatic conditions, such as higher than average rainfall totals throughout the summer survey season of 2021 may have influenced detectability. Field survey teams undertaking targeted surveys for nocturnal fauna, including harp trapping, spotlighting, call playback, frequently reported no or very little fauna activity due to sub-optimal weather conditions. Additionally, field teams had to abort their campaigns on more than one occasion due to worsening weather conditions which reduced overall survey effort. These limitations have been taken into account when making decisions around species credit species presence and absence.

The Golden Sun Moth flying season was significantly impacted by prolonged spring and summer rainfall. Across its entire range, very few moths were recorded flying with very limited survey days supporting suitable weather conditions for species activity. An expert report has been prepared to inform the assessment in lieu of targeted survey effort.

4.9.3 Project size and timeline

Due to the scale of the project, access, and timing constraints, repetition of some survey methods within each patch of suitable habitat was not possible. For instance, some survey methods that require multiple months between set-up and survey commencement (such as installation of artificial shelter sites for Striped Legless Lizard) were not considered possible for a project of this scale. Alternative survey methodologies were conducted (per the appropriate survey guidelines) (refer to Table 4-16), and in place of adequate assessment as determined by relative guidelines, a conservative approach was adopted, such as assuming species presence or engaging a species expert.

4.9.4 Bushfire impacts

The Dunn's Road bushfire occurred within the project footprint and surrounds during the 2019/2020 summer bushfire season. Areas of the project footprint that intersect the Snowy Mountains, Bondo and Inland Slopes IBRA subregions, were moderately to severely burnt according to field observations and FESM Mapping [DPE, 2020f]. The severity of the fire would have significantly influenced the ability of these areas to support threatened flora and fauna habitat within the survey period.

These limitations were addressed by applying specific guidelines for severely burnt areas (DPE, 2020e) and conducting surveys over a range of seasonal and climatic conditions to maximise seasonal coverage of survey effort and species detectability. This was also coupled with thorough analysis of candidate species' specific habitat requirements and employing a range of trapping and survey techniques. Refer to Chapter 9 for bushfire impacts and assessment considerations.

4.10 Land access constraints and supplementary assessment methods

This section provides further detail regarding land access constraints, property access prioritisation and supplementary assessment approaches adopted as a part of this BDAR to address information and data gaps as a result of land access issues or inadequate survey effort.

4.10.1 Land access constraints

Eco Logical Australia (ELA) and Niche-led ecologists have conducted field survey along the length of the alignment within accessible lands since December 2018. Access has generally increased (although some access has been revoked) as Transgrid have worked through the option selection process, which has involved consideration of constraints (including ecological constraints) and consultation with landowners. For each IBRA subregion intersecting the project footprint, the proportion of land access that could be facilitated for the purpose of field survey is summarised in Table 4-21 and shown in Figure 4-4 (Attachment 1).

Table 4-21: Field survey extent according to IBRA subregion

IBRA region	IBRA subregion	Project footprint (ha)	Survey extent (ha)	% project footprint surveyed in IBRA subregion
South-Eastern Highlands	Bungonia	387.93	360.17	93%
	Crookwell	1,132.65	793.81	70%
	Murrumbateman	1,381.49	1,217.75	88%
	Bondo	644.25	554.75	86%
NSW South-Western Slopes	Inland Slopes	4,442.11	2,279.78	51%
Australian Alps	Snowy Mountains	565.63	544.12	96%
	Total	**8,211.43**	**5,140.38**	**67%**

There was generally a scattering of properties throughout all IBRA subregions that could not be accessed for field survey. These lands were generally surrounded by good levels of survey access allowing for the extrapolation of existing field data to inform the assessment and mapping of biodiversity values. Within the Inland Slopes IBRA subregion however, a large cluster of properties within the Tumut region could not be accessed for field survey resulting in a considerable data gap.

To assist Transgrid to strategically approach landowners for field survey access, a prioritisation process was implemented to rank properties according to their priority for field survey access. Properties were assigned a priority level from low to very high according to the following criteria:

- Ecological value, including a review of aerial imagery to determine the level of vegetative intactness and a review of BioNet records (DPE, 2022) to confirm the likely location of threatened flora and fauna species. Sites identified as supporting intact vegetation and historic records for threatened species were assigned to the highest priority level.
- Property size, with larger properties offering a greater level of survey coverage within the project footprint assigned a higher priority over smaller sites.
- Landscape survey coverage, with sites within the Tumut region predominantly assigned a higher priority given inaccessible lands within other regions were generally more interspersed throughout the project footprint.

Access to an additional 265.62 hectares (three per cent) of the project footprint was negotiated based on this approach with vegetation zone mapping, fauna habitat assessment, hollow mapping and BAM plot surveys undertaken within these lands in September 2022.

Priorities for additional survey would be based on: potential conservation value as identified through vegetation and habitat mapping for threatened species; and to address data gaps with regard to geographic and landform/habitat coverage. Survey would be conducted either post EIS or as part of pre-construction activities. Section 4.10.2 details the supplementary field and desktop-based methods implemented as a part of this BDAR to classify and map biodiversity values and assess likely project impacts within inaccessible lands and other areas where survey effort was insufficient/compromised.

4.10.2 BDAR supplementary assessment methods

Desktop-based supplementary assessment methods implemented as a part of this BDAR to address information and data gaps are outlined in Table 4-22. Supplementary field survey activities undertaken to support these analyses included:

- Light Detection and Ranging (LiDAR) survey incorporating high resolution aerial imagery to support vegetation and habitat mapping, vegetation height modelling and the development of avoidance strategies
- over-the-fence surveys from public roads, existing transmission line easements and accessible private properties to inform constraints within adjacent lands that could not be directly accessed for survey.

Table 4-22: Supplementary assessment methods supporting the preparation of this BDAR

Component of the assessment	Supplementary methods	Details of approach	Limitations and assumptions
Vegetation zone mapping	Vegetation zone mapping	Desktop extrapolation of existing datasets (Section 4.5.1), field-based vegetation zone mapping within nearby lands, notes and observations from over the fence surveys and review of high-resolution aerial imagery was utilised to delineate and map vegetation zones within inaccessible lands. Additionally, geology, topography, canopy density, surrounding land use, Category 1 exempt land mapping and the survey team's knowledge from nearby surveyed areas, was used to inform PCT and condition assignment.	PCTs, condition classes and associated VI scores may vary from that present on the ground. However, a conservative approach was broadly adopted whereby a high condition class was generally adopted unless data and existing knowledge of the surrounding locality was available to refine this any further. For example, derived grasslands and thinned grassy woodlands were generally in low to very low condition within lands subject to agricultural land use and Category 1 exempt lands.
Threatened species habitat suitability	Desktop mapping of surface rock	Surface rock was mapped for the project footprint by means of a review of high-resolution aerial imagery and field data. Surface rock was generally mapped for all lands supporting areas of visible surface rock greater than 5 by 5 m. This is considered an appropriate scale for the mapping of suitable habitats for candidate threatened species.	Surface rock could not be clearly delineated from aerial imagery within lands supporting tree canopy cover. As such, surface rock was assumed present within these areas.
	Desktop mapping of tree hollows and old growth trees	Data informing the location of hollow-bearing and old-growth trees was collected for all accessible lands, as follows: Point location of hollow-bearing trees were recorded wherever possible, incorporating the collection of the following data: • Tree species • Condition • Number of hollows • Hollow(s) size classes (cm) • Hollow(s) type and location • Hollow(s) height from the ground (m) • Signs of use • Trunk DBH (cm). Where hollow-bearing trees were too dense to map efficiently, polygon data was collected to map the hollow size classes and approximate density of tree	It is possible that hollow densities assigned to inaccessible lands may vary from that on the ground. All hollow size classes were assumed present within vegetated lands that could not be accessed. This is likely to have resulted in a significant over-representation of suitable habitats for hollow-dependent candidate threatened fauna species, particularly within the Inland Slopes IBRA subregion which supported the largest proportion of inaccessible lands.

Component of the assessment	Supplementary methods	Details of approach	Limitations and assumptions
		hollows present. More specifically this included the collection of the following data: • Presence of hollows • Hollows per ha (0-5 cm) • Hollows per ha (5-10 cm) • Hollows per ha (10-20 cm) • Hollows per ha (>20 cm) • Number of large old trees per ha. Where land access could not be facilitated, the following data was used to inform the presence/ absence of hollow-bearing and/ or old-growth trees: • High resolution aerial imagery was used to delineate areas of woody vegetation • LiDAR data was used to inform vegetation height and lands likely to support a tree canopy layer. • Vegetation zone mapping and BAM plot data gathered from accessible lands was used to inform the likely floristics and age class of the canopy layer. • Tree hollows of all size classes were assumed present within vegetation zones identified as supporting a tree canopy layer and for which the age class and floristics was likely to support tree hollow development. • Hollow density estimates were applied based on observations from accessible lands.	
	Mapping of perennial and non-perennial stream habitats	Publicly available hydrolines and waterbody spatial data layers (NSW DPI 2022) were used to delineate the extent of perennial/ non-perennial stream habitats and dams across the entire alignment. These were cross-referenced with high-resolution aerial imagery and aquatic habitat assessment data collected throughout the broader footprint to characterise the nature and condition of stream environments likely present.	Mapped stream locations may vary slightly from that present on the ground.
	Mapping of potential karst and cliffines habitats	Potential karst and cliffline habitats that may offer suitable roosting opportunities for candidate microchirpoteran species were mapped using the approach documented below. These sites were ground-truthed to confirm the presence/absence of roosts within accessible lands. Where lands could not be accessed, microbat breeding within these habitats has been assumed. **Karst mapping** Karst mapping involved a review of BioNet (2022) records and literature review to establish known bat roost sites within the broader locality (within 50 km of the project footprint) including the following data sources: • Geoscience Australia (including caves mapping, Geoscience Australia 2006) datasets. • Scientific literature on known karst sites, age, and formation processes	Areas of potential karst and clifflines were determined based on suitable regional geological mapping, API, elevation modelling, and nearby records. Assumptions regarding the location of potential karst and cliff lines are considered relatively accurate. However, these features could not be ground-truthed within some parts of the alignment and as such there is potential for mapping errors.

Component of the assessment	Supplementary methods	Details of approach	Limitations and assumptions
		• NSW Seamless Geology (Department of Regional New South Wales 2019) • Contour mapping to determine areas where there were obvious high topographic relief/cliff line areas. Regional karst information was overlayed with known cave / roost locations (eg, Church Cave, Wee Jasper), and the NSW Seamless Geology layer. Where similar geologies occurred within the project footprint to confirmed cave/roost sites (eg, Yarrangobilly, Bungonia and Wee Jasper) or landscapes containing carbonate bedrocks with a similar deposition age (usually limestone, dolomite, or marble) were identified, these landscapes were filtered, refined, and saved as separate layers referred to as "Karst Geology". A Digital Elevation Model (DEM) was developed using 10 m contour mapping and ortho tiles. Areas considered "high potential" for karst formations were those with a slope greater than 30 degrees and intersecting the Karst Geology layer (above). The polygons produced by the intersection of slopes greater than 30 degrees and karstic geologies were reviewed individually using high-resolution aerial imagery, a review of nearby bat records (BioNet 2022), and on-the-ground data collection (habitat mapping, survey results, vegetation mapping, etc). Polygons were stratified as low, moderate, or high potential for karsts based on multiple lines of evidence (eg presence of nearby records, availability, and quality of habitat based on field data, photos, lithology, deposition age, and aerial interpretation showing signs of cliffs, uplift or other signs of metamorphism). This method of determining areas of karstic landscapes was developed based on the knowledge of Australian karsts typically having distinctive topography in which the landscapes are largely shaped by the dissolution of carbonate bedrocks. This process results in unusual surface and subsurface features ranging from sinkholes, vertical shafts, disappearing streams, and springs, to complex underground drainage systems and caves (Magee 2009, Spate and Baker 2018). Further, Bent-winged bats are known to occupy caves and vertical shafts, with a large, domed chamber providing warm and humid conditions to facilitate growth of the young (like a humidi-crib) (Dwyer and Hamilton-Smith 1965). **Cliff line mapping** For cliff line mapping within the project footprint, a DEM was developed using 5 m contour mapping and orthotiles. Areas considered high potential for overhangs were those with a slope greater than 45 degrees. The polygons produced by the slope filter were reviewed individually using high-resolution aerial imagery, review of nearby bat records (BioNet 2022)	

Component of the assessment	Supplementary methods	Details of approach	Limitations and assumptions
		and on-the-ground data collection (habitat mapping, survey results, vegetation mapping etc). Polygons were considered high potential to support cliff line habitat if there was: • presence of nearby (within 10 km) cave-dependant bat records (BioNet 2022) • presence of cliff line habitat, and nearby suitable foraging resources endorsed by field data, and photos • aerial interpretation showing signs of cliffs, steep gullies etc. Cliff line modelling was developed to identify potential roost sites for Large-eared Pied Bat. The closest known maternity sites for the Large-eared Pied bat includes a granitic mine tunnel in northern New South Wales (Dwyer 1966a) (250 km north of the project footprint), and another sandstone cave in central New South Wales with a low ceiling providing stable temperatures at approximately 15º C (Pennay 2008) (360 km north of the project footprint). At both sites, clusters of bats were observed roosting in ceiling indentations or cracks. No known maternity roosts, or species records for Large-eared Pied Bat occur within the project footprint, or within 10 km of the project footprint. However, as a precautionary approach for this species, cliffline habitat has been mapped (determined by API, field collected data, geological mapping and a DEM using 10-m interval contour mapping).	
	Identification of potential artificial roosts	Potential artificial roost sites (culverts and bridges) were identified by performing an intersection analysis in ArcGIS between the NSW Road Segment and Hydrology (Strahler order greater than or equal to 3) layers within the project footprint. In line with the TBDC (2022), which states for Large Bent-winged Bat, Little Bent-winged Bat, and Southern Myotis, species polygon boundaries should have a 100 m radius buffer around an accurate GPS point location centred on the cave/feature entrance. A 100 m buffer was then applied to the locations where the roads, waterways and project footprint intersected to determine potential artificial roosting habitat for Large Bent-winged Bat, Little Bent-winged Bat, and Southern Myotis. Buffered features were reviewed individually using high-resolution aerial imagery, a review of nearby bat records, and on-the-ground data collection (habitat mapping, survey results etc). The data was then appended into the fauna habitat layer, for attributes to be used in Large Bent-winged Bat, Little Bent-winged Bat, and Southern Myotis species habitat mapping.	Mapped culvert and bridge locations may vary slightly from that present on the ground.
Bushfire impacts	Identifying severely burnt vegetation	FESM mapping (DPIE, 2020f) was used to inform the extent of severely burnt vegetation within inaccessible lands.	Field assessment data collected from accessible lands is considered sufficient to inform the nature of

Component of the assessment	Supplementary methods	Details of approach	Limitations and assumptions
			bushfire impacts to vegetation communities and associated threatened species. Whilst the extent of bushfire impacts could not be ground-truthed for inaccessible lands, field survey activities suggested the FESM mapping was generally representative of impacts observed on the ground.

5 Landscape context

This chapter addresses the landscape context of the project in accordance with Section 3 of the BAM (DPIE, 2020a). Landscape features that occur within the landscape assessment area (ie within a 500 metre buffer for linear developments) are detailed in Section 5.2 below. These are presented separately in relation to each of the IBRA subregions that intersect the landscape assessment area (Section 5.1).

5.1 IBRA regions and subregions

The Landscape assessment for the project intersects three IBRA regions and six IBRA subregions, as detailed in Table 5-1 and shown in Figure 5-1 (Attachment 1). Almost half of the project footprint (46 per cent) occurs within the Inland Slopes subregion.

Table 5-1: IBRA regions and subregions

IBRA region	IBRA subregion	Extent within the landscape assessment area (ha)	Landscape assessment area (%)
South-Eastern Highlands	Bondo	4,466.13	9.5%
	Bungonia	2,359.15	5%
	Crookwell	7,012.98	15%
	Murrumbateman	8,223.84	17.6%
NSW South-Western Slopes	Inland Slopes	21,400.75	45.9%
Australian Alps	Snowy Mountains	3,092.02	6.6
Total		**46,554.86 ha**	**100%**

5.2 Landscape features

This section outlines the landscape features relevant to each IBRA subregion within the landscape assessment area (refer to Table 5-2 to Table 5-7). These have been used to inform the suitability of habitats for threatened species. Landscape features identified for each IBRA subregion are shown in Figure 5-1 (Attachment 1).

5.2.1 Bungonia IBRA subregion

Table 5-2: Landscape features of the Bungonia IBRA subregion

Landscape features	Description
NSW (Mitchell) Landscapes	Crookwell Basalts and Sands - 194.73 ha Rockley Plains - 966.88 ha Wollondilly - Bindook Tablelands and Gorges – 1,197.54 ha
Rivers, streams and estuaries and Strahler stream order	Within the Bungonia IBRA subregion there are 229 first order, 220 second order, 159 third order and 164 fourth order waterways.
Wetlands within and adjacent to the project footprint	The NSW Wetlands (DPE, 2010) dataset identifies one unnamed dam within the Bungonia IBRA subregion.
Connectivity features	Patches of woodland and forest within the project footprint connect to larger areas of native vegetation in Tarlo River National Park to the south of the alignment.
Karst, caves, crevices, cliffs, rocks and other geological features of significance	NSW Seamless Geology (Department of Regional NSW, 2022) suggests the occurrence of the following soil types within the Bungonia portion of the project footprint: • Alluvial Soils - Medium Textured (Loams, Clay Loams) • Kraznozems • Lithosols • Soloths Yellow Podzolic Soils - less fertile (granites and metasediments). These occur over the following rock groups recorded in the landscape assessment: • Adaminaby Group • Alluvium • Bendoc Group • Bindook Group • Colluvium • Crookwell Volcanic Complex • Lambie Group • Mount Fairy Group • Residual deposits. One area of limestone outcrop potentially supporting caves and crevices was identified. No cliffs were noted in the project footprint during field surveys, however areas of minor rock outcrops (ranging from 0.2% to 30% cover) and areas of loose surface rock (with rock cover ranging from 0.1% to 40%) were recorded.
Areas of Outstanding Biodiversity Value (AOBVs)	There are no Areas of Outstanding Biodiversity Value within the Bungonia project footprint and surrounds.

5.2.2 Crookwell IBRA subregion

Table 5-3: Landscape features of the Crookwell IBRA subregion

Landscape features	Description
NSW (Mitchell) Landscapes	Crookwell Basalts and Sands – 1,398.36 ha Gundary Plains - 999.17 ha Gunning Hills - 85.94 ha Oberon - Kialla Granites – 1,033.46 ha Rockley Plains – 2,591.14 ha Towrang Ranges - 904.90 ha
Rivers, streams and estuaries and Strahler stream order	Within the Crookwell IBRA subregion there are 328 first, 288 second, 333 third, 128 fourth and 215 fifth order waterways.
Wetlands within and adjacent to the project footprint	The NSW Wetlands dataset identifies one reservoir (Pejar Dam) mapped within the Crookwell IBRA subregion.
Connectivity features	The majority of the Crookwell IBRA subregion is cleared. In the southern section of the landscape assessment, there are patches of disconnected woodland. This woodland is separated from Abercrombie River State Conservation Area and Nuggetty State Conservation Area in the north by cleared farmland.
Karst, caves, crevices, cliffs, rocks and other geological features of significance	NSW Seamless Geology (Department of Regional NSW, 2022) suggests the occurrence of the following soil types within the Crookwell portion of the landscape assessment area: • Chernozems • Chocolate Soils • Kraznozems • Lithosols • Red Earths - more fertile (volcanics and granodiorites) • Red Podzolic Soils - more fertile (volcanics and granodiorites) • Solodic Soils • Soloths • Water • Weisenboden • Yellow Earths • Yellow Podzolic Soils - less fertile (granites and metasediments) • Yellow Podzolic Soils - more fertile (volcanics and granodiorites). These occur over the following rock groups recorded in the landscape assessment area: • Adaminaby Group • Alluvium • Bendoc Group • Bishopthorpe Suite • Campbells Group • Colluvium • Crookwell Volcanic Complex • Gunning Suite • Lambie Group • Mount Fairy Group • Parkesbourne Suite • Residual deposits • Turrallo Suite. No karst, crevices, caves or cliffs were noted in the landscape assessment area during field surveys, however one area containing boulders and areas of minor rock outcrops (ranging from 0.2% to

Landscape features	Description
	10% cover) and areas of loose surface rock (with rock cover ranging from 0.1% to 40%) were recorded.
AOBVs	There are no Areas of Outstanding Biodiversity Value within the Crookwell project footprint and surrounds.

5.2.3 Murrumbateman IBRA subregion

Table 5-4: Landscape features of the Murrumbateman IBRA subregion

Landscape features	Description
NSW (Mitchell) Landscapes	Boorowa Volcanics – 2,298.53 ha Burrinjuck Ridges - 823.48 ha Dalton Hills – 2,883.18 ha Doura Volcanics - 10.61 ha Gundary Plains - 2.38 ha Gunning Hills - 881.35 ha Marilba Range – 1,117.72 ha Upper Lachlan Channels and Floodplains - 176.98 ha Upper Murrumbidgee Gorge - 29.60 ha
Rivers, streams and estuaries and Strahler stream order	Within the Murrumbateman IBRA subregion there are 269 first, 236 second, 198 third, 136 fourth, 150 fifth and 60 sixth order waterways.
Wetlands within and adjacent to the project footprint	The NSW Wetlands dataset does not identify any wetlands mapped within the Murrumbateman IBRA subregion.
Connectivity features	The majority of the Murrumbateman IBRA subregion is cleared. Within the landscape assessment area there are patches of disconnected woodland, which is separated by cleared farmland from Brindabella National Park in the west.
Karst, caves, crevices, cliffs, rocks and other geological features of significance	NSW Seamless Geology (Department of Regional NSW, 2022) suggests the occurrence of the following soil types within the Murrumbateman portion of the landscape assessment area: • Lithosols • Red Brown Earths • Solodic Soils • Yellow Earths • Yellow Podzolic Soils - less fertile (granites and metasediments). These occur over the following rock groups recorded in the landscape assessment area: • Adaminaby Group • Alluvium • Bendoc Group • Black Range Group • Colluvium • Douro Group • Gunning Suite • Hattons Corner Group • Margules Group • Residual deposits • Unassigned Devonian intrusions. No karst, crevices, caves or cliffs were noted in the landscape assessment area during field surveys, however two areas containing boulders and areas of minor rock outcrops (ranging from 0.2% to 50% cover) and areas of loose surface rock (with rock cover ranging from 0.1% to 80%) were recorded.
AOBVs	There are no Areas of Outstanding Biodiversity Value within the Murrumbateman project footprint and surrounds.

5.2.4 Inland Slopes IBRA subregion

Table 5-5: Landscape features of the Inland Slopes IBRA subregion

Landscape features	Description
NSW (Mitchell) Landscapes	Adelong Granite Ranges – 4,384.03 ha Adrah Hills and Ranges – 2,351.62 ha Boorowa Volcanics – 1,769.38 ha Burrinjuck Ridges - 182.64 ha Carabost Hills and Ranges – 1,659.06 ha Coffin Rock Granite Hills - 549.78 ha Cootamundra - Tumut Serpentinite and Ultramafics - 398.79 ha Doura Volcanics – 1.426.71 ha Minjary Hills and Ranges – 2,349.52 ha Mt Bundarbo Basalt Caps - 40.34 ha Murrumbidgee - Tarcutta Channels and Floodplains – 2,159.55 ha Tooma Granite Ranges - 997.67 ha Tumut Channels and Floodplain - 333.82 ha Upper Murrumbidgee Gorge - 119.20 ha Wonga Hills and Ranges - 327.83 ha Young Hills and Slopes – 2,350.81 ha
Rivers, streams and estuaries and Strahler stream order	Within the Inland Slopes IBRA subregion there are 1,064 first, 1,020 second, 588 third, 532 fourth, 360 fifth, 180 sixth, 49 seventh, 24 eighth and 45 ninth order waterways.
Wetlands within and adjacent to the project footprint	The NSW Wetlands dataset identifies two unnamed wetlands mapped within the Inland Slopes IBRA subregion.
Connectivity features	The Inland Slopes IBRA subregion is predominantly cleared farmland. In the south of the Subregion there is connectivity to Green Hills State Forest, and in the north, there is connectivity to Red Hill State Forest. The Subregion also maintains some connectivity to Tumut State Forest and larger patches of vegetation in the neighbouring subregions.
Karst, caves, crevices, cliffs, rocks and other geological features of significance	NSW Seamless Geology (Department of Regional NSW, 2022) suggests the occurrence of the following soil types within the Inland Slopes portion of the landscape assessment area: • Alluvial Soils - Light Sandy Textured (Sands to Sandy Loams) • Alluvial Soils - Medium Textured (Loams, Clay Loams) • Brown Podzolic Soils • Euchrozems • Grey, Brown and Red Clays • Kraznozems • Lithosols • Non-Calcic Brown Soils • Red Brown Earths • Red Earths - less fertile (granites and metasediments) • Red Podzolic Soils - less fertile (granites and metasediments) • Red Podzolic Soils - more fertile (volcanics and granodiorites) • Solodic Soils • Soloths • Yellow Earths • Yellow Podzolic Soils - less fertile (granites and metasediments). These occur over the following rock group suits recorded in the landscape assessment area: • Adaminaby Group • Alluvium

Landscape features	Description
	• Boggy Plain Suite • Bogong Suite • Colluvium • Coolac Ophiolite Suite • Douro Group • Hattons Corner Group • Residual deposits • Snowy Mountains Volcanic Complex • Tom Groggin Suite • Unassigned Central Lachlan Silurian Granites • Unassigned Devonian intrusions • Unassigned Maragle Batholith units • Unassigned Palaeozoic intrusions • Ungrouped Central Lachlan Silurian units • Ungrouped Mt Foster-Tumut Zone units • Young Suite. One area of limestone outcrop potentially supporting caves and crevices was identified. No cliffs were noted in the landscape assessment area during field surveys, however areas of minor rock outcrops (ranging from 0.1% to 50% cover) and areas of loose surface rock (with rock cover ranging from 0.1% to 70%) were recorded.
AOBVs	There are no Areas of Outstanding Biodiversity Value within the Inland Slopes project footprint and surrounds.

5.2.5 Bondo IBRA subregion

Table 5-6: Landscape features of the Bondo IBRA subregion

Landscape features	Description
NSW (Mitchell) Landscapes	Adelong Granite Ranges - 838.92 ha Adrah Hills and Ranges - 71.82 ha Cabramurra - Kiandra Basalt Caps and Sands - 143.93 ha Carabost Hills and Ranges - 508.69 ha Cootamundra - Tumut Serpentinite and Ultramafics - 3.07 ha Minjary Hills and Ranges - 877.66 ha Mt Bundarbo Basalt Caps - 167.75 ha Tooma Granite Ranges – 1,156.89 ha Young Hills and Slopes - 697.41 ha
Rivers, streams and estuaries and Strahler stream order	Within the Bondo IBRA subregion there are 232 first, 182 second, 126 third, 140 fourth, 65 fifth and 78 sixth order waterways.
Wetlands within and adjacent to the project footprint	The NSW Wetlands dataset does not identify any wetlands mapped within the Bondo IBRA subregion.
Connectivity features	The landscape assessment area in the Bondo IBRA subregion is almost entirely vegetated. It is highly connected to Bago State forest and Maragle Native Reserve in the west and Batlow State forest in the east. There is some connectivity to surrounding reserves, including Mannus State forest, Red Hill State forest, Green Hills State forest and unnamed adjoining vegetation.
Karst, caves, crevices, cliffs, rocks and other geological features of significance	NSW Seamless Geology (Department of Regional NSW, 2022) suggests the occurrence of the following soil types within the Bondo portion of the landscape assessment area: • Alluvial Soils - Medium Textured (Loams, Clay Loams) • Euchrozems • Kraznozems • Lithosols • Red Brown Earths • Red Earths - less fertile (granites and metasediments) • Red Podzolic Soils - less fertile (granites and metasediments) • Red Podzolic Soils - more fertile (volcanics and granodiorites). These occur over the following rock group suits recorded in the landscape assessment area: • Adaminaby Group • Alluvium • Bendoc Group • Colluvium • Coolac Ophiolite Suite • Residual deposits • Snowy Mountains Volcanic Complex • Tom Groggin Suite • Unassigned Devonian intrusions • Unassigned Maragle Batholith units • Ungrouped Central Lachlan Silurian units • Ungrouped Mt Foster-Tumut Zone units • Young Suite. One area of limestone outcrop potentially supporting caves and crevices was identified. No cliffs were noted in the landscape assessment area during field surveys, however one potential overhang (45°+) was identified by the DEM. Areas of minor rock outcrops (ranging from 5% to 10% cover) and areas of loose surface rock (with rock cover ranging from 0.1% to 10%) were recorded.
AOBVs	There are no Areas of Outstanding Biodiversity Value within the Bondo project footprint and surrounds.

5.2.6 Snowy Mountains IBRA subregion

Table 5-7: Landscape features of the Snowy Mountains IBRA subregion

Landscape features	Description
NSW (Mitchell) Landscapes	Cabramurra - Kiandra Basalt Caps and Sands - 861.73 ha Tooma Granite Ranges – 2,230.29 ha
Rivers, streams and estuaries and Strahler stream order	Within the Snowy Mountains IBRA subregion there are 135 first, 130 second, 132 third, 88 fourth and 10 fifth order waterways.
Wetlands within and adjacent to the project footprint	The NSW Wetlands dataset does not identify any wetlands mapped within the Snowy Mountains IBRA subregion. There are five bogs and/or fens mapped which were ground-truthed during the field survey (Section 6.5.5).
Connectivity features	Most of the Snowy Mountains comprises woodland, native forests, and pine forests. In the south, there is connectivity to Maragle State forest and Bago State forest. This Subregion neighbours the Bondo Subregion and the Australian Capital Territory, both of which are substantially vegetated and maintain further connectivity.
Karst, caves, crevices, cliffs, rocks and other geological features of significance	NSW Seamless Geology (Department of Regional NSW, 2022) suggests the occurrence of the following soil types within the Snowy Mountains portion of the landscape assessment area: • Kraznozems • Lithosols • Neutral to Alkaline Peats • Red Earths - more fertile (volcanics and granodiorites) • Red Podzolic Soils - more fertile (volcanics and granodiorites) • Yellow Podzolic Soils - less fertile (granites and metasediments). These occur over the following rock group suits recorded in the landscape assessment area: • Adaminaby Group • Snowy Mountains Volcanic Complex • Tom Groggin Suite. No karst, crevices, caves or cliffs were noted in the landscape assessment area during field surveys, however areas of minor rock outcrops (ranging from 0.1% to 70% cover) and areas of loose surface rock (with rock cover ranging from 0.1% to 70%) were recorded.
AOBVs	There are no Areas of Outstanding Biodiversity Value within the Snowy Mountains project footprint.

5.3 Site context

5.3.1 Native vegetation cover

For each subregion, native vegetation cover was assessed within a 500-metre buffer to the project footprint in accordance with the methodology outlined in Section 4.1.1. Native vegetation cover is detailed in Table 5-8 for each IBRA subregion relevant to the project.

Table 5-8: Native vegetation cover

IBRA subregion	Total landscape assessment area (ha)	Native vegetation cover (ha)				Native vegetation cover per IBRA subregion	
		0-10%	>10-30%	>30-70%	>70%	ha	%
Bondo	4,466.13	24.18	521.85	1,240.25	122.40	1,908.67	43%
Bungonia	2,359.15	12.76	74.13	945.79	2.83	1,035.51	44%
Crookwell	7,012.98	129.34	591.76	750.35	0.08	1,471.53	21%
Murrumbateman	8,223.84	166.00	569.59	928.77	6.50	1,670.86	20%
Inland Slopes	21,400.75	277.53	1,990.71	3,000.77	567.91	5,836.92	27%
Snowy Mountains	3,092.02	0.00	0.22	14.48	2,877.31	2,892.01	94%
Total	46,554.86	609.81	3,748.26	6,880.40	3,577.03		

5.3.2 Patch size

The majority (96.5 per cent) of native woody vegetation within the project footprint was assigned to the highest patch size class. A small proportion (0.4 to 3.0 per cent) of woody vegetation within the Bungonia, Bondo, Crookwell, Murrumbateman, and Inland Slopes IBRA subregions were assigned to patch sizes less than five hectares and five to 25 hectares. Approximately 2.5 per cent of native woody vegetation in the Crookwell IBRA subregions was assigned to the 25 to 100 hectares patch size class.

All non-woody vegetation zones including derived grasslands within the project footprint were assigned to the highest patch size class (ie greater than or equal to 100 hectares).

Table 5-9: Native woody vegetation patch size classes according to IBRA subregion

Patch size class	All IBRA subregions	Bungonia	Crookwell	Murrumbateman	Inland Slopes	Bondo	Snowy Mountains
< 5ha	1.1%	0.5%	3.0%	1.4%	1.4%	0.3%	0.0%
5 to <25 ha	0.4%	0.0%	1.2%	0.4%	0.6%	0.0%	0.0%
25 to <100 ha	0.5%	0.0%	2.5%	0.0%	0.7%	0.0%	0.0%
>=100 ha	97.9%	99.5%	93.4%	97.5%	97.3%	99.7%	100.0%

6 Native vegetation

This chapter addresses native vegetation in accordance with Section 5 of the BAM. Planted native vegetation is addressed in Section 6.7.

6.1 Native vegetation extent

The project footprint includes approximately 8,551.21 ha of land, comprising 1,983.48 ha of Category 1 - exempt land, 30.71 ha of planted vegetation, 33.80 ha of surface water (ie streams and waterbodies), 810.25 ha of non-native vegetation and 5692.96 ha of native vegetation. Table 6-1 outlines the extent of native and non-native vegetation within the project footprint and indicative disturbance area relative to each IBRA subregion. The data presented in Table 6-1 excludes Category 1 - exempt land, planted vegetation and surface water as documented above. Native vegetation recorded during field surveys is described in the following sections. Areas of non-native vegetation included Pine (ie *Pinus radiata*) plantations, exotic shelter belts and exotic dominated pastures.

Vegetation was considered native when the groundcover was comprised of least 30% native species. Given this, grasslands used for grazing were commonly mapped as native vegetation due to the moderate to high cover of native grasses. Grass species were typically common with a high tolerance for disturbance (eg *Microlaena stipoides* (Weeping Grass) and *Sporobolus spp*. (Rat' Tail Grass)). The condition of these grasslands is often reflected by a lower VI score (below 15) and is therefore mapped as Very low condition. Additionally, where native canopy is present, but the groundcover is predominantly exotic, native vegetation was mapped to where the canopy extended. For example, in areas of exotic pasture with scattered canopy species.

Table 6-1: Extent of native and non-native vegetation within the project footprint and indicative disturbance area

IBRA subregions	Vegetation	Project footprint (ha)	Project footprint (%)	Indicative disturbance area (ha)	Indicative disturbance area (%)
Bungonia	Native	260.70	3.48%	34.17	3.69%
	Non-native	23.07	1.56%	4.94	0.53%
Crookwell	Native	671.60	8.95%	76.83	8.31%
	Non-native	68.96	4.79%	13.07	1.41%
Murrumbateman	Native	1,036.47	14.41%	98.11	10.61%
	Non-native	50.89	2.97%	24.14	2.61%
Inland Slopes	Native	3,014.80	33.59%	245.29	26.52%
	Non-native	208.32	13.13%	55.13	5.96%
Bondo	Native	171.25	2.71%	38.84	4.20%
	Non-native	432.11	6.35%	148	16.00%
Snowy Mountains	Native	538.29	7.66%	176.97	19.14%
	Non-native	26.90	0.39%	9.4	1.02%
Total		**6,503.21**	**100.00%**	**924.8**	**100.00%**

6.2 Plant Community Types

Native vegetation recorded within the project footprint falls within twelve vegetation formations that occur within the six IBRA subregions, including:

- Alpine Complex
- Dry Sclerophyll Forests (Shrub/grass sub-formation)
- Dry Sclerophyll Forests (Shrubby sub-formation)
- Eastern Riverine Forests
- Forested Wetlands
- Freshwater Wetlands
- Grasslands
- Grassy Woodlands
- Semi-arid Woodlands (Shrubby sub-formation)
- Western Slopes Grassy Woodlands
- Wet Sclerophyll Forests (Grassy sub-formation)
- Wet Sclerophyll Forests (Shrubby sub-formation).

These vegetation formations include 42 PCTs that have been mapped within the project footprint. These are shown in Figure 6-1 (Attachment 1) and described in Attachment 10.

6.3 Vegetation Zones

PCTs within the project footprint were stratified into five broad condition classes in accordance with the methodology detailed in Section 4.4.2. A summary of the survey effort for each vegetation zone is provided in Section 4.4.3 including a discussion of the process applied to address any plot shortfall where relevant.

The VI score of individual BAM plots was analysed for the available plot data. to further refine subsequent vegetation mapping across the broader project footprint.

The VI score was obtained for each vegetation zone by entering BAM plot data into the BAM-C. The data provides quantitative measures of composition, structure and function for each vegetation zone (Attachment 6). The BAM-C compares the values recorded in each vegetation zone in the project footprint with the benchmark for the PCT as described in the BioNet Vegetation Classification database (DPIE, 2021a) to provide the VI score. This score represents the overall condition, health and function of the vegetation compared to the benchmark value (out of 100).

The following sections detail the VI scores within each vegetation zone within each of the six IBRA subregions. TECs listed under the BC Act are also noted where associated with a vegetation zone. Figure 6-1 (Attachment 1) shows the extent of native vegetation and TECs mapped within the project footprint.

6.3.1 Vegetation zones within the Bungonia IBRA subregion

Table 6-2 details native vegetation VI scores in relation to the project footprint within the Bungonia IBRA subregion. The native vegetation extent documented excludes Category 1 exempt lands.

Table 6-2: PCTs, Keith formations and vegetation zones of the project footprint within the Bungonia IBRA subregion

PCT ID	PCT name	Keith Formation	Keith Class	% Cleared	Corresponding TEC	Condition	Composition score	Structure score	Function score	VI score
283	Apple Box – Blakely's Red Gum moist valley and footslopes grass-forb open forest	Grassy Woodlands	Western Slopes Grassy Woodlands	91	White Box Yellow Box Blakely's Red Gum Woodland	Low	20.8	69.7	12.1	26
						Moderate	74	18.4	45.5	39.6
870	Grey Gum - Thin-leaved Stringybark grassy woodland	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Central Gorge Dry Sclerophyll Forests	10	N/A	Very high	62.4	91.2	94.5	81.3
1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests	61	N/A	Low	33.7	42.3	36.9	37.4
						Moderate	72.3	37.4	55.7	53.2
						High	84.9	70.5	65.7	73.3
						Very high	92	66.1	96.2	83.6
1097	Ribbon Gum - Narrow-leaved Peppermint grassy open forest on basalt plateaux	Wet Sclerophyll Forests (Grassy sub-formation)	Southern Tableland Wet Sclerophyll Forests	95	Tableland Basalt Forest	Very low	2.7	17.4	50.5	13.4
						Moderate	30.1	64.9	74	52.5
1107	River Peppermint - Narrow-leaved Peppermint open forest on sheltered escarpment slopes	Wet Sclerophyll Forests (Shrubby sub-formation)	Southern Escarpment Wet Sclerophyll Forests	10	Tableland Basalt Forest	High	93.4	65.7	44.7	65
1150	Silvertop Ash - Blue-leaved Stringybark shrubby open forest on ridges	Dry Sclerophyll Forests (Shrubby sub-formation)	South-East Dry Sclerophyll Forests	40	N/A	Very low	44.2	27.5	0.1	4.8
						Low	61	23.6	12.9	26.5
						Moderate	50.7	25.3	41.8	37.7
						High	83.5	17.9	61.8	45.2
1330	Yellow Box - Blakely's Red Gum grassy woodland on the tablelands	Grassy Woodlands	Southern Tableland Grassy Woodlands	94	White Box Yellow Box Blakely's Red Gum Woodland	Very low	4.1	1	0.3	1.1
						Low	33.8	58	20.4	34.2
						Very high	94.9	60.1	93.8	81.2

6.3.2 Vegetation zones within the Crookwell IBRA subregion

Table 6-3 details native vegetation zones and VI scores in relation to the project footprint within the Crookwell IBRA subregion. The native vegetation extent documented excludes Category 1 exempt lands.

Table 6-3: PCTs, Keith formations and vegetation zones of the project footprint within the Crookwell IBRA subregion

PCT ID	PCT name	Keith Formation	Keith Class	% Cleared	Corresponding TEC	Condition	Composition score	Structure score	Function score	VI score
280	Red Stringybark - Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland	Grassy Woodlands	Western Slopes Grassy Woodlands	80	White Box Yellow Box Blakely's Red Gum Woodland	Low	53.9	70.6	0.3	10.4
						Moderate	28.1	28.1	93.5	42
283	Apple Box – Blakely's Red Gum moist valley and footslopes grass-forb open forest	Grassy Woodlands	Western Slopes Grassy Woodlands	91	White Box Yellow Box Blakely's Red Gum Woodland	Very low	49.2	70.6	0	2.2
						Low	74.2	81.9	71.4	75.7
						Moderate	75.9	42.4	72.9	61.7
						High	69.7	87.1	83.8	79.8
335	Tussock grass - sedgeland fen - - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South-Western Slopes Bioregion	Freshwater Wetlands	Inland Floodplain Swamps	83	N/A	High	78.2	91	n/a	84.4
679	Black Sallee - Snow Gum low woodland of montane valleys, South-Eastern Highlands Bioregion and Australian Alps Bioregion	Grassy Woodlands	Subalpine Woodlands	35	Monaro Tableland Cool Temperate Grassy Woodland	Low	53.8	66.4	45	54.4
						Moderate	45.4	49.8	32.2	41.8
						High	70.7	56.8	70.1	65.5
727	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests	50	N/A	Very low	52.6	47.4	0.4	10.4
						Moderate	63	69.3	29.1	50.3
						Very high	85.3	80.2	93.1	86
731	Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills	Grassy Woodlands	Southern Tableland Grassy Woodlands	80	N/A	Low	61.2	47.8	2.2	18.7
						Moderate	67.5	86.3	54.8	68.3
						High	67.8	88.1	91.6	81.8
952	Mountain Gum - Narrow-leaved Peppermint - Snow Gum dry	Grassy Woodlands	Subalpine Woodlands	50	Tableland Basalt Forest	Very low	20.4	48.9	0.2	5.7
						Low	18.5	59.9	61.4	40.8

PCT ID	PCT name	Keith Formation	Keith Class	% Cleared	Corresponding TEC	Condition	Composition score	Structure score	Function score	VI score
	shrubby open forest on undulating tablelands					Moderate	21	74.1	59.3	45.2
1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests	61	N/A	Very low	25.1	28.8	0.2	5.2
						Low	57.2	33	19.7	33.4
						Moderate	72.3	37.4	55.7	53.2
						High	84.9	70.5	65.7	73.3
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	Dry Sclerophyll Forests (Shrubby sub-formation)	South-East Dry Sclerophyll Forests	90	N/A	Very low	44.2	25.3	0.1	4.6
						Low	61	21.4	12.9	25.6
						Moderate	25.8	44	100	48.4
						High	80.1	57.7	99.2	77.1
						Very high	73.8	73	100	81.4
1191	Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes	Grassy Woodlands	Subalpine Woodlands	95	Monaro Tableland Cool Temperate Grassy Woodland	Low	7.1	2.4	10.1	5.5
1256	Tableland swamp meadow on impeded drainage sites	Freshwater Wetlands	Montane Bogs and Fens	85	Montane Peatlands and Swamps	Low	9.2	83.8	n/a	27.8
1330	Yellow Box - Blakely's Red Gum grassy woodland on the tablelands	Grassy Woodlands	Southern Tableland Grassy Woodlands	94	White Box Yellow Box Blakely's Red Gum Woodland	Very low	4.1	1	0.3	1.1
						Low	40.5	82	45.8	53.4
						High	80.1	82.1	80.9	81.1

6.3.3 Vegetation zones within the Murrumbateman IBRA subregion

Table 6-4 details native vegetation zones and VI scores in relation to the project footprint within the Murrumbateman IBRA subregion. The native vegetation extent documented excludes Category 1 exempt lands.

Table 6-4: PCTs, Keith formations and vegetation zones of the project footprint within the Murrumbateman IBRA subregion

PCT ID	PCT name	Keith Formation	Keith Class	% Cleared	Corresponding TEC	Condition	Composition score	Structure score	Function score	VI score
266	White Box grassy woodland	Grassy Woodlands	Western Slopes Grassy Woodlands	94	White Box Yellow Box Blakely's Red Gum Woodland	Low	35.7	70.7	0	4.3
						Moderate	19.1	82.2	69.5	47.8
278	Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest	Grassy Woodlands	Western Slopes Grassy Woodlands	80	White Box Yellow Box Blakely's Red Gum Woodland	Very low	49.2	70.6	0	2.2
280	Red Stringybark - Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland	Grassy Woodlands	Western Slopes Grassy Woodlands	80	White Box Yellow Box Blakely's Red Gum Woodland.	Very low	8.2	62.5	0.3	5.2
						Low	46	70.7	0.2	7.9
						Moderate	47.4	74.7	9.9	32.7
						High	60.7	41	96.1	62.1
283	Apple Box - Blakely's Red Gum moist valley and footslopes grass-forb open forest	Grassy Woodlands	Western Slopes Grassy Woodlands	91	White Box Yellow Box Blakely's Red Gum Woodland	Moderate	75.9	42.4	72.9	61.7
						High	45.8	35.4	69	48.2
						Very high	73	90.2	74.4	78.9
287	Long-leaved Box - Red Box - Red Stringybark mixed open forest	Dry Sclerophyll Forests (Shrubby sub-formation)	Western Slopes Dry Sclerophyll Forests	67	N/A	Very low	26	21.1	5.3	14.3
						Low	15.8	30.1	41	26.9
						High	43.4	66.8	62.4	56.5
322	Inland Scribbly Gum - Red Stringybark - Black Cypress Pine hillslope shrub-tussock grass open forest	Dry Sclerophyll Forests (Shrubby sub-formation)	Western Slopes Dry Sclerophyll Forests	33	N/A	Very low	23	25	0.1	3.3
						High	75.4	62.8	91.5	75.7
349	Inland Scribbly Gum - Red Stringybark open forest on hills composed of siliceous substrates	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests	50	N/A	Low	37.1	28.8	1	10.4
						Moderate	70.2	31.8	44.5	46.3
						High	90.6	68.8	75	77.6
351				60	N/A	Very low	26	48.4	0	10.8

PCT ID	PCT name	Keith Formation	Keith Class	% Cleared	Corresponding TEC	Condition	Composition score	Structure score	Function score	VI score
	Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests			Low	35.7	41.8	25.3	33.6
						Moderate	45	53.8	75.2	56.7
352	Red Stringybark - Blakely's Red Gum hillslope open forest on meta-sediments in the Yass - Boorowa - Crookwell region	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests	86	White Box Yellow Box Blakely's Red Gum Woodland	Very low	4.3	46.8	2.7	8.2
						Low	20.8	29.8	9.7	18.2
						Moderate	26.6	79.9	26.5	38.3
731	Broad-leaved Peppermint - Red Stringybark grassy open forest	Grassy Woodlands	Southern Tableland Grassy Woodlands	80	N/A	High	52.2	81.5	79.1	69.5
1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests	61	N/A	Very low	25.1	28.8	0.2	5.2
						Low	81.8	47.1	4.8	26.4
						Moderate	75.5	63.6	62.1	66.8
						High	69.1	90.8	93.1	83.6
						Very high	69.2	77.8	83.2	76.5
1330	Yellow Box – Blakely's Red Gum grassy woodland on the tablelands	Grassy Woodlands	Southern Tableland Grassy Woodlands	94	White Box Yellow Box Blakely's Red Gum Woodland	Very low	46.1	49.7	2.6	18.2
						Low	38.8	60.9	18.5	35.2
						Moderate	46.3	64.3	64	57.5
						High	63.9	87	88.5	79
						Very high	78.4	60.6	81.5	72.9

6.3.4 Vegetation zones within the Inland Slopes IBRA subregion

Table 6-5 details native vegetation zones and VI scores in relation to the project footprint within the Inland Slopes IBRA subregion. The native vegetation extent documented excludes Category 1 exempt lands.

Table 6-5: PCTs, Keith formations and vegetation zones of the project footprint within the Inland Slopes IBRA subregion

PCT ID	PCT name	Keith Formation	Keith Class	% Cleared	Corresponding TEC	Condition	Composition score	Structure score	Function score	VI score
5	River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains	Forested Wetlands	Inland Riverine Forests	40	N/A	Low	44.8	37.2	6.5	22.1
						High	24.7	51.2	82.1	47
266	White Box grassy woodland in the upper slopes sub-region of the NSW South-Western Slopes Bioregion	Grassy Woodlands	Western Slopes Grassy Woodlands	94	White Box Yellow Box Blakely's Red Gum Woodland	Low	45.8	56.3	0	3
						Moderate	27	37.6	31.2	31.7
						High	47.8	91.1	68.6	66.9
268	White Box – Blakely's Red Gum - Long-leaved Box – Norton's Box - Red Stringybark grass-shrub woodland on shallow soils on hills	Grassy Woodlands	Western Slopes Grassy Woodlands	63	White Box Yellow Box Blakely's Red Gum Woodland	Low	61.3	74.5	9.5	35.2
						Moderate	58	14	41.5	32.3
						High	98.4	95.4	56.3	80.8
277	Blakely's Red Gum - Yellow Box grassy tall woodland	Grassy Woodlands	Western Slopes Grassy Woodlands	94	White Box Yellow Box Blakely's Red Gum Woodland	Very low	31.9	87.3	4.1	22.5
						Low	46.1	79.9	15.7	38.7
						Moderate	63.6	86.6	63.8	70.6
						High	56.1	83.6	72.1	69.7
278	Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest	Grassy Woodlands	Western Slopes Grassy Woodlands	80	White Box Yellow Box Blakely's Red Gum Woodland	Very low	42.4	56.9	0.1	6.2
						Moderate	26.2	29.4	21.7	25.6
						High	70.7	87	51.6	68.2
280	Red Stringybark – Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland	Grassy Woodlands	Western Slopes Grassy Woodlands	80	White Box Yellow Box Blakely's Red Gum Woodland	Very low	14.2	55.3	0.1	4.2
						Low	66.9	55.7	0.1	7.4
						Moderate	24.3	75	50.5	45.1
						High	55.3	89.2	61.1	67.1
287				67	N/A	Very low	27.2	17.8	3.8	12.3

PCT ID	PCT name	Keith Formation	Keith Class	% Cleared	Corresponding TEC	Condition	Composition score	Structure score	Function score	VI score
	Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes	Dry Sclerophyll Forests (Shrubby sub-formation)	Western Slopes Dry Sclerophyll Forests			Low	55.4	4	79.8	26
						Moderate	35.3	50.5	41.8	42.1
290	Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Upper Riverina Dry Sclerophyll Forests	67	N/A	Very low	33.2	19.7	8.9	18
						Low	23.8	9.1	28.9	18.4
						High	96.3	83.7	55.4	76.5
294	Nortons Box – Red Box – White Box tussock grass open forest	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Upper Riverina Dry Sclerophyll Forests	47	N/A	Moderate	64.6	7.2	42.5	27.1
297	Broad-leaved Peppermint – Norton's Box - Red Stringybark tall open forest on red clay on hills	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Upper Riverina Dry Sclerophyll Forests	38	N/A	Low	22.3	21.1	3.2	11.5
						Moderate	69.6	29.9	70	52.7
299	Riparian Ribbon Gum – Robertson's Peppermint - Apple Box riverine very tall open forest	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests	50	N/A	Very low	6.1	23.6	0	5.2
						Low	43.8	35.9	43.2	40.8
301	Drooping Sheoke - Ricinocarpus bowmannii - grasstree tall open shrubland of the Coolac - Tumut Serpentinite Belt	Grassy Woodlands	Western Slopes Grassy Woodlands	72	Coolac-Tumut Serpentinite Shrubby Woodland	Low	69.5	35.2	5.9	24.3
						Moderate	71.7	85.1	8.4	37.1
						High	89.6	90.4	35.8	66.2
306	Red Box - Red Stringybark – Norton's Box hill heath shrub - tussock grass open forest of the Tumut region	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Upper Riverina Dry Sclerophyll Forests	33	N/A	Very low	33.2	19.7	8.9	18
						Low	28.3	26.7	13.4	21.6
						High	92.5	48.3	57.6	63.6
314	Apple Box - Red Stringybark basalt scree open forest in the upper Murray River region	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Upper Riverina Dry Sclerophyll Forests	50	N/A	Very low	28.4	19.7	0.1	3.6
						Low	22.3	21.1	3.2	11.5
						Moderate	47.8	46.5	37	43.5
						Very high	100	100	100	100
316		Grassy Woodlands		63	N/A	Low	33.5	56.3	3.7	19.2

PCT ID	PCT name	Keith Formation	Keith Class	% Cleared	Corresponding TEC	Condition	Composition score	Structure score	Function score	VI score
	Norton's Box - Red Box - Red Stringybark +/- Nodding Flax Lily forb-grass open forest		Western Slopes Grassy Woodlands			Moderate	65.1	55.4	2.8	21.5
						High	89.6	90.4	35.8	66.2
						Very high	88.9	93.4	89	90.4
319	Tumbledown Red Gum - White Cypress Pine hill woodland	Semi-arid Woodlands (Shrubby sub-formation)	Inland Rocky Hill Woodlands	60	N/A	Low	28.2	68.5	5	21.3
						High	64.2	78.8	31.2	54.1
343	Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates	Dry Sclerophyll Forests (Shrubby sub-formation)	Western Slopes Dry Sclerophyll Forests	88	N/A	Very low	32.2	16.9	3.1	11.9
						Low	55.4	4	79.8	26
						Moderate	50	35.7	50.2	44.8
352	Red Stringybark – Blakely's Red Gum hillslope open forest on meta-sediments	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests	86	White Box Yellow Box Blakely's Red Gum Woodland	Very low	4.9	29.1	2.9	7.4
						Low	22.8	23.9	9.7	17.4
731	Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills	Grassy Woodlands	Southern Tableland Grassy Woodlands	80	N/A	Very low	59.5	39.2	2.6	18.3
						Low	68.7	36.3	2.2	17.7
1191	Snow Gum - Candle Bark woodland on broad valley flats	Grassy Woodlands	Subalpine Woodlands	95	N/A	Moderate	21.3	83.9	31	38.1

6.3.5 Vegetation zones within the Bondo IBRA subregion

Table 6-6 details native vegetation zones and VI scores in relation to the project footprint within the Bondo IBRA subregion. The native vegetation extent documented excludes Category 1 exempt lands.

Table 6-6: PCTs, Keith formations and vegetation zones of the project footprint within the Bondo IBRA subregion

PCT ID	PCT name	Keith Formation	Keith Class	% Cleared	Corresponding TEC	Condition	Composition score	Structure score	Function score	Vegetation Integrity score
285	Broad-leaved Sally grass - sedge woodland on valley flats and swamps	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Upper Riverina Dry Sclerophyll Forests	75	N/A	Low	7.9	18.1	69.2	21.5
295	Robertson's Peppermint - Broad-leaved Peppermint – Norton's Box - stringybark shrub-fern open forest	Wet Sclerophyll Forests (Grassy sub-formation)	Southern Tableland Wet Sclerophyll Forests	40	N/A	Low	51	48	8.9	28
						Moderate	31.4	66.6	74	53.7
296	Brittle Gum - peppermint open forest of the Woomargama to Tumut region, NSW South Western Slopes Bioregion	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests	40	N/A	Low	48.9	36.2	8.9	25.1
299	Riparian Ribbon Gum – Robertson's Peppermint - Apple Box riverine very tall open forest	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests	50	N/A	Very low	5.4	28.7	0	5.4
						Moderate	63	60.9	49.7	57.6
953	Mountain Gum - Snow Gum - Broad-leaved Peppermint shrubby open forest of montane ranges	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests	5	Tableland Basalt Forest	Very low	5.4	28.7	0	5.4
						Low	55.4	36.4	10.8	27.9
						High	84.8	57.7	68.9	69.6
						Very high	83.9	93.2	95.5	90.7

6.3.6 Vegetation zones within the Snowy Mountains IBRA subregion

Table 6-7 details native vegetation zones and VI scores in relation to the project footprint within the Snowy Mountains IBRA subregion. The native vegetation extent documented excludes Category 1 exempt lands.

Table 6-7: PCTs, Keith formations and vegetation zones of the project footprint within the Snowy Mountains IBRA subregion

PCT ID	PCT name	Keith Formation	Keith Class	% Cleared	Corresponding TEC	Condition	Composition score	Structure score	Function score	Vegetation Integrity score
300	Ribbon Gum - Narrow-leaved (Robertson's) Peppermint montane fern - grass tall open forest on deep clay loam soils	Wet Sclerophyll Forests (Grassy sub-formation)	Southern Tableland Wet Sclerophyll Forests	20	N/A	Low	53.3	44	8.9	27.6
						Moderate	87	73.9	15	45.9
						High	83.9	66.7	80.7	76.7
638	Alpine Ash - Mountain Gum moist shrubby tall open forest of montane areas	Wet Sclerophyll Forests (Grassy sub-formation)	Montane Wet Sclerophyll Forests	5	N/A	High	90.9	33.5	91.3	65.3
679	Black Sallee - Snow Gum low woodland of montane valleys	Grassy Woodlands	Subalpine Woodlands	35	N/A	Low	46	50.4	15.4	32.9
						High	61.9	65.2	84.2	69.8
939	Montane wet heath and bog of the eastern tablelands	Freshwater Wetlands	Montane Bogs and Fens	50	Montane Peatlands and Swamps	Very high	74.2	68	n/a	71
953	Mountain Gum - Snow Gum - Broad-leaved Peppermint shrubby open forest of montane ranges	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests	5	N/A	Low	53	26.5	10.8	24.7
						Moderate	61.8	37.5	50.4	48.8
						High	57	28.6	58.4	45.7
						Very high	82.5	55.8	95.4	76

PCT ID	PCT name	Keith Formation	Keith Class	% Cleared	Corresponding TEC	Condition	Composition score	Structure score	Function score	Vegetation Integrity score
1196	Snow Gum - Mountain Gum shrubby open forest of montane areas	Grassy Woodlands	Subalpine Woodlands	5	N/A	Low	62.7	39.5	17.3	35
						High	61.1	68	95.1	73.4
1224	Sub-alpine dry grasslands and heathlands of valley slopes	Grasslands	Temperate Montane Grasslands	5	N/A	High	81	93.8	n/a	87.2

6.4 Weeds

High Threat Weeds (HTW), Priority weeds and Weeds of National Significance (WoNS) recorded within the project footprint are detailed in Table 6-8. Note: an ‘x’ indicates the weed was recorded within the relevant IBRA subregion. The vegetation zones in which these weeds were recorded are also detailed.

Table 6-8: Weed species recorded in BAM plots and incidental recordings.

Scientific name	Common name	Vegetation zones	HTW	Priority weed	WoNS	IBRA subregion					
						BUN	CRO	MUR	INL	BON	SNO
Agrostis capillaris	Browntop Bent	0-Non-native; 1093-Low	Yes	No	No		x	x		x	
Axonopus fissifolius	Narrow-leafed Carpet Grass	283-Moderate; 952-Low; 1093-Very Low; 1093-Low	Yes	No	No	x	x	x			
Bidens pilosa	Cobbler's Pegs	1330-Low	Yes	No	No	x					
Briza subaristata	-	280-Low; 280-High; 283-Moderate; 283-Very High; 351-Moderate; 727-Moderate; 731-Low; 731-Moderate; 1093-Low; 1151-Moderate; 1330-Low; 1330-Moderate; 1330-High	Yes	No	No		x	x			
Bromus diandrus	Great Brome	266-High; 277-Moderate; 277-High; 280-Low; 280-High; 283-Moderate; 319-Low; 319-High; 343-Moderate; 351-Moderate	Yes	No	No			x	x		
Carduus nutans	Nodding Thistle	870-Very High; 1330-Low; 1330-Very High	No	Yes - General Biosecurity Duty	No	x					
Carthamus lanatus	Saffron Thistle	0-Non-native; 266-Low; 266-High; 277-Moderate; 277-High; 280-High; 287-Low; 287-Moderate; 287-High; 295-Moderate; 299-Low; 301-High; 352-Low; 352-Moderate; 1093-Very Low; 1330-Low	Yes	Yes - General Biosecurity Duty	No	x	x	x	x	x	
Cenchrus ciliaris	Buffel Grass	266-High; 268-High	Yes	No	No				x		
Centaurea solstitialis	St Barnabys Thistle	280-Very Low; 280-High; 301-Low; 301-High	No	Yes - General Biosecurity Duty	No				x		

Scientific name	Common name	Vegetation zones	HTW	Priority weed	WoNS	IBRA subregion					
						BUN	CRO	MUR	INL	BON	SNO
Cirsium arvense	Perennial Thistle	280-High; 300-Low; 953-Very High; 1093-Low; 1093-Very High; 1330-Very Low; 1330-Low; 1330-Very High	No	Yes - General Biosecurity Duty	No	x	x	x	x		x
Cirsium vulgare	Spear Thistle	0-Non-native; 266-Low; 266-Moderate; 266-High; 277-Very Low; 277-Low; 277-Moderate; 277-High; 278-Very Low; 278-High; 280-Moderate; 280-High; 283-Moderate; 283-Very High; 287-Low; 287-Moderate; 287-High; 295-Moderate; 299-Low; 301-Low; 301-High; 349-Low; 352-Moderate; 727-Very Low; 727-Moderate; 727-Very High; 731-Moderate; 731-High; 870-Very High; 952-Very Low; 952-Low; 952-Moderate; 953-Low; 1093-Very Low; 1093-Low; 1093-Very High; 1107-High; 1151-Moderate; 1196-High; 1256-Low; 1330-Low; 1330-Moderate; 1330-High; 1330-Very High	No	Yes - General Biosecurity Duty	No	x	x	x	x	x	x

Scientific name	Common name	Vegetation zones	HTW	Priority weed	WoNS	IBRA subregion					
						BUN	CRO	MUR	INL	BON	SNO
Conyza bonariensis	Flaxleaf Fleabane	0-Non-native; 266-High; 268-Low; 268-High; 277-Very Low; 277-Low; 277-Moderate; 277-High; 278-Moderate; 280-High; 283-Moderate; 283-Very High; 287-Moderate; 299-Very Low; 300-Low; 300-High; 301-Low; 301-High; 314-Moderate; 322-Moderate; 349-Moderate; 727-Very Low; 727-Very High; 731-Low; 870-Very High; 952-Moderate; 953-Low; 953-Very High; 1093-Very Low; 1093-Low; 1093-High; 1093-Very High; 1107-High; 1151-Moderate; 1196-High; 1330-Very Low; 1330-Low; 1330-High; 1330-Very High	No	Yes - General Biosecurity Duty	No	x	x	x	x	x	x
Conyza sumatrensis	Tall fleabane	0-Non-native	No	Yes - General Biosecurity Duty	No				x		
Crataegus monogyna	Hawthorn	1093-Low; 1330-Very High	Yes	Yes - General Biosecurity Duty	No	x	x				
Cyperus eragrostis	Umbrella Sedge	85-Moderate; 268-Low; 277-Low; 277-Moderate; 283-Moderate; 1330-Low	Yes	No	No	x		x	x		
Datura stramonium	Common Thornapple	1330-Low	No	Yes - General Biosecurity Duty	No	x					
Echium italicum	Italian Bugloss	1093-Low	No	Yes - General	No	x					

Scientific name	Common name	Vegetation zones	HTW	Priority weed	WoNS	IBRA subregion					
						BUN	CRO	MUR	INL	BON	SNO
				Biosecurity Duty							
Echium plantagineum	Patterson's Curse	0-Non-native; 266-Low; 266-High; 268-Low; 277-Very Low; 277-Low; 277-Moderate; 278-Very Low; 278-Moderate; 280-Very Low; 287-Low; 287-Moderate; 287-High; 299-Very Low; 352-Moderate; 1093-Very Low; 1330-Very Low; 1330-Low	No	Yes - General Biosecurity Duty	No	x		x	x	x	
Echium vulgare	Viper's Bugloss	278-Very Low	No	Yes - General Biosecurity Duty	No				x		
Ehrharta erecta	Panic Veldtgrass	277-Moderate, 278-Very Low	Yes	No	No	x			x		
Eragrostis curvula	African Lovegrass	278-Very Low	Yes	Yes - General Biosecurity Duty	No			x	x		
Hypericum perforatum	St. John's Wort	0-Non-native; 266-Low; 266-High; 268-Low; 268-High; 277-Very Low; 277-Low; 277-Moderate; 277-High; 278-Very Low; 280-Very Low; 280-Low; 280-Moderate; 283-Moderate; 283-Very High; 287-High; 295-Moderate; 299-Very Low; 299-Low; 300-Low; 300-Moderate; 301-Low; 301-High; 314-Moderate; 322-High; 349-Low; 349-Moderate; 349-High; 351-Very Low; 731-Low; 731-Moderate; 731-High; 952-Low; 952-Moderate; 953-Low; 953-Very High; 1093-Low; 1093-Very High; 1330-Very Low; 1330-Low; 1330-Moderate; 1330-High	Yes	Yes - General Biosecurity Duty	No		x	x	x	x	x

Scientific name	Common name	Vegetation zones	HTW	Priority weed	WoNS	IBRA subregion					
						BUN	CRO	MUR	INL	BON	SNO
Marrubium vulgare	White Horehound	266-Moderate; 277-High; 280-Moderate; 283-Moderate; 287-High; 352-Moderate; 1330-High	No	Yes - General Biosecurity Duty	No	x		x	x		
Nassella neesiana	Chilean Needle Grass	727-Moderate; 952-Low; 1093-Very Low; 1330-Very Low	Yes	Yes - General Biosecurity Duty & Prohibition on certain dealings	Yes	x	x	x	x		
Nassella trichotoma	Serrated Tussock	0-Non-native; 283-Moderate; 1093-Moderate; 1330-Very Low; 1330-Very High	Yes	Yes - General Biosecurity Duty & Prohibition on certain dealings	Yes	x	x	x			
Onopordum acanthium	Scotch Thistle	266-Low; 266-High; 277-Moderate; 277-High; 278-High; 287-High; 1330-Very Low; 1330-Low	No	Yes - General Biosecurity Duty	No	x	x	x	x		
Paspalum dilatatum	Paspalum	85-Moderate; 266-Moderate; 268-Low; 277-Low; 277-Moderate; 278-Moderate; 278-High; 280-Very Low; 280-Moderate; 280-High; 283-Moderate; 283-Very High; 952-Very Low; 1093-Very Low; 1093-Low; 1330-Low; 1330-Moderate	Yes	No	No	x	x	x	x		
Proboscidea louisianica	Purple-flowered Devil's Claw	266-High	No	Yes - General Biosecurity Duty	No				x		

Scientific name	Common name	Vegetation zones	HTW	Priority weed	WoNS	IBRA subregion					
						BUN	CRO	MUR	INL	BON	SNO
Romulea rosea	Onion Weed	277-Moderate; 280-Low, 319-Low, 343-Moderate	Yes	No	No			x	x		
Rosa rubiginosa	Sweet Briar	0-Non-native; 277-Very Low; 277-Moderate; 278-Very Low; 278-High; 283-Moderate; 283-Very High; 295-Moderate; 299-Low; 299-Very Low; 731-Low; 1093-Very High; 1330-Low; 1330-High; 1330-Very High	Yes	Yes - General Biosecurity Duty	No	x	x	x	x	x	
Rubus fruticosus sp. agg.	Blackberry complex	85-Moderate; 266-High; 268-High; 277-Very Low; 277-Low; 277-Moderate; 277-High; 280-High; 283-Very High; 287-Low; 287-Moderate; 287-High; 300-Moderate; 300-High; 314-Moderate; 351-Low; 351-Moderate; 352-Moderate; 727-Very High; 731-Low; 731-Moderate; 952-Very Low; 952-Low; 952-Moderate; 953-Low; 953-Very High; 1093-Very Low; 1093-High; 1093-Very High; 1107-High; 1151-Very High; 1330-Low; 1330-High; 1330-Very High	Yes	Yes - General Biosecurity Duty & Prohibition on certain dealings	Yes	x	x	x	x		x

Scientific name	Common name	Vegetation zones	HTW	Priority weed	WoNS	IBRA subregion					
						BUN	CRO	MUR	INL	BON	SNO
Rumex acetosella	Sheep Sorrel	0-Non-native; 266-High; 268-Low; 277-Very Low; 277-Low; 277-Moderate; 277-High; 278-Very Low; 278-Moderate; 278-High; 280-Low; 280-Moderate; 280-High; 283-Moderate; 283-Very High; 287-Low; 287-Moderate; 287-High; 295-Moderate; 299-Very Low; 299-Low; 300-Low; 300-Moderate; 301-Low; 301-High; 319-Low; 319-High; 322-Very Low; 343-Moderate; 349-Low; 349-Moderate; 351-Very Low; 351-Low; 351-Moderate; 352-Low; 727-Very Low; 727-Very High; 731-Low; 731-Moderate; 731-High; 870-Very High; 952-Very Low; 952-Low; 952-Moderate; 953-Low; 1093-Very Low; 1093-Low; 1093-Moderate; 1093-High; 1093-Very High; 1150-Moderate; 1151-Low; 1151-Moderate; 1330-Very Low; 1330-Low; 1330-Moderate; 1330-High; 1330-Very High	Yes	No	No	x	x	x	x	x	x
Salix spp.	Willow	0-Non-native	Yes	Yes - General Biosecurity Duty	Yes			x			
Senecio madagascariensis	Fireweed	266-High; 283-Moderate; 1093-Low; 1330-Low;	No	Yes - General Biosecurity Duty & Prohibition on certain dealings	Yes	x	x		x		
Xanthium italicum	Hunter Burr	266-High	No	Yes - General	No				x		

Scientific name	Common name	Vegetation zones	HTW	Priority weed	WoNS	IBRA subregion					
						BUN	CRO	MUR	INL	BON	SNO
				Biosecurity Duty							
Xanthium occidentale	Noogoora Burr	277-High; 280-Moderate; 1330-Low	Yes	Yes - General Biosecurity Duty	No	x			x		
Xanthium orientale	Californian Burr	266-High	No	Yes - General Biosecurity Duty	No				x		
Xanthium spinosum	Bathurst Burr	266-Moderate; 277-Low; 280-High; 287-High	Yes	Yes - General Biosecurity Duty	No			x	x		

Note: HTW – Very High Threat Weed, WoNS – Weeds of National Significance, Priority Weeds- Weeds required to be managed by the relevant local government under the NSW Biosecurity Act (2015). This includes plants that are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable. It also includes prohibition on certain dealings, including plants that must not be imported into the state, sold, bartered, exchanged or offered for sale.

6.5 Threatened ecological communities

A total of five TECs listed under the BC Act and/or EPBC Act were recorded within the project footprint during field surveys. In relation to the inaccessible lands, the TECs mapped during the field survey were used in conjunction with desktop assessments, to extrapolate the likely presence and distribution of TECs therein. Table 6-9 details the TECs, associated PCTs and presence within each IBRA subregion. The extent of known and likely TECs in relation to the project footprint is shown in Figure 6-1 (Attachment 1).

The TECs mapped within the project footprint include:

- *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (White Box Yellow Box Blakely's Red Gum Woodland)
- *Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South-Western Slopes and South-Eastern Highlands Bioregions* (Coolac-Tumut Serpentinite Shrubby Woodland)
- *Tableland Basalt Forest in the Sydney Basin and South-Eastern Highlands Bioregions* (Tableland Basalt Forest)
- *Monaro Tableland Cool Temperate Grassy Woodland in the South-Eastern Highlands Bioregion* (Monaro Tableland Cool Temperate Grassy Woodland)
- *Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South-East Corner, South-Eastern Highlands and Australian Alps bioregions* (Montane Peatlands and Swamps).

An assessment of PCT alignment with each potentially occurring BC Act and EPBC Act TEC was undertaken using information within the BioNet Vegetation Classification Database (DPE, 2022) and relevant key criteria and thresholds documented within the relevant Commonwealth conservation advice. The results of the assessment are presented in Sections 6.5.1 to 6.5.6.

Two PCTs were identified as comprising a partial subset of the TEC *Robertson Basalt Tall Open-forest in the Sydney Basin and South-Eastern Highlands Bioregions* (listed as a CEEC under the BC Act). These are:

- PCT 1097 – Ribbon Gum - Narrow-leaved Peppermint grassy open forest on basalt plateaux, Sydney Basin Bioregion and South-Eastern Highlands Bioregion
- PCT 1107 – River Peppermint - Narrow-leaved Peppermint open forest on sheltered escarpment slopes, Sydney Basin Bioregion and South-East Corner Bioregion.

However, the *Robertson Basalt Tall Open-forest in the Sydney Basin and South-Eastern Highlands Bioregions* TEC is not considered to occur within the project footprint given the following reasons:

- Robertson Basalt Tall Open-forest is mainly known from the Sydney Basin Bioregion and has been reported in the Southern Highlands on the Robertson plateau and Cambewarra Range (30 kilometres south-west of the project footprint).
- Robertson Basalt Tall Open-forest rarely occurs in areas receiving less than 1000 mm of annual rainfall while the converse is true for Tableland Basalt Forest, the project footprint in Bungonia would receive 800-1000 mm of rainfall.
- Species recorded in the floristic plots more closely align to the Tableland Basalt Forest TEC (*Hydrocotyle laxiflora, Viola betonicifolia, Eucalyptus viminalis* and *Plantago varia*). No species recorded in the floristic plots are characteristic of Robertson Basalt Tableland Tall Open-Forest alone.

PCT 1097 and PCT 1107 are also a partial subset of the TEC *Tableland Basalt Forest in the Sydney Basin and South-Eastern Highlands Bioregions* (listed as an EEC under the BC Act), and given the above, have been assigned to this TEC (Section 6.5.3).

Two PCTs within the project footprint partially align to the TEC *Mt Canobolas Xanthoparmelia Lichen Community* (listed as an EEC under the BC Act). These are:

- PCT 351 – Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South-Eastern Highlands Bioregion
- PCT 727 – Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South-Eastern Highlands Bioregion.

As per the BioNet Vegetation Classification Database (DPE, 2022) both PCT 351 and PCT 727 partially align to the TEC. However, the *Mt Canobolas Xanthoparmelia Lichen Community* TEC is not considered to occur within the project footprint and is restricted to the Mt Canobolas SCA, outside of the Orange township (over 130 kilometres north of the project footprint) as stated in the scientific determination (DPE 2001). Given this, the TEC has been excluded on this basis.

Table 6-9: Threatened ecological communities recorded within the project footprint

BC Act TEC	EPBC Act TEC	SAII	PCT ID	IBRA subregion					
				BON	BUN	CRO	MUR	INL	SNO
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South- Eastern Highlands, NSW South-Western Slopes, South-East Corner and Riverina Bioregion	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Y	PCT 266 - White Box grassy woodland in the upper slopes sub-region of the NSW South-Western Slopes Bioregion					X	
			PCT 268 - White Box - Blakely's Red Gum - Long-leaved Box – Norton's Box - Red Stringybark grass-shrub woodland on shallow soils on hills in the NSW South-Western Slopes Bioregion					X	
			PCT 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South-Western Slopes Bioregion				X	X	
			PCT 278 - Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South-Western Slopes Bioregion				X	X	
			PCT 280 - Red Stringybark - Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland of the NSW South-Western Slopes Bioregion	X		X	X	X	
			PCT 283 - Apple Box – Blakely's Red Gum moist valley and footslopes grass-forb open forest of the NSW South-Western Slopes Bioregion		X	X	X		
			PCT 352 - Red Stringybark - Blakely's Red Gum hillslope open forest on meta-sediments in the Yass - Boorowa - Crookwell region of the NSW South- Western Slopes Bioregion and South-Eastern Highlands Bioregion				X	X	
			PCT 1330 - Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South-Eastern Highlands Bioregion		X	X	X		
Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South-Western Slopes and South- Eastern Highlands Bioregions	N/A	Y	PCT 301 - Drooping Sheoke - *Ricinocarpos bowmannii* - grasstree tall open shrubland of the Coolac - Tumut Serpentinite Belt					X	
Tableland Basalt Forest in the Sydney Basin and South-Eastern Highlands Bioregions	N/A	Y	PCT 952 - Mountain Gum - Narrow-leaved Peppermint - Snow Gum dry shrubby open forest on undulating tablelands, southern South-Eastern Highlands Bioregion			X			

BC Act TEC	EPBC Act TEC	SAII	PCT ID	IBRA subregion					
				BON	BUN	CRO	MUR	INL	SNO
			PCT 953 - Mountain Gum - Snow Gum - Broad-leaved Peppermint shrubby open forest of montane ranges, South-Eastern Highlands Bioregion and Australian Alps Bioregion	X					
			PCT 1097 - Snow Gum - Mountain Gum tussock grass-herb forest of the South-Eastern Highlands Bioregion		X				
			PCT 1107 - River Peppermint - Narrow-leaved Peppermint open forest on sheltered escarpment slopes, Sydney Basin		X				
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South-East Corner, South-Eastern Highlands and Australian Alps bioregion	Alpine Sphagnum Bogs and Associated Fens	N	PCT 939 - Montane wet heath and bog of the eastern tablelands, South-Eastern Highlands Bioregion						X
			PCT 1256 - Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South-Eastern Highlands Bioregion			X			
Monaro Tableland Cool Temperate Grassy Woodland in the South-Eastern Highlands Bioregion	N/A	Y	PCT 679 - Black Sallee - Snow Gum low woodland of montane valleys, South-Eastern Highlands Bioregion and Australian Alps Bioregion			X			
			PCT 1191 - Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South-Eastern Highlands Bioregion			X			

6.5.1 White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland

White Box Yellow Box Blakely's Red Gum Woodland TEC is listed as Critically Endangered under the BC Act and EPBC Act. A total of eight PCTs potentially align to the BC Act and EPBC Act listed TEC as detailed in Table 6-9.

The State listing and description for the TEC is described in NSW Scientific Committee (2020) *Final Determination - White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South-Eastern Highlands, NSW South-Western Slopes, South-East Corner and Riverina Bioregions*. The Commonwealth listing and description is detailed in DoE (2006) *Approved Conservation Advice (including listing advice) for White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands.*

A comparison of the final determination for BC Act listed White Box Yellow Box Blakely's Red Gum Woodland TEC and candidate PCTs is provided in Table 6-10. Each element of the final determination including locality, species composition, characteristic species and resilience was compared to each condition class for candidate PCTs to determine if vegetation recorded was consistent with the listing criteria.

The criteria for an area to qualify as the EPBC Act listed CEEC *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Box Gum Woodland and Derived Grassland) are slightly different to the NSW determination. Under the EPBC Act, remnants can exist in one of three states:

- an overstorey of Eucalypt trees exists, but there is no substantial native understorey
- a native understorey exists, but the trees have been cleared (ie derived grassland with greater than 50 per cent native perennial cover)
- both a native understorey and an overstorey of Eucalypts exist in conjunction (DEH 2006).

The Threatened Species Scientific Committee considers that areas in which an overstorey exists without a substantially native understorey are degraded and are no longer a viable part of the ecological community. Although some native species may remain, in most of these areas the native understorey is effectively irretrievable. In order for an area to be included in the listed ecological community, a patch must have a predominantly native understorey (DEH 2006).

Vegetation communities with the potential to be the locally occurring EPBC Act listed CEEC *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Box Gum Woodland and Derived Grassland), were analysed in detail by using the criteria in Table 6-11.

In summary, all eight PCTs in all condition classes were found to align to the BC Act listed White Box Yellow Box Blakely's Red Gum Woodland TEC. This is summarised in Table 6-10. Alignment of the PCTs to the EPBC Act listed community was more complex. Vegetation zones of all eight PCTs in relatively better condition aligned to the EPBC Act listed community (generally those areas in very high, high and moderate condition) while patches in poorer condition (low and very low condition) did not. A summary of the alignment of each of the condition classes to the EPBC Act listed TEC is provided in Table 6-11.

Table 6-10: Correlation of BC Act-listed White Box Yellow Box Blakely's Red Gum Woodland and associated PCTs

BC Act Scientific Determination	PCT 266	PCT 268	PCT 277	PCT 278	PCT 280	PCT 283	PCT 352	PCT 1330
The site is in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South-Eastern Highlands or NSW South-Western Slopes Bioregions	Yes, South-Eastern Highlands and NSW South-Western Slopes.	Yes, NSW South-Western Slopes.	Yes, South-Eastern Highlands and NSW South-Western Slopes.	Yes, South-Eastern Highlands and NSW South-Western Slopes.	Yes, South-Eastern Highlands and NSW South-Western Slopes.	Yes, NSW South-Western Slopes.	Yes, South-Eastern Highlands and NSW South-Western Slopes.	Yes, South-Eastern Highlands.
There are native species in the understorey, and/or the site is likely to respond to assisted natural regeneration	Yes Native species were recorded in the understorey in all vegetation zones.	Yes Native species were recorded in the understorey in all vegetation zones.	Yes Native species were recorded in the understorey in all vegetation zones.	Yes Native species were recorded in the understorey in all vegetation zones.	Yes Native species were recorded in the understorey in all vegetation zones.	Yes Native species were recorded in the understorey in all vegetation zones.	Yes Native species were recorded in the understorey in all vegetation zones.	Yes Native species were recorded in the understorey in all vegetation zones.
The site has trees OR The site is treeless, but is likely to have supported White Box, Yellow Box or Blakely's Red Gum prior to clearing:	The plots sampled in Moderate and High condition vegetation recorded canopy species. Low condition vegetation was often mapped adjacent to woodland, and/or paddock trees (White Box) were present.	The plots sampled in High and Moderate condition vegetation recorded canopy species. Low condition vegetation was often mapped adjacent to woodland dominated by White Box and/or Blakely's Red Gum.	The plots sampled in High, Moderate and Low condition vegetation recorded canopy species. Very low condition vegetation was often mapped adjacent to woodland, and/or paddock trees were present.	The plots sampled in High condition vegetation recorded canopy species. Moderate and Very low condition vegetation was often mapped adjacent to woodland and/or paddock trees (Blakely's Red Gum and/or Yellow Box) were present.	The plots sampled in High, Moderate, Low and Very low condition vegetation recorded canopy species. Very low condition vegetation was often mapped adjacent to woodland, and/or paddock trees were present.	The plots sampled in Very high, High, Moderate and Low condition vegetation recorded canopy species. Very low condition vegetation was often mapped adjacent to woodland, and/or paddock trees were present.	The plots sampled in Moderate and Low condition vegetation recorded canopy species. Very low condition vegetation was often mapped adjacent to woodland where Blakely's Red Gum is present.	The plots sampled in Very high, High, Moderate and Low condition vegetation recorded canopy species. Very low condition vegetation was often mapped adjacent to woodland, and/or paddock trees (Blakely's Red Gum and/or Yellow Box) were present.

BC Act Scientific Determination	PCT 266	PCT 268	PCT 277	PCT 278	PCT 280	PCT 283	PCT 352	PCT 1330
White Box, Yellow Box or Blakely's Red Gum, or a combination of these species, are or were present	White Box is dominant in this PCT. Blakely's Red Gum was also recorded.	White Box and Blakely's Red Gum are co-dominant in this PCT. Yellow Box was also recorded.	Blakely's Red Gum dominant, then Yellow and White Box.	Blakely's Red Gum and/or Yellow Box present in every non-grassland plot. Overall cover of these canopy species was less than 37.5% of total canopy cover. However, in most plots, Blakely's Red Gum or Yellow Box was recorded as the dominant or codominant species.	This PCT is dominated by Red Stringybark, however the canopy composition often varied across the PCT with Blakely's Red Gum, Yellow Box and White Box frequently present. Plots indicate that when present, Blakely's Red Gum, Yellow Box and/or White Box were frequently dominant or codominant.	Blakely's Red Gum dominates this vegetation PCT. Yellow Box was also recorded in low densities.	Blakely's Red Gum dominates this PCT.	Blakely's Red Gum and Yellow Box co-dominate this PCT.
Does the PCT meet the criteria for this TEC?	**Yes** **All condition classes of this PCT align to the BC Act listed TEC**	**Yes** **All condition classes of this PCT align to the BC Act listed TEC**	**Yes** **All condition classes of this PCT align to the BC Act listed TEC**	**Yes** **All condition classes of this PCT align to the BC Act listed TEC**	**Yes** **All condition classes of this PCT align to the BC Act listed TEC**	**Yes** **All condition classes of this PCT align to the BC Act listed TEC**	**Yes** **All condition classes of this PCT align to the BC Act listed TEC**	**Yes** **All condition classes of this PCT align to the BC Act listed TEC**

Table 6-11: Correlation of EPBC Act-listed White Box Yellow Box Blakely's Red Gum Woodland and associated PCTs

Criteria	EPBC Act	PCT 266	PCT 268	PCT 277	PCT 278	PCT 280	PCT 283	PCT 352	PCT 1330
1	**Is, or was previously, at least one of the most common**	Yes White Box is dominant in this PCT.	Yes White Box and Blakely's Red Gum are co-	Yes Blakely's Red Gum dominant, then Yellow and White Box.	Yes Less than 37.5% Blakely's Red Gum and Yellow	Yes This PCT is dominated by Red Stringybark,	Yes Blakely's Red Gum dominates this	Yes Blakely's Red Gum dominates this	Yes Blakely's Red Gum and Yellow Box co-

Criteria	EPBC Act	PCT 266	PCT 268	PCT 277	PCT 278	PCT 280	PCT 283	PCT 352	PCT 1330
	overstorey species White Box, Yellow Box or Blakely's Red Gum (or Western Grey Box or Coastal Greg Box in the Nandewar Bioregion)?	Blakely's Red Gum was also recorded.	dominant in this zone. Yellow Box was also recorded.		Box. However, the precautionary principle has been applied.	however Blakely's Red Gum, Yellow Box and White Box were sub dominant species.	vegetation zone. Yellow Box was also recorded in low densities.	vegetation zone.	dominate this vegetation zone.
2	**Does the 'patch' have a predominantly native understorey (>50% perennial native cover)?**	Yes For the plots sampled High, Moderate and Low condition the understorey comprised over 50% native species.	Yes For the plots sampled in High, Moderate and Low condition the understorey comprised over 50% native species.	Partial For the plots sampled in High, Moderate and Low condition the understorey comprised over 50% native species. The plots sampled in Very low condition were under 50%, therefore PCT 277 Very low does not meet this threshold.	Partial For the plots sampled in Moderate and High condition the understorey comprised over 50% native species. The plots sampled in Very low condition were under 50%, therefore PCT 278 Very low does not meet this threshold.	Partial For the plots sampled in High, Moderate and Low condition the understorey comprised over 50% native species. The plots sampled in Very low condition were under 50%, therefore PCT 280 Very low does not meet this threshold.	Partial For the plots sampled in Very high, High, Moderate and Low condition the understorey comprised over 50% native species. The plots sampled in Very low condition were under 50%, therefore PCT 283 Low does not meet this threshold.	Partial For the plots sampled in Moderate and Low condition the understorey comprised over 50% native species. The plots sampled in Very low condition were under 50%, therefore PCT 352 Very low does not meet this threshold.	Yes For the plots sampled in Very high, High, Moderate, Low and Very low condition the understorey comprised over 50% native species.
3	**Is the patch 0.1 ha or greater in size?**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4a	**Are there 12 or more native understorey species present**	High conditions meets this threshold.	High and Moderate conditions meet this	High and Moderate condition meets this threshold. However, less than 12 non-grass	High and Moderate condition vegetation meets	High, Moderate and Low	More than 12 non-grass species were recorded in	Moderate condition vegetation meets this	Very high, High and Moderate condition vegetation

Criteria	EPBC Act	PCT 266	PCT 268	PCT 277	PCT 278	PCT 280	PCT 283	PCT 352	PCT 1330
	(excluding grasses)?	However, less than 12 non-grass species were recorded in the Moderate and Low condition vegetation.	threshold. However, less than 12 non-grass species were recorded in the Low condition vegetation.	species were recorded in the Low and Very low condition vegetation.	this threshold. However, less than 12 non-grass species were recorded in the Moderate and Very low condition vegetation.	conditions meet this threshold.	Very High, High Moderate and Low conditions and therefore meet this threshold.	threshold. However, less than 12 non-grass species were recorded in the Low condition vegetation.	meets this threshold. However, less than 12 non-grass species were recorded in the Low and Very low condition vegetation.
4b	**There must be at least one important species.**	There is at least one important species in the High, Moderate and Low condition vegetation.	There is at least one important species in the High, Moderate and Low condition vegetation.	There is at least one important species in the High, Moderate, Low and Very low condition vegetation.	There is at least one important species in the High, Moderate and Very Low condition vegetation.	There is at least one important species in the High, Moderate, Low and Very low condition vegetation.	There is at least one important species in the Very high, High, Moderate, Low and Very low condition vegetation.	There is at least one important species in the Moderate, Low and Very low condition vegetation.	There is at least one important species in the Very high, High, Moderate, Low and Very low condition vegetation.
For condition classes that do not meet criteria 1-4:									
6	**Where patches do not meet the criteria 4a and 4b, is the patch 2 ha or greater in size?**	Moderate and Low condition is greater than 2 ha in size.	Low condition is greater than 2 ha in size.	Low and Very low condition is greater than 2 ha in size.	Moderate and Very low condition is greater than 2 ha in size.	Very low condition is greater than 2 ha in size.	Very low condition is greater than 2 ha in size.	Low and Very low condition is greater than 2 ha in size.	Low and Very low condition is greater than 2 ha in size.
7	**Does the 2 ha patch have 40 or more trees with a DBH >40 cm? (ie 20 per ha) Or is there natural regeneration of the dominant**	The Low condition vegetation does not meet this large tree threshold. Additionally, no	Based on the plots sampled, the Low condition vegetation does not meet this large tree threshold or	Based on the plots sampled, the Low and Very low condition vegetation does not meet this large tree threshold or regeneration threshold.	Based on the plots sampled, the Moderate and Very low condition vegetation does not meet this large tree	Based on the plots sampled, the Low and Very low condition vegetation does not meet this large tree threshold or	Very low condition vegetation does not meet this large tree threshold.	Based on the plots sampled, the Low and Very low condition vegetation does not meet this large tree	The Low and Very low condition vegetation does not meet this large tree threshold. No regeneration

Criteria	EPBC Act	PCT 266	PCT 268	PCT 277	PCT 278	PCT 280	PCT 283	PCT 352	PCT 1330
	overstorey Eucalypts?	regeneration was recorded in the Low condition.	regeneration threshold.		threshold or regeneration threshold.	regeneration threshold.		threshold or regeneration threshold.	was recorded in the Very low condition. however, plots sampled in Low condition vegetation mostly recorded regeneration.
Does the PCT meet the criteria for this TEC?		**High and Moderate – yes.** High condition meet all criteria. Moderate condition does not meet criteria 4a however meets the additional criteria 6 and 7. **Low – no.** Low condition does not meet criteria 4a or criteria 7 and therefore does not align to the TEC.	**High and Moderate – yes.** High and Moderate condition meet all criteria. **Low – no.** Low condition does not meet criteria 4a or criteria 7 and therefore does not align to the TEC.	**High and Moderate – yes.** **High and** Moderate condition meet all criteria. **Low and Very low – no.** Very low condition does not meet criteria 2. Low does not meet criteria 4a or criteria 7 and therefore does not align to the TEC.	**High – yes.** High condition meets all criteria. **Moderate and Very low – no.** Very low condition does not meet criteria 2. Moderate does not meet criteria 4a or criteria 7 and therefore does not align to the TEC.	**High and Moderate – yes.** High and Moderate condition meet all criteria. **Low and Very low – no.** Very low condition does not meet criteria 2. Low condition does not meet criteria 4a or criteria 7 and therefore does not align to the TEC.	**Very high, High, Moderate and Low – yes.** Very High, High, Moderate and Low condition meet all criteria. **Very low – no.** Very low condition does not meet criteria 2.	**Moderate – yes.** Moderate condition meets all criteria. **Low and Very low – no.** Very low condition does not meet criteria 2. Low condition does not meet criteria 4a or criteria 7 and therefore does not align to the TEC.	**Very high, high Moderate and Low – yes.** Very High, High and Moderate condition meet all criteria. Low condition does not meet criteria 4a. However, Low condition meets criteria 6 and 7 and therefore aligns with the TEC. **Very Low – no.** Very low condition does not meet criteria 4a.

6.5.2 Coolac-Tumut Serpentinite Shrubby Woodland

Coolac-Tumut Serpentinite Shrubby Woodland TEC is listed as Endangered under the BC Act. One PCT is identified as potentially aligning to this TEC (PCT 301).

The State listing and description for the TEC is described in NSW Scientific Committee (2015) Final Determination - Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South-Western Slopes and South-Eastern Highlands Bioregions – endangered ecological community listing.

A comparison of the final determination for Coolac-Tumut Serpentinite Shrubby Woodland TEC and candidate PCT is provided in Table 6-12. Each element of the final determination including locality, species composition, characteristic species and resilience is compared to each condition class for the candidate PCT to determine if vegetation recorded is consistent with the listing criteria. Based on this assessment and undertaking a conservative approach, PCT 301 was considered to align with the Coolac-Tumut Serpentine Shrubby Woodland TEC listed under the BC Act.

Table 6-12: Correlation of BC Act-listed Coolac-Tumut Serpentinite Shrubby Woodland and associated PCT 301

BC Act Scientific Determination	PCT 301
Coolac-Tumut Serpentinite Shrubby Woodland occurs within the NSW South-Western Slopes and South-Eastern Highlands Bioregions.	All areas of mapped PCT 301 occur within the NSW South-Western Slopes (Inland Slopes) or South-Eastern Highlands Bioregion (Bondo) bioregions.
Characteristic flora species of the Coolac-Tumut Serpentinite Shrubby Woodland TEC present*.	Characteristic species of the TEC are present throughout PCT 301. The most common species were *Allocasuarina verticillata* (Drooping Sheoak), *Xanthorrhoea glauca* and *Ricinocarpos bowmanii* (Western Wedding Bush). *Eucalyptus nortonii* (Long-leaved Box) was recorded in one plot. All of these species are characteristic of this TEC.
Associated serpentinite geology formations mapped at the site.	Of the PCT 301 mapped in the project footprint, 87% is mapped as occurring on Cootamundra - Tumut Serpentinite and Ultramafics Mitchell Landscape which is an associated serpentinite geology formation for the TEC. Of the remaining mapped PCT 301, 12% is mapped on the Carabost Hills and Ranges Landscape and 1% on the Adelong Granite Ranges Landscape (DECC, 2002). These Mitchell Landscapes are not associated serpentinite geology formations.
Soils are commonly shallow to skeletal with much exposed rock.	Of the PCT 301 mapped in the project footprint 87% is mapped as occurring on Cootamundra - Tumut Serpentinite and Ultramafics Mitchell Landscape, 12% on the Carabost Hills and Ranges Landscape and 1% on Adelong Granite Ranges Landscape (DECC, 2002). The Tumut Serpentinite and Ultramafics landscape is described as having narrow ridges of extended linear outcrops. The Carabost Hills and Ranges landscape is characterised as having thin stony gradational red brown earth and red-yellow texture-contrast soils. The Adelong Granite Ranges Landscape is associated with rocky outcrops (DECC, 2002). These soil types generally align with the shallow to skeletal soils with exposed rock associated with the TEC. Field observations also support this, with exposed rock described as being present throughout PCT 301.
Does the PCT meet the criteria for this TEC?	**Partial** 87% of PCT 301 within the project footprint meets the criteria for this TEC. Based on a review of available geology mapping, the remaining 13% does not. However, given limitations with regard to the accuracy and coverage of geology mapping, a conservative approach has been adopted and TEC status assigned to the entire of PCT 301.

* See the Final Determination listing for characteristic species (2015).

6.5.3 Tableland Basalt Forest

Tableland Basalt Forest TEC is listed as Endangered under the BC Act. Five PCTs potentially align with this TEC as detailed in Table 6-9.

The State listing and description for the TEC is described in NSW Scientific Committee (2011) Final Determination - Tableland Basalt Forest in the Sydney Basin and South-Eastern Highlands Bioregions.

A comparison of the final determination for Tableland Basalt Forest and candidate PCTs is provided in Table 6-13. Each element of the final determination including locality, species composition, characteristic species and resilience is compared to each condition class for candidate PCTs to determine if vegetation recorded is consistent with the listing criteria. The consideration of whether the PCT meets the TEC listing criteria is made considering all of the listing criteria as a whole, therefore where a PCT does not or only partially meets one of the listing criteria, it does not preclude the PCT meeting the overall criteria for the TEC, if most other criteria are met.

The final determination for Tableland Basalt Forest identifies the TEC as occurring in the Southern Eastern Highlands IBRA Bioregion, however, does not detail specific IBRA subregions. A BAM-C case assigned to the Bondo IBRA subregion (within the Southern Eastern Highlands IBRA Bioregion) currently does not provide the associated Tableland Basalt Forest TEC for PCT 953. The below justification has adopted a conservative approach and assumes PCT 953 in Bondo aligns to the associated Tableland Basalt Forest TEC.

PCT 953 is mapped in the Snowy Mountains IBRA subregion which is in the Australian Alps IBRA Bioregion. Given Tableland Basalt Forest TEC is only associated with the Sydney Basin and South Eastern Highlands Bioregions, PCT 953 in the Snowy Mountains does not align to the TEC.

Characteristics of each of the four PCTs within the project footprint were found to be consistent with the listing criteria and are thus considered the TEC.

Table 6-13: Correlation of BC Act-listed Tableland Basalt Forest and associated PCTs

BC Act determination	PCT 952	PCT 953	PCT 1097	PCT 1107
The site is located 600–900 metres Australian Height Datum (mAHD) in the Sydney Basin and South-Eastern Highlands Bioregions	**Yes** All of PCT 952 situated within the project footprint occurs within 771 – 898 m AHD Crookwell Subregion) (ICSM, 2022).	**Yes** All of PCT 953 situated within the project footprint occurs within 400 – 900 mAHD (Bondo Subregion).	**Yes** All of PCT 1097 situated within the project footprint occurs within 659 – 770 mAHD and 771 – 898 mAHD (Bungonia Subregion) (ICSM, 2022).	**Yes** All of PCT 1107 situated within the project footprint occurs within 659–770 mAHD (Bungonia Subregion) (ICSM, 2022).
Mean annual rainfall varies from approximately 750 mm up to 1,100 mm	**Yes** PCT 952 in the project footprint occurs in an area that receives 600-800 mm of rain (BOM, 2022).	**Yes** All of PCT 953 in the project footprint occurs in an area that receives 1,000-1,200 mm of rain.	**Yes** PCT 1097 in the project footprint occurs in an area that receives 600-800 mm of rain (BOM, 2022).	**Yes** PCT 1107 in the project footprint occurs in an area that receives 600-800 mm of rain (BOM, 2022).
Is the site on relatively fertile loam or clay soils derived mainly from basalt but also from other substrates?	**Yes** 56% of PCT 952 is mapped in the Crookwell Basalts and Sands Mitchell Landscape, and 44% is mapped in the Towrang Ranges which is not characterised by fertile loam or clay soils (DECC, 2002).	**No** All of PCT 953 is mapped on sandy soils (Minjary Hills Ranges Mitchell Landscapes) (DECC, 2002).	**Partial** 50% of PCT 1097 is mapped on Crookwell Basalts and Sands Mitchell Landscape. The remaining vegetation is mapped on the Rockley Plains landscape (48%) and Wollondilly - Bindook Tablelands and Gorges landscape (2%) (DECC, 2002).	**No** The PCT 1107 occurs on the mapped Rockley Plains Mitchell Landscape (DECC, 2002).
Is the vegetation a grassy open forest or woodland, or a native grassland (where trees and shrubs have been removed)?	**Yes** Plots sampled in PCT 952 show a high cover of grass and grass-like species and low cover of shrub species.	**Yes** Plots sampled in PCT 953 show a high cover of grass and grass-like species and low to moderate cover of shrub species.	**Yes** Plots sampled in PCT 1097 show a moderate cover of grass and grass-like species and a low cover of shrub species.	**Yes** Plots sampled in PCT 1107 show a moderate cover of grass and grass-like species and a low cover of shrub species.
Does the tree layer, if present, contain any of the following: ribbon gum, narrow-leaved peppermint, mountain gum or white sally (snow gum)?	**Yes** The canopy is dominated by *Eucalyptus pauciflora* (White Sally).	**Yes** The canopy is dominated by *Eucalyptus pauciflora* (White Sally) and *Eucalyptus dalrympleana* subsp. *dalrympleana* (Mountain Gum).	Yes The canopy is dominated by *Eucalyptus radiata* (Narrow-leaved Peppermint) and *Eucalyptus viminalis* (Ribbon Gum).	**Yes** Both *Eucalyptus radiata* (Narrow-leaved Peppermint) and *Eucalyptus viminalis* (Ribbon Gum) are present in this PCT.
Does the PCT meet the criteria for this TEC?	**Yes**	**Yes**	**Yes**	**Yes**

6.5.4 Monaro Tableland Cool Temperate Grassy Woodland

Monaro Tableland Cool Temperate Grassy Woodland TEC is listed as Critically Endangered under the BC Act. Two PCTs potentially align to this TEC (PCT 679 and PCT 1191 in the Crookwell IBRA subregion).

A comparison of the final determination for Monaro Tableland Cool Temperate Grassy Woodland and candidate PCTs is provided in Table 6-14. Each element of the final determination including locality, species composition, characteristic species and resilience is compared to each condition class for candidate PCTs to determine if vegetation recorded is consistent with the listing criteria.

PCT 679 and PCT 1191 are mapped in the Snowy Mountains IBRA subregion which is in the Australian Alps IBRA Bioregion. Similarly, PCT 1191 is mapped in the Inland Slopes IBRA subregion which is part of the NSW South-Western Slopes IBRA Bioregion. Given the Monaro Tableland Cool Temperate Grassy Woodland TEC is only associated with the South Eastern Highlands Bioregion, PCT 679 and PCT 1191 in the Snowy Mountains and PCT 1191 in the Inland Slopes do not align to the TEC.

Characteristics of each of the two PCTs within the project footprint were found to be consistent with the listing criteria and are thus considered the TEC.

Table 6-14: Correlation of BC Act-listed Monaro Tableland Cool Temperate Grassy Woodland and associated PCTs

BC Act	PCT 679	PCT 1191
Is the vegetation characterised by a sparse to very sparse tree stratum dominated by *Eucalyptus pauciflora* or co-dominant with *Acacia melanoxylon*, *Eucalyptus rubida* subsp. *rubida*, *Eucalyptus stellulata* or *Eucalyptus viminalis.**	**Yes** *Eucalyptus pauciflora* was the dominant species in all the plots sampled. The characteristic canopy species, *Eucalyptus stellulata* was also recorded in this PCT.	**Yes** *Eucalyptus pauciflora* was the dominant species in all the plots sampled. The characteristic canopy species, *Eucalyptus rubida* subsp. *rubida* was also recorded in this PCT.
Monaro Tableland Cool Temperate Grassy Woodland occurs on broad valley floors and the slopes and low rises of the moderately undulating tablelands.	**Yes** Most of PCT 679 is distributed across three Mitchell Landscapes: the Cabramurra - Kiandra Basalt Caps and Sands (hills on the high plains), Gundary Plains (Wide open valleys) and Tooma Granite Ranges (Rounded hills, ranges and plateau).	**Yes** Most of PCT 1191 in the project footprint occurs on the Rockley Plains Mitchell Landscape which is characterised by low rolling hills on plateau surface.
Does the vegetation occur at elevation 700–1,200 m above sea level.	**Yes** All of PCT 679 in the project footprint occurs between 771 – 1,213 m above sea level.	**Yes** Majority of PCT 1191 in the project footprint occurs between 771 – 898 m above sea level. A small portion of PCT 1191 in the project footprint is planted vegetation and has been assigned PCT 1191 as the best fit, this vegetation is below 700 m above sea level. and does not align to the TEC.
Does the vegetation occur in an area with an average annual rainfall 600–800 mm.	**Partial** All of PCT 679 occurs in an area with an average annual rainfall of 600 - 800 mm.	**Yes** Majority of PCT 1191 occurs in an area with an average annual rainfall of 600 - 800 mm. A small portion of PCT 1191 in the project footprint is planted vegetation and has been assigned PCT 1191 as the best fit. This vegetation is in an area with an

BC Act	PCT 679	PCT 1191
		average annual rainfall 800 – 1,000 mm. It does not align to the TEC.
Does the PCT meet the criteria for this TEC?	**Yes**	**Yes**

* See the Final Determination listing for characteristic species (2019).

6.5.5 Montane Peatlands and Swamps

Montane Peatlands and Swamps TEC is listed as Endangered under the BC and EPBC Acts. Two PCTs potentially align to these TECs (PCT 939 and PCT 1256).

The State listing and description for the TEC is described in NSW Scientific Committee (2004) *Final Determination - Montane peatlands and swamps of the New England Tableland, NSW North Coast, Sydney Basin, South-East Corner, South-Eastern Highlands and Australian Alps bioregions*, whilst the Commonwealth listing and description is detailed in DoE (2006) Approved Conservation Advice (including listing advice) for Alpine Sphagnum Bogs and Associated Fens.

The final determination for Montane Peatlands and Swamps identifies the TEC as occurring in the Southern Eastern Highlands IBRA Bioregion, however, does not detail specific IBRA subregions. A BAM-C case assigned to the Crookwell IBRA subregion (within the Southern Eastern Highlands IBRA Bioregion) currently does not provide the associated Montane Peatlands and Swamps TEC for PCT 1256. The below justification has adopted a conservative approach and assumed PCT 1256 in Crookwell aligns to the TEC.

A comparison of the final determination for Montane Peatlands and Swamps and candidate PCTs is provided in Table 6-15 and Table 6-16. Each element of the final determination including locality, species composition, characteristic species and resilience is compared to each condition class for candidate PCTs to determine if vegetation recorded is consistent with the listing criteria.

In summary, both PCTs were found to align to the BC Act listed TEC. Only PCT 939 was found to align with the EPBC Act listed TEC; PCT 1256 did not meet four of the six defining criteria required.

Table 6-15: Correlation of BC Act-listed Montane Peatlands and associated PCTs

BC Act determination	PCT 939	PCT 1256
Is the site above 400 m in the New England Tableland, NSW North Coast, Sydney Basin, South-East Corner, South-Eastern Highlands or Australian Alps bioregion?	**Yes** All areas of PCT 939 are within the Australian Alps Bioregion and are above 1,100 m above sea level (ICSM, 2022).	**Yes** All areas of PCT 1256 are present within the South-Eastern Highlands Bioregion and are between 560 – 830 m above sea level (ICSM, 2022).
Is the site on a generally boggy flat area near the headwaters of a stream?	**Yes** PCT 939 is mapped in boggy areas of impeded drainage near the headwaters of streams.	**Yes** PCT 1256 is mapped in boggy areas of impeded drainage near the headwaters of streams.
Is the site associated with accumulated peaty or organic-mineral sediments generally in catchments with soil derived from basalt or fine-grained sedimentary substrates or, occasionally, granite and metamorphic sediments?	**Yes** PCT 939 occurs on the Tooma Granite Ranges Mitchell landscape (DECC, 2002) and is associated with granite derived soils. Detailed soil mapping showing areas of peat soils is not available for the area. Therefore, the precautionary principle has been applied and it is assumed all areas of PCT 939 lie in areas associated with these soil types.	**Yes** Detailed soil mapping showing areas of peat soils is not available for the area. PCT 1256 occurs within the Rockley Plains, Boorowa Volcanics and Marilba Range Mitchell landscapes (DECC, 2002). The Rockley Plains Mitchell landscape is associated with Silurian and Ordovician slate, phyllites, felspathic sandstones and interbedded volcanics. The Boorowa Volcanics Mitchell Landscape is associated with volcanic rocks varying in composition from felsic to intermediate and associated sedimentary rocks while the Marilba Range Mitchell landscape is also associated with steep dipping Devonian rhyolite, dacite, andesite, tuff and shale (DECC, 2002).

BC Act determination	PCT 939	PCT 1256
		Detailed soil mapping showing areas of peat soils is not available for the area. Therefore, the precautionary principle has been applied and it is assumed all areas of PCT 1256 lie in areas associated with these soil types.
Does the site have a noticeably low number to complete absence of trees?	**Yes** Trees were absent or present in low abundance.	**Yes** Trees were absent or present in low abundance.
Does the site contain more than trace amounts of Sphagnum moss (if the community is highly stressed from drought or otherwise Sphagnum may be rare on site to completely absent)?	**Yes** *Sphagnum cristatum* was recorded in 939 Very high condition.	**No** *Sphagnum sp*. were recorded.
Is there a reasonable representation of the shrubs and groundcover species present from those listed as characteristic of Montane Peatlands and Swamps*?	**Yes** 22 species characteristic of Montane Peatlands and Swamps were recorded within PCT 939. These included: • *Acaena novae-zelandiae* • *Asperula gunnii* • *Baeckea utilis* • *Blechnum nudum* • *Blechnum penna-marina subsp. alpina* • *Carex appressa* • *Deyeuxia quadriseta* • *Empodisma minus* • *Epacris breviflora* • *Geranium neglectum* • *Gonocarpus micranthus* • *Gratiola peruviana* • *Hakea microcarpa* • *Juncus planifolius* • *Juncus sarophorus* • *Leptospermum myrtifolium* • *Mitrasacme serpyllifolia* • *Poa labillardierei var. labillardierei* • *Poa sieberiana* • *Ranunculus lappaceus* • *Sphagnum cristatum* • *Stellaria pungens.*	**No** Three species characteristic of Montane Peatlands and Swamps were recorded within PCT 1256. These included: • *Carex appressa* • *Carex gaudichaudiana* • *Poa labillardierei var. labillardierei.* However, the presence of these three species is not considered to be a reasonable representation of the shrubs and groundcover species characteristic of the TEC.
Does the PCT meet the criteria for this TEC?	**Yes** While there is no detailed soil mapping available, all areas of PCT 939 are considered to align with the TEC based on the other characteristics and the precautionary principle.	**Yes** All areas of PCT 1256 are precautionarily considered to align with the TEC despite the lack of detailed soil mapping and absence of Sphagnum moss and other characteristic species.

* See the Final Determination listing for characteristic species (2004).

Table 6-16: Correlation of EPBC Act listed Alpine Sphagnum Bogs and Associated Fens and associated PCTs

EPBBC Act determination	PCT 939	PCT 1256
Is the site in one of the following IBRA Regions: Australian Alps, the Tasmanian Central Highlands and the Tasmanian Southern Ranges IBRA bioregions. Or, it is also found in a small area of the Bondo subregion of the South-Eastern Highlands IBRA bioregion on mainland Australia	Yes Situated within the Australian Alps IBRA bioregion.	No The mapped occurrences are situated within the Murrumbateman and Crookwell Sub-region of the South-Eastern Highlands IBRA bioregion.
Typical plant species found in the Alpine Sphagnum Bogs and Associated Fens ecological community are present? *	Yes 11 species found in the Alpine Sphagnum Bogs and Associated Fens were recorded within PCT 939. These included: • *Asperula gunnii* • *Baeckea utilis* • *Blechnum penna-marina subsp. alpina* • *Carex appressa* • *Empodisma minus* • *Epacris breviflora* • *Gonocarpus micranthus* • *Poa labillardierei var. labillardierei* • *Poa sieberiana* • *Ranunculus lappaceus* • *Sphagnum cristatum.*	No Only 3 species were found that corelated with the species found in the listing advice: • *Carex appressa* • *Carex gaudichaudiana* • *Poa labillardierei var. labillardierei.*
Is any species of *Sphagnum* present? *However, there are some sites… where Sphagnum has been depleted or lost due to disturbance. In these cases, the site may still be considered to be part of this ecological community if other key species are present and a peat substratum is evident.*	Yes *Sphagnum cristatum* was recorded in 939 Very high.	No *Sphagnum sp*. was not recorded.
A peat layer is present?	Assumed Detailed soil mapping showing areas of peat soils is not available for the area. Therefore, the precautionary principle has been applied and it is assumed all areas of PCT 939 lie in areas associated with a peat layer.	Assumed Detailed soil mapping showing areas of peat soils is not available for the area. Therefore, the precautionary principle has been applied and it is assumed all areas of PCT 1256 lie in areas associated with a peat layer.
Is the site in a permanently wet area, such as along a stream, valley edge or valley floor?	Yes PCT 939 is mapped in boggy areas of impeded drainage near the headwaters of streams.	Yes PCT 1256 is mapped in boggy areas of impeded drainage near the headwaters of streams.
The site is above 1,000 m above sea level	Yes All areas of PCT 939 are above 1,100 m above sea level (ICSM, 2022).	No All areas of PCT 1256 are between 560 – 830 m above sea level (ICSM, 2022).
Outcome	Yes, it is the TEC	Not the TEC

* See the Threatened Species Scientific Committee listing for characteristic species (2009).

6.6 Groundwater dependent ecosystems

Groundwater dependent ecosystems (GDEs) are ecosystems that rely on access to groundwater on a permanent or intermittent basis to meet all or some of their water requirements to maintain their communities of plants and animals, ecological processes and ecosystem services (BoM, 2017). GDEs include aquifers, caves, lakes, palustrine wetlands, lacustrine wetlands, rivers and vegetation (BoM, 2017).

A review of the Atlas of GDEs (BoM, 2017) indicates moderate and high potential terrestrial GDEs are mapped as occurring within the project footprint. These generally corresponded with the location of large streams and waterways as follows:

Table 6-17: Large streams and watercourses within project footprint.

IBRA sub region	Large streams and waterways within region
Bungonia	Bannaby, Connors and Kerrawary Rivers.
Crookwell	Back, Cowpers, Dawsons Flat, First, Gurrundah, Heffernans, Kialla, Melamalong, Middle, Myrtle, Pejar, Ryans, Sawpit, Steeves, Tarlo, Turrallo and Wollondilly Rivers.
Murrumbateman	Cart Road, Derringullen, Black Range, Bogolong, Bowning, Cart Road, Derringullen, Jugiong, Mantons, Three Waterholes, Washpen, Woolgarlo and Yellow Rivers.
Inland Slopes	Adelong, Adjungbilly, Bango, Big Rock, Big Sring, Brungle, Cart Road, Cockatoo, College, Comatawa, Cooks, Coxs, Darlows, Derringullen, Dicks, Excursion, Fairy Hole, Foleys, Galvins, Gocup, Gregadoo, Keajura, Killimicat, Kyeamba, Leech, Mudhole, Murrumbidgee, Nacki Nacki, Oak, O'briens, Right Arm, Rocky, Sandy, Sawpit, Sod Hut, Stony, Tarcutta, Tumut, Turners, Tywong, Umbango, Wilsons, Windowie, Yaven and Yellow Clay Rivers.
Bondo	Adelong, Gilmore, Kiley, Ridings, Saw Mill, Sharps, Snubba and Uncles Rivers.
Snowy Mountains	Sandy, Buddong, Foxes, Honeysuckle, Logbridge, Long, Mcgregors, Mettys, New Zealand, Plain, Sandy, Sheepyard, Stockmans, Tomneys Plain, Weir, Yellowin and Yorkers Rivers.

Mapped GDEs within the project footprint were subject to ground-truthing as a part of the field campaign (depending on land access) to confirm landscape position (ie alluvial) and associated floristic composition. The nation-wide inflow dependent ecosystems (IDE) rating (BoM, 2017) was also reviewed to assess the likelihood that mapped GDEs are accessing supplementary groundwater sources to fulfil their water requirements.

The IDE rating is expressed as a range of values between 1 and 10 (low to high), where 10 indicates landscapes that are most likely to access additional water sources such as soil water, surface water, or groundwater (BoM, 2017). An IDE of 6 or more indicates that the landscape is more likely to be inflow-dependent and accessing an additional source of water rather than relying solely on rainfall. The IDE rating is considered as a supplementary indicator of the importance of additional water sources in the landscape. A low rating is not interpreted as meaning a PCT within the relevant landscape is not groundwater dependent.

A total of 15 PCTs within the project footprint have been identified as potential terrestrial GDEs. Their GDE potential, IDE score and relative extent is detailed in Table 6-18 and shown in Figure 6-2 (Attachment 1). The calculations presented in Table 6-18 includes Category 1 exempt lands. An assessment of project impacts to GDEs is presented in Chapter 13 of this BDAR.

Table 6-18: Potential groundwater dependant ecosystems within the study area

Groundwater-dependent PCTs	Associated TEC	GDE potential (BoM, 2017)	IDE	GDE extent (ha)	Total PCT extent (ha)	% PCT
PCT 5 - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South-Western Slopes Bioregion and the eastern Riverina Bioregion.	-	Moderate potential GDE - from regional studies	10	6.92	10.54	65.7
PCT 266 - White Box grassy woodland in the upper slopes sub-region of the NSW South-Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	Moderate potential GDE - from regional studies	6	2.08	508.86	0.41
PCT 277 – Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South-Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	Moderate potential GDE - from regional studies	6	0.03	926.5	0
PCT 280 - Red Stringybark – Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland of the NSW South-Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	High potential GDE - from national assessment	10	6.57	735.48	0.89
PCT 287 - Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes in the NSW South-Western Slopes Bioregion	-	High potential GDE - from national assessment	8	0.08	182.83	0.04
PCT 287 - Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes in the NSW South-Western Slopes Bioregion	-	Moderate potential GDE - from national assessment	6	6.91	182.83	3.78
PCT 287 - Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes in the NSW South-Western Slopes Bioregion	-	Moderate potential GDE - from national assessment	7	2.6	182.83	1.42
PCT 300 - Ribbon Gum - Narrow-leaved (Robertson's) Peppermint montane fern - grass tall open forest on deep clay loam soils in the upper NSW South-Western Slopes Bioregion and western Kosciuszko escarpment	-	Moderate potential GDE - from regional studies	3	0.51	59.34	0.85
PCT 638 - Alpine Ash - Mountain Gum moist shrubby tall open forest of montane areas, southern South-Eastern Highlands Bioregion and Australian Alps Bioregion	-	High potential GDE - from regional studies	4	0.02	76.05	0.02
PCT 679 - Black Sallee - Snow Gum low woodland of montane valleys, South-Eastern Highlands Bioregion and Australian Alps Bioregion	Monaro Tableland Cool Temperate Grassy Woodland	High potential GDE - from regional studies	8	2.16	36.43	5.93
PCT 679 - Black Sallee - Snow Gum low woodland of montane valleys, South-Eastern Highlands Bioregion and Australian Alps Bioregion	Monaro Tableland Cool Temperate Grassy Woodland	High potential GDE - from regional studies	9	0.7	36.43	1.93
PCT 679 - Black Sallee - Snow Gum low woodland of montane valleys, South-Eastern Highlands Bioregion and Australian Alps Bioregion	Monaro Tableland Cool Temperate Grassy Woodland	Moderate potential GDE - from regional studies	8	0.74	36.43	2.03
PCT 939 - Montane wet heath and bog of the eastern tablelands, South-Eastern Highlands Bioregion	-	High potential GDE - from regional studies	3	0.05	3.53	1.41
PCT 953 - Mountain Gum - Snow Gum - Broad-leaved Peppermint shrubby	Tableland Basalt Forest		3	5.81	551.68	1.05
PCT 953 - Mountain Gum - Snow Gum - Broad-leaved Peppermint shrubby	Tableland Basalt Forest		4	4.01	551.68	0.73

Groundwater-dependent PCTs	Associated TEC	GDE potential (BoM, 2017)	IDE	GDE extent (ha)	Total PCT extent (ha)	% PCT
open forest of montane ranges, South-Eastern Highlands Bioregion and Australian Alps Bioregion		High potential GDE - from regional studies	8	3.72	551.68	0.67
			9	0.06	551.68	0.01
		Moderate potential GDE - from regional studies	3	3.14	551.68	0.57
			4	0.5	551.68	0.09
PCT 1107 - River Peppermint - Narrow-leaved Peppermint open forest on sheltered escarpment slopes, Sydney Basin Bioregion and South-East Corner Bioregion	-	Moderate potential GDE - from national assessment	6	0.17	3.64	4.76
PCT 1150 - Silvertop Ash - Blue-leaved Stringybark shrubby open forest on ridges, north-east South-Eastern Highlands Bioregion	-	Moderate potential GDE - from national assessment	6	0.88	87.92	1
PCT 1196 - Snow Gum - Mountain Gum shrubby open forest of montane areas, South-Eastern Highlands Bioregion and Australian Alps Bioregion	-	High potential GDE - from regional studies	3	0.18	111.67	0.16
			8	3.52	111.67	3.15
		Moderate potential GDE - from regional studies	3	5.03	111.67	4.51
			8	1.08	111.67	0.97
PCT 1224 - Sub-alpine dry grasslands and heathlands of valley slopes, southern South-Eastern Highlands Bioregion and Australian Alps Bioregion	-	High potential GDE - from regional studies	7	0.47	10.63	4.45
			8	9.63	10.63	90.58
PCT 1330 - Yellow Box – Blakely's Red Gum grassy woodland on the tablelands, South-Eastern Highlands Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	High potential GDE - from national assessment	10	0.15	1303.16	0.01

6.7 Planted native vegetation

In accordance with Section 2.2,1(c) of the BAM (DPIE, 2020a), planted native vegetation may be assessed using a streamlined assessment module, where the vegetation is planted for purposes such as street trees or other roadside plantings, windbreaks, landscaping in parks and gardens and revegetation for environmental rehabilitation.

Throughout the project footprint, there is approximately 48.65 ha of mapped Planted Native Vegetation, 17.93 ha (37%) of which is situated within Category 1 - exempt lands (Table 6-19). This vegetation is largely planted along the boundaries of paddocks, for the purposes of windbreaks within agricultural landscapes.

An assessment of planted native vegetation is presented in Attachment 11 in accordance with the BAM Attachment D Planted Native Vegetation Streamlined Assessment Module.

It should be noted that a BAM operational manual was published in December 2022 for the Planted Native Vegetation Streamlined Assessment Module (DPIE 2022). The assessments conducted as part of this BDAR were completed prior to the release of this manual.

Table 6-19: Planted native vegetation within the project footprint

IBRA subregion	Project footprint (ha)	Indicative disturbance area (ha)
Bondo	0.71	0.53
Bungonia	1.60	0.15
Crookwell	12.69	1.31
Inland Slopes	26.02	3.35
Murrumbateman	7.62	0.75
Snowy Mountains	0.0	0.0
Total	**48.65**	**6.09**

7 Threatened species

This chapter addresses threatened species in accordance with Section 6 of the BAM (DPIE, 2020a).

7.1 Candidate species credit species assessment process

Species credit species are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence or components of their habitat. Threatened species to be assessed for species credits are identified for a project by the BAM-C. In the BAM-C, these species are referred to as candidate species.

Assessing habitat suitability for a species credit species involves the following steps:

- Step 1: Identify species credit species for assessment
- Step 2: Assess the habitat constraints and vagrant species for species credit species on the biodiversity assessment development footprint
- Step 3: Further assessment of candidate species credit species
- Step 4: Determine the presence of a candidate species credit species
- Step 5: Determine the area or count, and location of suitable habitat for a species credit species (a species polygon)
- Step 6: Determine the habitat condition within the species polygon for species assessed by area.

The list of candidate threatened flora and fauna species (species credit species) generated via the BAM-C is provided in Table 7-1 and Table 7-4. No additional threatened flora and fauna species were identified as requiring assessment.

Given the size of the project and the complexity of the assessment (ie involving consideration of many candidate species over six different IBRA subregions) a mapping process was applied in ESRI ArcGIS to delineate the extent of suitable habitats for candidate threatened flora and fauna species in which further assessment of species presence/ absence would be required by means of targeted surveys, an expert report or assumed presence.

The mapping process applied broadly followed the principles outlined in the BAM (DPIE, 2020a) (step 2, 5 and 6 above) incorporating the use of the TBDC and BioNet species profile information (DPE, 2020), field data and site observations, BAM-C outputs, supplementary desktop and mapping methods (Section 4.10.2) and species-specific feedback received from the BCD as a part of project consultation. In summary, the process to map suitable habitat for candidate species credit species was as follows:

- vegetation zones forming a known PCT habitat association were identified
- listed geographic constraints were mapped and excluded
- habitats were excluded where the patch size assigned to each vegetation polygon did not meet the patch size threshold for the candidate species, as per the TBDC
- habitats were excluded where the native woody vegetation cover score assigned to each vegetation polygon did not meet the vegetation cover threshold for the candidate species, as per the TBDC (Attachment 12 identifies candidate species with higher vegetation cover thresholds for which this filter was applied)
- habitat constraints listed within the TBDC were considered provided these could be confidently mapped for all lands (including inaccessible private lands within the project footprint). Relevant habitat constraints applied as a part of the mapping process included:

    - semi-permanent/ ephemeral wet areas
    - riparian areas and drainage lines
    - cliffs
    - karst
    - rocky areas
    - hollow presence/ absence and associated hollow size class (ie hollows greater than 20 centimetres diameter)
- degraded habitats were defined and excluded where necessary microhabitats for candidate species were considered absent. Where relevant, degraded habitats generally incorporated:
    - low and very low condition PCTs subject to significant land use disturbance as a result of historical clearing, cropping and intensive grazing practices
    - PCTs under-scrubbed or lacking a native understorey
    - Category 1 exempt lands and scattered trees completely enveloped by these lands.

Attachment 12 provides details of the mapping approach applied for relevant candidate threatened flora and fauna species associated with IBRA subregions within the project footprint.

7.2 Threatened flora

7.2.1 Candidate threatened flora species

A total of 66 threatened flora species (candidate species) with potential habitat within the project footprint were identified by means of the BAM-C (refer to Section 4.5.1).

A summary of the results of the habitat suitability assessment (Step 2 above) for each species is provided in Table 7-1, including justification for species inclusion/exclusion from further assessment. Of the 66 potential candidate species, six species were excluded from further assessment based on lack of suitable habitat/habitat constraints/geographic limitations or vagrancy as described in Table 7-1.

A total of 60 threatened flora species were identified as requiring further assessment. Many of these candidate species occur across multiple IBRA subregions. Of the 60 candidate species identified, the following number occur in each of the IBRA subregions associated with the project:

- 20 in Bungonia
- nine in Crookwell
- 11 in Murrumbateman
- 23 in Inland Slopes
- two in Bondo
- 17 in Snowy Mountains.

Species-specific information presented in Table 7-1 below was obtained from the information sources outlined in Section 4.5.1.

Table 7-1: Candidate threatened flora species credit species

Scientific name	Common name	BC Act status *	EPBC Act status*	SAII	Habitat/ geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
						BON[3]	BUN[4]	CRO[5]	MUR[6]	INL[7]	SNO[8]	
Acacia ausfeldii	Ausfeld's Wattle	V	-	-	Other; footslopes and low rises on sandstone	-	-	-	-	Included	-	**Included** Found east of Dubbo in the Mudgee-Ulan-Gulgong area of the NSW South-Western Slopes IBRA bioregion with some records also in South-Eastern highlands. Associated with PCTs and habitat that occurs in the Inland Slopes IBRA subregion.
Acacia bynoeana	Bynoe's Wattle	E	V	-	NA	-	Included	Included	-	-	-	**Included** Bynoe's wattle is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. Associated with PCTs and habitat that occurs in the project footprint.
Acacia clunies-rossiae	Kanangra Wattle	V	-	-	NA	-	Included	-	-	-	-	**Included** Kanangra Wattle grows in the Kowmung and Coxs River areas entirely within Kanangra-Boyd and Blue Mountains National Parks.
Acacia flocktoniae	Flockton Wattle	V	V	-	NA	-	Included	-	-	-	-	**Included**

[3] Bondo IBRA subregion
[4] Bungonia IBRA subregion
[5] Crookwell IBRA subregion
[6] Murrumbateman IBRA subregion
[7] Inland Slopes IBRA subregion
[8] Snowy Mountains IBRA subregion

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												Flockton Wattle is found only in the Southern Blue Mountains (at Mt Victoria, Megalong Valley and Yerranderie).
Acacia phasmoides	Phantom Wattle	V	V	Yes	NA	-	-	-	-	Included	-	**Included** The species is only known from one location in NSW: Woomargama National Park in Greater Hume Shire, approximately 60 km south-west of the project footprint.
Ammobium craspedioides	Yass Daisy	V	V	-	NA	Included	-	Included	Included	Included	-	**Included** Found from near Crookwell on the Southern Tablelands to near Wagga Wagga on the South-western Slopes. Most populations are in the Yass region. Associated with PCTs and habitat that occurs in the Bondo, Crookwell, Murrumbateman, and Inland Slope IBRA subregions.
Baloskion longipes	Dense Cord-rush	V	V	-	NA	-	Included	-	-	-	-	**Included** Dense Cord-rush has been recorded from the Kanangra-Boyd area to the Southern Tablelands, but all populations are small. Associated with PCTs and habitat that occurs in the project footprint. Associated with PCTs and habitat that occurs in the Bungonia IBRA subregion.
Bossiaea fragrans	-	CE	CE	Yes	NA	-	-	-	-	Included	-	**Included**

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						BON[3]	BUN[4]	CRO[5]	MUR[6]	INL[7]	SNO[8]	
												Currently only known from the Abercrombie Karst Conservation Reserve, south of Bathurst on the NSW central tablelands.
Bossiaea oligosperma	Few-seeded Bossiaea	V	V	-	NA	-	Included	-	-	-	-	**Included** Few-seeded Bossiaea is found in the Windellama area in Goulburn Mulwaree Shire, where it is locally abundant. Associated with PCTs and habitat that occurs in the project footprint.
Caesia parviflora var. *minor*	Small Pale Grass-lily	E	-	-	NA	-	-	-	-	Included	-	**Included** Known outlying population in NSW, in Barcoongere State Forest, between Grafton and Coffs Harbour. This species may be more common than currently known, as Pale Grass-lilies are often not identified to variety level. Associated PCTs mapped in Inland Slopes.
Caladenia concolor	Crimson Spider Orchid	E	V	Yes	West of Jingellic	-	-	-	Included	Included	-	**Included** There are two known populations, one population comprising of a few hundred plants on private property near Bethungra and the other of about 100 plants occurs in Burrinjuck Nature reserve.
Caladenia montana	-	V	-	-	See justification column	Excluded	-	-	-	-	Excluded	**Excluded – Geographic limitations** Species profile page states: "The species occurs mainly in the east alps section of the Alpine National Park in Victoria.

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												There are records in the ACT and adjacent areas in NSW, but these are now referred to as *Caladenia fitzgeraldii*. *Caladenia montana* may occur in southern Kosciuszko National Park adjacent to Victoria." The project does not extend into the above National Park.
Caladenia tessellata	Thick Lip Spider Orchid	E	V	Yes	NA	-	Included	-	-	-	-	**Included** Associated with PCTs and habitat that occurs in the Bungonia IBRA subregion.
Calotis glandulosa	Mauve Burr-daisy	V	V	Yes	North of Eucumbene	-	-	-	-	-	Included	**Included** The distribution of the Mauve Burr-daisy is centred on the Monaro and Kosciuszko regions. There are three known sites in the upper Shoalhaven catchment. There are old and possibly dubious records from near Oberon, the Dubbo area and Mt Imlay. Associated with PCTs and habitat that occurs in the Snowy Mountains IBRA subregion.
Calotis pubescens	Max Mueller's Burr-daisy	E	-	-	NA	-	-	-	-	-	Included	**Included** This species has been recorded from five sites in the Snowy Mountains of NSW (four of which, all in Kosciuszko National Park and are extant). Associated PCT is mapped in the project footprint.

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Commersonia prostrata	Dwarf Kerrawang	E	E	-	NA	-	-	Included	-	-	-	**Included** Dwarf Kerrawang occurs on the Southern Highlands and Southern Tablelands (one plant at Penrose State Forest, and one plant at Tallong, a small population near the Corang and about 2,000 plants at Rowes Lagoon). Associated with PCTs and habitat that occurs in the Bungonia and Crookwell IBRA subregions.
Cullen parvum	Small Scurf-pea	E	-	-	NA	-	-	-	-	Included	-	**Included** The Small Scurf-pea is known in NSW from only two herbarium collections: one from Wagga Wagga in 1884 and the other from Jindera (near Albury) in 1967. Associated with PCTs and habitat that occurs in the project footprint.
Dillwynia glaucula	Michelago Parrot-pea	E	-	-	NA	-	Included	-	-	-	-	**Included** Michelago Parrot-pea is recorded from five areas on the NSW Southern Tablelands: near Windellama, where the species is locally abundant, near Mongarlowe, in Nadgigomar Nature Reserve near Braidwood, north-east of Michelago and at Numeralla. There is potential habitat between the known sites.

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Discaria nitida	Leafy Anchor Plant	V	-	-	Riparian areas or within 50 m of riparian areas	-	-	-	-	-	Excluded	**Excluded** The location of the project footprint in relation to *Discaria nitida*'s known and predicted distribution was reviewed by the accountable BCD officer and determined likely to be outside the extent of the population.
Diuris aequalis	Buttercup Doubletail	E	E	-	Within 20 km of the Great Dividing Range	-	Included	Included	-	-	-	**Included** The Buttercup Doubletail has been recorded in Kanangra-Boyd National Park, Gurnang State Forest, towards Wombeyan Caves, the Taralga - Goulburn area, and the ranges between Braidwood, Tarago, and Bungendore. Associated with PCTs and habitat that occurs in the project footprint.
Diuris ochroma	Pale Golden Moths	E	V	Yes	NA	-	-	-	-	-	Included	**Included** Recorded in south-eastern NSW on the sub-alpine plains of Kosciuszko National Park and the Kybean area. Associated with PCTs and habitat that occurs in the project footprint.

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Diuris tricolor	Pine Donkey Orchid	V	-	-	NA	-	-	-	-	Included	-	**Included** Sporadically distributed on the western slopes of NSW, extending from south of Narrandera all the way to the north of NSW. Localities in the south include Red Hill north of Narrandera, Coolamon, and several sites west of Wagga Wagga. Associated with PCTs within the project footprint.
Eucalyptus aggregata	Black Gum	V	V	-	NA	-	-	Included	Included	Included	-	**Included** Black Gum is found in the NSW Central and Southern Tablelands, with small, isolated populations in Victoria and the ACT. In NSW it occurs in the South-Eastern Highlands Bioregion and on the western fringe of the Sydney Basin Bioregion. Black Gum has a moderately narrow distribution, occurring mainly in the wetter, cooler and higher parts of the tablelands, for example in the Blayney, Crookwell, Goulburn, Braidwood and Bungendore districts. Associated with PCTs and habitat that occurs in the project footprint.
Eucalyptus alligatrix subsp. *alligatrix*	-	V	V	Yes	NA	-	-	-	-	Included	-	**Included** Only known from a single location south-west of Rylstone; however, the species has reportedly been widely propagated and planted in

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												the Rylstone area. The species has habitat within the project footprint.
Eucalyptus cannonii	Capertee Stringybark	V	-	-	NA	-	-	-	-	Included	-	**Included** The Capertee Stringybark is predominantly restricted to the central tablelands and slopes of NSW between the Golden Highway in the north, and the Mitchell Highway in the south. The species' distribution is bounded from east of Bathurst to Wallerawang near Lithgow, north along the western edge of Wollemi National Park and north-west to Mudgee; isolated occurrences are known from a short way north of Goulburn River National Park between Dunedoo and Merriwa. Within this area the species is often locally frequent.
Eucalyptus macarthurii	Paddys River Box, Camden Woollybutt	E	E	-	NA	-	Included	-	-	-	-	**Included** Paddy's River Box has a moderately restricted distribution. It is currently recorded from the Moss Vale District to Kanangra-Boyd National Park. In the Southern Highlands it occurs mainly on private land, often as isolated individuals in, or on the edges of roads and paddocks. It is not well reserved but does occur within Cecil Hoskins Nature Reserve in the Southern Highlands. In Kanangra-Boyd National Park

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												isolated stands occur in the north-west part of the range on the Boyd Plateau.
Eucalyptus robertsonii subsp. *hemisphaerica*	Robertson's Peppermint	V	V	Yes	NA	-	-	Included	-	Included	-	**Included** Associated with PCTs and habitat that occurs in the Crookwell and Inland Slopes IBRA subregions.
Euphrasia arguta	-	CE	CE	Yes	NA	-	-	-	-	Included	-	**Included** Rediscovered in the Nundle area of the NSW north-western slopes and tablelands in 2008. Prior to this, it had not been collected for 100 years. Historically, has only been recorded from relatively few places within an area extending from Sydney to Bathurst and north to Walcha. The Royal Botanic Gardens Specimen Register records an additional location reported and vouchered in 2002 from near the Hastings River; and *Euphrasia arguta* was also recorded from the Barrington Tops in 2012.
Euphrasia scabra	Rough Eyebright	E	-	Yes	Montane bogs or within 50 m	-	-	-	-	-	Included	**Included** There are ten old herbarium collections of Rough Eyebright from NSW (including Port Jackson, Bathurst Plains, Lake George, Jindabyne, Yarrangobilly Caves and Tumbarumba). There are three extant populations in NSW: Bondi State Forest, South-east Forests

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												National Park and near Nunnock Swamp. Total NSW population is between 250 and 500 plants. This number varies with season with few plants appearing in some years. Associated with PCTs and habitat that occurs in the project footprint.
Genoplesium superbum	Superb Midge Orchid	E	-	Yes	NA	-	Included	-	-	-	-	**Included** The Superb Midge Orchid is restricted to the Central and Southern Tablelands of NSW where it has been recorded from 2 locations near Nerriga, about 20 km apart, and north of Wallerawang. Some plants occur in Morton National Park. Associated with PCTs and habitat that occurs in the project footprint.
Glycine latrobeana	Clover Glycine	CE	V	Yes	NA	-	-	-	-	-	Included	**Included** The Clover Glycine is endemic to south-eastern Australia, where it is widely distributed. It was recently discovered in Kosciuszko National Park. Associated with PCTs and habitat that occurs in the project footprint.
Grevillea iaspicula	Wee Jasper Grevillea	CE	E	Yes	Rocky areas; Limestone rock substrate	-	-	-	Included	-	-	**Included** The Wee Jasper Grevillea is found only in the Wee Jasper area and on the shores of Lake Burrinjuck near Burrinjuck village on the border of the Southern Tablelands and

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												South-Western Slopes (approximately 12 km from the project Footprint). Only inhabits rocky areas on limestone substrate.
Grevillea renwickiana	Nerriga Grevillea	E	-	Yes	East of the Shoalhaven River	-	Excluded	-	-	-	-	**Excluded – Geographic Limitations** Restricted to a small area between Mongarlowe (Nettletons Creek) and Nerriga.
Grevillea wilkinsonii	Tumut Grevillea	CE	CE	Yes	NA	-	-	-	-	Included	-	**Included** The Tumut Grevillea has a highly restricted distribution in the NSW South-west Slopes region. Its main occurrence is along 6 km stretch of the Goobarragandra River approximately 20 km east of Tumut where about 1,000 plants are known. The other occurrence is a small population that straddles the boundary of two private properties at Gundagai where only eight mature plants survive. A total of 17 records of this species occur within 20 km of the project footprint (Attachment 16), however, associated PCTs occur in the project footprint.
Hakea dohertyi	Kowmung Hakea	E	E	-	NA	-	Included	-	-	-	-	**Included** Kowmung Hakea is confined to a small area (18 square km) in the Kowmung Valley in Kanangra Boyd National Park. Population varies, but up to 7,000 plants have been

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												counted. Additional small populations occur in Bindook area and at Tonalli Cove on Lake Burragorang. Three records of the species occur in the Bungonia subregion, none of which occur within 20 km of the project footprint (Attachment 16), however associated PCTs occur in the project footprint.
Haloragis exalata subsp. *exalata*	Square Raspwort	V	V	-	Waterbodies; Edges of coastal lakes after flooding has removed other vegetation, creek banks within flood zone, areas close to these features subject to human disturbance including road verges and transmission line easements or within 100 m	-	-	-	-	-	Excluded	**Excluded** *Haloragis exalata* subsp. *exalata* in the Snowy Mountains IBRA subregion has recently been identified as a new taxon and renamed to *Haloragis milesei.*
Irenepharsus magicus	Elusive Cress	E	-	Yes	NA	-	-	-	-	-	Included	**Included** Although the location information provided with the single NSW collection is vague, it would appear that it was made in the vicinity of Geehi Dam, which is within Kosciuszko National Park. Elusive Cress has also been recorded in East Gippsland in Victoria.

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Kunzea cambagei	Cambage Kunzea	V	V	-	NA	-	Included	-	-	-	-	**Included** Mainly occurs in the western and southern parts of the Blue Mountains, NSW, mainly the Yerranderie/Mt Werong area, with four main populations with 20 to 150 individuals. Associated with PCTs and habitat that occurs in the project footprint.
Lepidium hyssopifolium	Aromatic Peppercress	E	E	-	NA	-	-	Included	-	-	-	**Included** In NSW, there is a small population near Bathurst, one population at Bungendore, and one near Crookwell.
Leucochrysum albicans var. *tricolor*	Hoary Sunray	-	E	-	NA	Included	Included	Included	Included	Included	Included	**Included** Endemic to south-eastern Australia, where it is currently known from three geographically separate areas in Tasmania, Victoria and south-eastern NSW and ACT. In NSW it currently occurs on the Southern Tablelands adjacent areas in an area roughly bounded by Albury, Bega and Goulburn, with a few scattered localities know from beyond this region. Associated with PCTs and habitat that occurs in the Bondo, Bungonia, Crookwell, Murrumbateman, Inland Slopes and Snowy Mountains IBRA subregions.

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Persoonia marginata	Clandulla Geebung	V	V	-	NA	-	-	-	-	Included	-	**Included** The Clandulla Geebung occurs between Kandos and Clarence in the western Blue Mountains. Populations are largely disjunct and include Clandulla, Ben Bullen and Sunny Corner State forests; isolated populations have also been recorded from Turon and Gardens of Stone National Parks.
Persoonia mollis subsp. *revoluta*	-	V	-	-	NA	-	Included	-	-	-	-	**Included** The species is endemic to NSW where it is currently known to occur in seven populations, primarily in the area between Mittagong, Paddys River and High Range in the Southern Highlands with an outlying population in the Bindook Highlands. Most of the populations occur between 600 and 800 m above sea level, and with an average annual rainfall across the range of between 700 and 900 mm.
Phyllota humifusa	Dwarf Phyllota	V	V	-	NA	-	Included	-	-	-	-	**Included** Known from the southern Blue Mountains (Bimlow Tableland), the Joadja area west of Mittagong and Penrose area near Paddys River.

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Pomaderris cotoneaster	Cotoneaster Pomaderris	E	E	-	East of Tumut; South of northern Kosciuszko National Park boundary	-	Included	-	-	-	-	**Included** A very disjunct distribution, being known from the Nungatta area, northern Kosciuszko National Park (near Tumut), the Tantawangalo area in South-East Forests National Park and adjoining freehold land, Badgery's Lookout near Tallong, Bungonia State Conservation Area, the Yerranderie area, Kanangra-Boyd National Park, the Canyonleigh area and Ettrema Gorge in Morton National Park. The species has also been recorded along the Genoa River in Victoria.
Pomaderris delicata	Delicate Pomaderris	CE	CE	Yes	West of Shoalhaven River	-	Included	-	-	-	-	**Included** Known from only two sites; between Goulburn and Bungonia and south of Windellama (Cullula).
Pomaderris pallida	Pale Pomaderris	V	V	Yes	NA	-	-	-	Included	-	-	**Included** Recorded from near Kydra Trig (north-west of Nimmitabel), Tinderry Nature Reserve, the Queanbeyan River (near Queanbeyan), the Shoalhaven River (between Bungonia and Warri), the Murrumbidgee River west of the ACT and the Byadbo area in Kosciuszko National Park. It is also found along the Murrumbidgee River in the ACT

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												and has been recently recorded in eastern Victoria.
Prasophyllum bagoense	Bago Leek Orchid	CE	CE	Yes	NA	-	-	-	-	-	Included	**Included** Currently known from a single population on land covered by a Crown Lease on State Forest near Tumbarumba on the Southern Tablelands of NSW. The species occurs over about 12 ha of sub-alpine grassy plain and wetland at an elevation of about 1,100 m. Its distribution may extend into adjacent woodlands. Recent annual surveys suggest that the number of individuals emerging at the site may fluctuate seasonally, with counts ranging from about 20 to 80 in the flowering seasons of 2000 and 2003.
Prasophyllum innubum	Brandy Marys Leek-orchid	CE	CE	Yes	NA	-	-	-	-	-	Included	**Included** The species is known from a single population comprising about seven small colonies, totalling about 400 individuals, from a small area about 30 km north-west of Cabramurra and about 17 km south of Talbingo, in the Tumbarumba Local Government Area. The species occurs in Bago State Forest and apparently also on adjacent Crown forestry lease and private freehold. The species

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												is not known to occur in any conservation reserves.
Prasophyllum keltonii	Kelton's Leek Orchid	CE	CE	Yes	NA	-	-	-	-	-	Included	**Included** Kelton's Leek Orchid is known from a single population that occurs in a small area known as McPhersons Plain, about 30 km north-west of Cabramurra and about 17 km south of Talbingo, in the Tumbarumba Local Government Area. The known population, which is intermingled with the Bago Leek Orchid, is recorded as comprising approximately 400 plants, of which about 380 occur on the Brandy Marys State Forest Crown Leases, and about 20 on an adjacent private property. Records provided by the NSW Forestry Corporation (2020) indicates a population occurs within sections of Bago State Forest intersecting the project footprint.
Prasophyllum petilum	Tarengo Leek Orchid	E	E	-	East of Binalong, south and east of Boorowa	-	-	-	Included	Included	-	**Included** Natural populations are known from a total of five sites in NSW. These are near Boorowa, Queanbeyan area, Ilford, Delegate and a newly recognised population 10 km west of Muswellbrook. It also occurs at Hall in the ACT. This species has also been recorded at Bowning Cemetery where it was

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												experimentally introduced, though it is not known whether this population has persisted.
Prasophyllum retroflexum	Kiandra Leek Orchid	V	V	-	Treeless vegetation above 1,000 m in altitude /Kosciuszko National Park	-	-	-	-	-	Excluded	**Excluded – Geographic Limitations** All populations are thought to occur within Kosciuszko National Park (in the Long Plain, Kiandra, Tantangara area).
Prasophyllum sp. *Wybong*	-	-	CE	-	NA	-	-	-	-	Included	-	**Included** Endemic to NSW, it is known from near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell, Tenterfield, Currabubula and the Pilliga area. Most populations are small, although the Wybong population contains by far the largest number of individuals. Whilst this species is predicted to occur within the subregion, there are no previous records in the Inland Slopes IBRA subregion. However associated PCTs occur in the project footprint.
Pterostylis alpina	Alpine Greenhood	V	-	-	NA	-	-	-	-	-	Included	**Included** The Alpine greenhood grows in moist forests on foothills and ranges, extending to montane areas in NSW, the ACT and Victoria. In NSW the species occurs in the Southern Tablelands south from Bondo State forest.

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Pterostylis foliata	Slender Greenhood	V	-	-	NA	-	-	-	-	-	Included	**Included** *Pterostylis foliata* is found in NSW, ACT, Victoria, SA, Tasmania and New Zealand (type location). In NSW the species occurs mainly in the Southern Tablelands south from Batlow.
Pterostylis oreophila	Blue-tongued Greenhood	CE	CE	Yes	NA	-	-	-	-	-	Included	**Included** In NSW, the Blue-tongued Greenhood is known from a few small populations within Kosciuszko National Park and a population of about 40 plants (possibly now extinct) in Bago State Forest and adjoining Crown Leases south of Tumut. The known distribution includes parts of the Snowy River, Tumbarumba and possibly Tumut Local Government Areas. The Blue-tongued Greenhood is also known from the ACT (Brindabella Range) and in montane areas of far north-eastern Victoria.
Pultenaea humilis	Dwarf Bush-pea	V	-	-	NA	-	-	-	-	Included	-	**Included** *Pultenaea humilis* is rare in New South Wales and Tasmania, but relatively common in Victoria. In NSW, *Pultenaea humilis* is currently known from three confirmed localities in the NSW South-Western Slopes bioregion.

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						BON [3]	BUN [4]	CRO [5]	MUR [6]	INL [7]	SNO [8]	
Pultenaea pedunculata	Matted Bush-pea	E	-	-	Between Boro and Marulan	-	Excluded	-	-	-	-	**Excluded – Geographic Limitations** Matted Bush-pea is widespread in Victoria, Tasmania, and south-eastern SA. In NSW however, it is represented by just three disjunct populations, in the Cumberland Plains in Sydney, the coast between Tathra and Bermagui and the Windellama area south of Goulburn (where it is locally abundant).
Rutidosis leiolepis	Monaro Golden Daisy	V	V	-	NA	-	-	-	-	-	Included	**Included** The Monaro Golden Daisy is found in scattered populations on the Monaro, and in low subalpine plains of Kosciuszko National Park (eg. Long Plain and Happy Jacks Plain).
Senecio garlandii	Woolly Ragwort	V	-	-	Within 10 km of Burrinjuck	-	-	-	Included	Included	-	**Included** Found between Temora, Bethungra and Albury and possibly Burrinjuck near Yass. The largest populations are at The Rock and Mt Tabletop (and surrounds). There is a single population in Victoria at Chiltern.
Solanum armourense	-	E	-	Yes	NA	-	Included	-	-		-	**Included** Confined to a relatively small area west and south-west of Sydney, from the Kowmung Valley within Blue Mountains and Kanangra Boyd national parks south to the Wombeyan area. Most known

Scientific name	Common name	BC Act status *	EPBC Act status*	SAII	Habitat/ geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
						BON [3]	BUN [4]	CRO [5]	MUR [6]	INL [7]	SNO [8]	
												locations occur within national park and other conservation estate, but the species is also known from private lands.
Swainsona recta	Small Purple-pea	E	E	-	NA	-	-	-	Included	Included	-	**Included** Small Purple-pea was recorded historically from places such as Carcoar, Culcairn and Wagga Wagga where it is probably now extinct. Populations still exist in the Queanbeyan and Wellington-Mudgee areas. Over 80% of the southern population grows on a railway easement.
Swainsona sericea	Silky Swainson -pea	V	-	-	NA	-	Included	-	Included	Included	-	**Included** Recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. There is one isolated record from the far north-west of NSW. Its stronghold is on the Monaro. Also found in South Australia, Victoria and Queensland.
Thelymitra alpicola	Alpine Sun-orchid	V	-	-	NA	-	-	-	-	-	Included	**Included** *T.alpicola* is distributed in south–eastern NSW and north–eastern Victoria. The northern-most populations are in the upper Blue Mountains. The remainder of the New South Wales distribution is from the Snowy Mountains extending north–west to Bago

Scientific name	Common name	BC Act status *	EPBC Act status*	SAII	Habitat/ geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
						BON [3]	BUN [4]	CRO [5]	MUR [6]	INL [7]	SNO [8]	
												State Forest and to the eastern part of the Great Dividing Range south from Braidwood.
Thesium australe	Austral Toadflax	V	V	-	Kosciuszko National Park	-	Included	Included	Included	-	Included	**Included** Austral Toadflax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Although originally described from material collected in the south-west Sydney area, populations have not been seen in a long time. It may persist in some areas in the broader region.
Xerochrysum palustre	Swamp Everlastin g	-	V	-	NA	-	-	-	-	-	Included	**Included** Found in Kosciuszko National Park and the eastern escarpment south of Badja. Also found in eastern Victoria.
Zieria obcordata	Granite Zieria	E	E	Yes	Rocky areas; Land containing granite boulders or rocky outcrops with 100 m	-	-	-	-	Included	-	**Included** Found in Kosciuszko National Park and the eastern escarpment south of Badja. Also found in eastern Victoria. Occurs at two sites with a geographic range of 105 km. These are in the Wuuluman area near Wellington, comprising of a single subpopulation over 3 sites comprising up to 200 plants and Crackerjack Rock/Rock Forests area NW of Bathurst, with a

Scientific name	Common name	BC Act status *	EPBC Act status*	SAII	Habitat/ geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
						BON [3]	BUN [4]	CRO [5]	MUR [6]	INL [7]	SNO [8]	
												subpopulation comprising of 14 sites, totalling to approximately 700 adults plants after good seasons. Occurs only in rocky areas or within 100 m of granite boulders or rocky outcrops.

* EPBC Act and BC Act conservation status: CE- Critically Endangered; E -Endangered; V- Vulnerable.

7.2.2 Threatened flora results

Targeted surveys undertaken to inform the presence/ absence of candidate threatened flora species are documented in Section 4.5. Based on the result of the surveys, the following three threatened flora species were directly recorded within the project footprint:

- *Ammobium craspedioides* (Yass Daisy) listed as vulnerable under the BC and EPBC Act
- *Leucochrysum albicans* var. *tricolor* (Hoary Sunray) listed as endangered under the EPBC Act
- *Xerochrysum palustre* (Swamp Everlasting) listed as vulnerable under the EPBC Act.

The following two additional species were recorded immediately adjacent to the project footprint:

- *Prasophyllum bagoense* (Bago Leek Orchid) listed as critically endangered under the BC and EPBC Act (approximately 130 metres west of the project footprint within the Bago State Forest)
- *Prasophyllum keltonii* (Kelton's Leek Orchid), listed as critically endangered under the BC and EPBC Act, (approximately 750 metres west of the project footprint within the Bago State Forest).

Figure 7-1 (Attachment 1) shows the location of the threatened flora records in relation to the project footprint.

Two candidate flora species, *Acacia clunies-rossiae* (Kanangra Wattle) and *Hakea dohertyi* (Kowmung Hakea) were sufficiently surveyed across the project footprint and were not recorded and are therefore deemed to be absent. However, for most of the candidate species, surveying all areas of potential habitat/associated PCTs with sufficient effort to determine presence/absence across the whole project footprint was not possible.

Apart from the five candidate species directly recorded, and the two determined to be absent, the 53 remaining candidate flora species were assumed present within all associated PCTs habitats due to a lack of sufficient survey effort (refer to the limitations noted in Section 4.9) within suitable seasonal windows. However, many of the species assumed present are considered to have a low likelihood of occurring within the project footprint (Table 7-2).

Table 7-2 presents a summary of threatened flora species that have been confirmed present or assumed present within the project footprint, including the relevant IBRA subregions and associated PCTs. The extent of potential habitat excluded by means of field survey is also noted. A detailed overview of the approach to the survey effort review and final species polygon development is presented in Attachment 12.

Of the flora species recorded or assumed present, 23 species were considered potential Serious and Irreversible Impact candidates in line with section 6.7 of the BC Regulation (Attachment 13). Note: The assessment outcomes and habitat extents shown in Table 7-2 below are subject to change following further consultation with the BCD.

Table 7-2: Threatened flora species confirmed or assumed present

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
Acacia ausfeldii	Ausfeld's Wattle	V	-	-	PCT 266 and 277	Inland Slopes	Known	12.24	0	109.33	109.33	Assumed present	*Acacia ausfeldii* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. The species occurs to the east of Dubbo in the Mudgee-Ulan-Gulgong area of the NSW South Western Slopes bioregion and adjoining bioregions, with the closest record in Grenfell, 120 km from the project footprint. This species is considered to have a low likelihood of occurrence.
Acacia bynoeana	Bynoe's Wattle	E	V	-	PCT 1093	Bungonia	Predicted	13.48	0	12.94	12.94	Assumed present	No individuals of *Acacia bynoeana* have been recorded within the project footprint during targeted surveys. There are recent records of the species from Crookwell, therefore the species is considered to have a moderate likelihood of
						Crookwell	Known	24.61	0	38.30	38.30	Assumed present	

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													occurrence in the Bungonia and Crookwell IBRA subregions based on the presence of suitable habitat and associated PCT 1093.
Acacia clunies-rossiae	Kanangra Wattle	V	-	-	PCT 870	Bungonia	Known	10.48	0	0	0	Confirmed absent through field survey	*Acacia clunies-rossiae* was not recorded in the project footprint despite sufficient targeted survey effort. The species known range is limited to the Kanangra-Boyd and Blue Mountains National Parks (nearest record approximately 36 km north of the project footprint; DPE, 2022). This species has been confirmed absent through field survey.
Acacia flocktoniae	Flockton Wattle	V	V	-	PCT 870, 1150 and 1330	Bungonia	Known	4.63	0	86.57	86.57	Assumed present	The species was not recorded in the project footprint and is considered to have a low likelihood of occurrence, given the species known range is limited to the Southern Blue Mountains, and there

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													are no previous records of the species across the broader Bungonia IBRA subregion. However, the species has been assumed present over a portion of the project footprint due to survey limitations.
Acacia phasmoides	Phantom Wattle	V	V	Yes	PCT 287	Inland Slopes	Known	0.13	0	49.05	49.05	Assumed present	*Acacia phasmoides* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. The species is considered unlikely to occur within the project footprint given it is only known from one location in NSW: Woomagarma National Park in Greater Hume Shire (nearest known location is approximately 27 km from the project footprint).
Ammobium craspedioides	Yass Daisy	V	V	-	PCT 266, 268, 277,	Bondo	Known	0	0.39	0.13	0.52	Recorded- 2 individuals within PCT 299	*Ammobium craspedioides* is known to occur within the Bondo, Crookwell and Murrumbateman IBRA

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
					283, 287, 290, 294, 343, 352, 727 and 1330	Crookwell	Known	32.11	1.42	345.41	346.83	Recorded-133 individuals within PCT 1093	subregions. The species has a high Likelihood of occurrence in Inlands Slopes IBA subregion.
						Inland Slopes	Known	245.31	0	1689.11	1689.11	Assumed present	
						Murrumbateman	Known	136.27	6.37	563.20	569.57	Recorded-6392 individuals within PCT 280	
Baloskion longipes	Dense Cord-rush	V	V	-	PCT 1093	Bungonia	Predicted	13.48	0	12.94	12.94	Assumed present	This species was not recorded in the project footprint and there are no previous records in the Bungonia IBRA subregion. Additionally, there is minimal suitable habitat within the project footprint within Bungonia. This species has a low likelihood of occurrence, but has been assumed present in portions of the project footprint due to survey limitations.
Bossiaea fragrans	-	CE	CE	Yes	PCT 268	Inland Slopes	Known	81.26	0	102.93	102.93	Assumed present	*Bossiaea fragrans* was not recorded in the project

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. The species is only known from the Abercrombie Karst Conservation Reserve (nearest known location is approximately 75 km from the project footprint) and within the adjacent Travelling Stock Reserve, south of Bathurst on the NSW central tablelands. It has a highly restricted distribution, with only a small number of discrete known sub-populations and therefore is considered to have a low likelihood of occurrence.
Bossiaea oligosperma	Few-seeded Bossiaea	V	V	-	PCT 1093	Bungonia	Known	20.85	0	17.83	17.83	Assumed present	This species was not recorded in the project footprint. The species has been assumed present over a portion of the project footprint due to

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													survey limitations. However, the species is considered to have a low likelihood of occurrence as the species known occurrence is restricted to the Warragamba and Windellama area, both approximately 50 km from the project footprint.
Caesia parviflora var. minor	Small Pale Grass-lily	E	-	-	PCT 295 and 297	Inland Slopes	Predicted	11.54	0	12.43	12.43	Assumed present	*Caesia parviflora var. minor* was not recorded in the project footprint during targeted surveys, however the species has been assumed present over a portion of the project footprint. The species is considered to have a low likelihood of occurrence, given that there is only one known outlying population in NSW in Barcoongere State Forest, approximately 570 km from the project footprint.
		E	V	Yes		Inland Slopes	Known	5.07	0	262.91	262.91	Assumed present	*Caladenia concolor* was not recorded in the project

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
Caladenia concolor	Crimson Spider Orchid				PCT 268, 280 and 290	Murrumbateman	Predicted	0.15	0	34.61	34.61	Assumed present	footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. Known populations are limited to a property near Bethungra and within Burrinjuck Nature Reserve (nearest known location is approximately 4 km from the project footprint), therefore the species is considered to have a low likelihood of occurrence.
Caladenia tessellata	Thick Lip Spider Orchid	E	V	Yes	PCT 870, 1093, 1150 and 1330	Bungonia	Known	14.31	0	103.32	103.32	Assumed present	*Caladenia tessellata* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. No known populations occur within proximity to the project footprint (nearest known location is approximately 55 km from the project footprint), therefore the species is

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													considered to have a low likelihood of occurrence.
Calotis glandulosa	Mauve Burr-daisy	V	V	Yes	PCT 679, 1196 and 1224	Snowy Mountains	Known	34.31	0	104.34	104.34	Assumed present	*Calotis glandulosa* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. The species is known from three sites in the upper Shoalhaven catchment (approximately 20 km from the project footprint). Whilst it is a coloniser of disturbed lands it does not tolerate heavy grazing. The species is considered to have a low likelihood of occurrence.
Calotis pubescens	Max Mueller's Burr-daisy	E	-	-	PCT 1224	Snowy Mountains	Known	2.11	0	6.72	6.72	Assumed present	This species was not recorded within the project footprint during targeted surveys, but has been assumed present due to survey limitations. Known from the Snowy Mountains of NSW, with populations recorded in

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													Kosciuszko National Park. This species has not been recorded within 20 km of the project footprint and is therefore considered to have a low likelihood of occurrence.
Commersonia prostrata	Dwarf Kerrawang	E	E	-	PCT 1191	Crookwell	Predicted	3.64	0	22.31	22.31	Assumed present	The species was not recorded within the project footprint during targeted surveys, but has been assumed present over a portion of the project footprint due to survey limitations. There are no previous records in the IBRA subregion, therefore the species is considered to have a low likelihood of occurrence.
Cullen parvum	Small Scurf-pea	E	-	-	PCT 5 and 277	Inland Slopes	Known	3.31	0	781.49	781.49	Assumed present	The Small Scurf-pea has not been recorded in the project footprint during targeted surveys, however the species has been assumed present in the Inland Slopes IBRA subregion portion of the footprint due to survey

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													limitations. Known primarily from Wagga Wagga and Jindera, with one record within 5 km of the project of the footprint (DPE, 2022), the species is therefore considered to have a moderate likelihood of occurrence.
Dillwynia glaucula	Michelago Parrot-pea	E	-	-	PCT 1093	Bungonia	Known	13.82	0	24.86	24.86	Assumed present	*Dillwynia glaucula* has not been recorded in the project footprint during targeted surveys, however has been assumed present due to survey limitations. It is known only from five locations on the NSW Southern Tablelands, all of which are greater than 20km from the project footprint. The species is therefore considered to have a low likelihood of occurrence.
Diuris aequalis	Buttercup Doubletail	E	V	-	PCT 731, 1093, 1097, 1151	Bungonia	Known	0	0	48.14	48.14	Assumed present	*Diuris aequalis* has not been recorded in the project footprint, however the species has been assumed present over a
						Crookwell	Known	18.99	0	284.70	284.70	Assumed present	

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
					and 1191								portion of the project footprint due to survey limitations. The likelihood of occurrence for this species is low due to the absence of records within 20 km of the project footprint (Bungonia IBRA subregion) and the absence of associated PCTs (Crookwell IBRA subregion).
Diuris ochroma	Pale Golden Moths	E	V	Yes	PCT 1224	Snowy Mountains	Known	0	0	8.83	8.83	Assumed present	*Diuris ochroma* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. Known populations of the species are limited to Kosciuszko National Park and the Kybean area in NSW (approximately 27 km from the project footprint) and therefore the likelihood of occurrence for this species is low.

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
Diuris tricolor	Pine Donkey Orchid	E	V	-	PCT 731	Inland Slopes	Known	0	0	19.82	19.82	Assumed present	*Diuris tricolor* was not recorded in the project footprint during targeted surveys, however the species has been assumed present over a portion of the project footprint due to survey limitations. The species is sporadically distributed on the western slopes of NSW, extending from south of Narrandera all the way to the north of NSW. There is only one record of the species within 20 km of the project footprint which is dated 1917. Therefore due to the lack of recent nearby records, the species is considered to have a low likelihood of occurrence.
Eucalyptus aggregata	Black Gum	V	V	-	PCT 679, 1191, 1256 and 1330	Crookwell	Known	11.49	0	43.93	43.93	Assumed present	*Eucalyptus aggregata* has not been recorded in the project footprint, but has been assumed present over a portion of the project footprint due to survey limitations. The
						Inland Slopes	Predicted	2.92	0	52.94	52.94	Assumed present	
						Murrumbateman	Predicted	2.39	0	14.48	14.48	Assumed present	

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													species is considered to have a high likelihood of occurrence within the Crookwell IBRA subregion and a moderate likelihood of occurrence within the Murrumbateman IBRA subregion due to the presence of suitable habitat and associated PCTs. The species is also known to occur in the Inland Slopes IBRA subregion (Bionet records, Appendix 16), however due to limited previous records (1 only), the potential for the species to occur within Inland Slopes IBRA subregion portion of the project footprint is low.
Eucalyptus alligatrix subsp. alligatrix	-	V	V	Yes	PCT 287 and 290	Inland Slopes	Known	5.64	0	52.86	52.86	Assumed present	*Eucalyptus alligatrix* subsp. *alligatrix* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													survey limitations. The species is only known from a single population south-west of Rylstone (approximately 174 km from the project footprint), therefore the species has a low likelihood of occurrence.
Eucalyptus cannonii	Capertee Stringybark	V	-	-	PCT 290	Inland Slopes	Known	8.12	0	147.57	147.57	Assumed present	The species was not recorded in the project footprint, but has been assumed present over a portion of the project footprint due to survey limitations. Given this species is conspicuous, it is likely to have been recorded either during the threatened flora surveys and/or initial vegetation mapping where canopy species were heavily relied on to confirm PCT ID. Given the moderate survey effort and the conspicuous nature of the species, the likelihood of occurrence is low.

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
Eucalyptus macarthurii	Paddys River Box, Camden Woollybutt	E	E	-	PCT 1097 and 1330	Bungonia	Known	43.39	0	108.57	108.57	Assumed present	The species was not recorded in the project footprint, but has been assumed present over a portion of the project footprint due to survey limitations. Given this species is conspicuous, it is likely to have been recorded either during the threatened flora surveys and/or initial vegetation mapping where canopy species were heavily relied on to confirm PCT ID. Given the moderate survey effort and the conspicuous nature of the species, the likelihood of occurrence is low.
Eucalyptus robertsonii subsp. *hemisphaerica*	Robertson's Peppermint	V	V	Yes	PCT 352 and 727	Crookwell	Predicted	8.11	0	5.87	5.87	Assumed present	*Eucalyptus robertsonii* subsp. *hemisphaerica* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. Given the moderate survey effort, conspicuous nature
						Inland Slopes	Predicted	0	0	7.09	7.09	Assumed present	

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													of the species, and that it is known only from the central tablelands of NSW north of Orange to Burraga. (approximately 64 km from the project footprint), the likelihood of occurrence is low.
Euphrasia arguta	-	CE	CE	Yes	PCT 266, 277, 287 and 290	Inland Slopes	Predicted	103.55	0	1254.03	1254.03	Assumed present	*Euphrasia arguta* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. The only known population of the species occurs in the Nundle area of NSW. (approximately 195 km from the project footprint), therefore the species has a low likelihood of occurrence.
Euphrasia scabra	Rough Eyebright	E	-	Yes	PCT 679 and 939	Snowy Mountains	Predicted	0.10	0	6.20	6.20	Assumed present	*Euphrasia scabra* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													to survey limitations. There are three known populations of the species in NSW: Bondi State Forest, South East Forests National Park and near Nunnock Swamp (nearest known location is approximately 14 km from the project footprint), therefore the species has a low likelihood of occurrence.
Genoplesium superbum	Superb Midge Orchid	E	-	Yes	PCT 1150	Bungonia	Known	21.44	0	49.69	49.69	Assumed present	Suitable habitat for *Genoplesium superbum* was detected within the project footprint within the Bungonia IBRA subregion. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable habitat. The species is only known from two locations near Nerriga and Morton National Park in NSW (nearest known location is

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													approximately 71 km from the project footprint), therefore the species has a low likelihood of occurrence.
Glycine latrobeana	Clover Glycine	CE	V	Yes	PCT 1224	Snowy Mountains	Known	2.11	0	6.72	6.72	Assumed present	*Glycine latrobeana* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. The closest known population is within Kosciuszko National Park (approximately 30 km from the project footprint), therefore the species has a low likelihood of occurrence.
Grevillea iaspicula	Wee Jasper Grevillea	CE	E	Yes	PCT 266 and 1330	Murrumbateman	Known	47.40	0	64.53	64.53	Assumed present	*Grevillea iaspicula* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. The species is only known to occur on the shores of Lake

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													Burrinjuck. (approximately 11 km from the project footprint), therefore the species has a low likelihood of occurrence.
Grevillea wilkinsonii	Tumut Grevillea	E	-	Yes	PCT 266, 278 and 301	Inland Slopes	Known	50.51	0	304.72	304.72	Assumed present	*Grevillea wilkinsonii* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. The species is only known from two locations in NSW: Goobarragandra River and overlapping two properties at Gundagai (nearest known location is approximately 14 km from the project footprint), therefore the species has a low likelihood of occurrence.
Hakea dohertyi	Kowmung Hakea	E	E	-	PCT 870	Bungonia	Known	10.48	0	0	0	Confirmed absent through field survey	*Hakea dohertyi* was not recorded in the project footprint despite sufficient targeted survey effort. The species is conspicuous and has a distribution limited

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													to 30 km north of the project footprint. This species has been confirmed absent through field survey.
Irenepharsus magicus	Elusive Cress	E	-	Yes	PCT 638	Snowy Mountains	Predicted	5.98	0	58.63	58.63	Assumed present	Habitat for Elusive Cress was detected within the project footprint in the Snowy Mountains IBRA subregion. Targeted flora surveys within the project footprint did not locate the species, however certain areas of potential suitable habitat within the project footprint were inaccessible for surveys, therefore the species has been assumed present in these areas. The only known records from Geehi Dam within Kosciuszko National Park (nearest known location is approximately 56 km from the project footprint), therefore the species is considered to have a low likelihood of occurrence.

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
Kunzea cambagei	Cambage Kunzea	V	V	-	PCT 1150	Bungonia	Known	0	0	71.10	71.10	Assumed present	The species was not recorded in the project footprint, but has been assumed present over a portion of the project footprint due to survey limitations. The species is considered to have a moderate likelihood of occurrence based on indicative mapping and habitat assessments.
Lepidium hyssopifolium	Aromatic Peppercress	E	E	-	PCT 280, 283 and 1330	Crookwell	Predicted	10.61	0	342.94	342.94	Assumed present	The species was not recorded in the project footprint, but has been assumed present over a portion of the project footprint due to survey limitations. The species is considered to have a low likelihood of occurrence due to the absence of previous records within 20 km of the project footprint.
Leucochrysum albicans	Hoary Sunray	E	E	-	PCT 268, 349, 351,	Bondo	Predicted	8.21	0	147.13	147.13	Assumed present	The species has been recorded in the project footprint. A total of 119,311 individuals were
						Bungonia	Known	63.92	0	126.71	126.71	Assumed present	

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
var. tricolor					352, 679, 727, 731, 952, 1093, 1097, 1191 and 1330	Crookwell	Known	171.02	1.08	527.69	528.77	Recorded- 29,631 individuals within PCT 952, 1330, 727, 1093, 280, 731, 679 and Non-native vegetation	recorded in PCT 1330 in the Crookwell IBRA-subregion, and 8792 individuals were recorded in PCT 727 in the Murrumbateman IBRA subregion. The species was recorded in grasslands, in areas with existing or past disturbance, or on the edges of existing easement. The species is considered to have a low likelihood of occurrence within Bondo, Bungonia, Inland Slopes and Snowy IBRA subregions, however has been assumed present within these IBRA subregions due to survey limitations.
						Inland Slopes	Known	77.31	0	481.59	481.59	Assumed present	
						Murrumbateman	Known	378.06	3.57	571.44	575.01	Recorded- 113,369 individuals within PCT280, 322, 1093, 1330 and Non-native vegetation	
						Snowy Mountains	Known	126.09	0	289.58	289.58	Assumed present	
Persoonia marginata	Clandulla Geebung	V	V	-	PCT 287	Inland Slopes	Predicted	0.35	0	114.04	114.04	Assumed present	The species has not been recorded in the project footprint, but has been assumed present over a portion of the project

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													footprint due to survey limitations. Given the fact that there are no previous records in the IBRA subregion, the species has a low likelihood of occurring in the project footprint.
Persoonia mollis subsp. *revoluta*	-	V	-	-	PCT 1107 and 1150	Bungonia	Known	24.92	0	42.27	42.27	Assumed present	*Persoonia mollis* subsp. *revoluta* was not recorded in the project footprint during targeted surveys, but has been assumed present over a portion of the project footprint due to survey limitations. Currently known to occur in seven populations, primarily in the area between Mittagong, Paddys River and High Range (nearest location approximately 22 km from the project footprint), therefore the species is considered to have a low likelihood of occurrence.
Phyllota humifusa	Dwarf Phyllota	V	V	-	PCT 1150	Bungonia	Predicted	0.72	0	63.53	63.53	Assumed present	*Phyllota humifusa* was not recorded in the project

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. There are no previous records in the Bungonia IBRA subregion, therefore the likelihood of occurrence is considered low.
Pomaderris cotoneaster	Cotoneaster Pomaderris	E	E	-	PCT 1150	Bungonia	Known	0	0	64.25	64.25	Assumed present	No targeted surveys have been undertaken for this species in the Bungonia IBRA subregion. There are 161 previous records in the IBRA subregion, 110 of which occur within 20 km of the project footprint, however none occur within 5 km of the project footprint (DPE, 2022). Given no threatened flora surveys have been undertaken for this species, the proximity of previous records and the potential habitat present in the forested areas of the Bungonia subregion, the

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													likelihood of occurrence is considered moderate.
Pomaderris delicata	Delicate Pomaderris	CE	CE	Yes	PCT 1150	Bungonia	Known	22.10	0	42.16	42.16	Assumed present	*Pomaderris delicata* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. Known from only two sites: between Goulburn and Bungonia and south of Windellama (nearest known location is approximately 32 km from the project footprint), therefore the species is considered to have a low likelihood of occurrence.
Pomaderris pallida	Pale Pomaderris	V	V	Yes	PCT 1093	Murrumbateman	Known	46.39	0	42.10	42.10	Assumed present	*Pomaderris pallida* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. There are no known records of the species within 20 km of the project footprint

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													(nearest known location is approximately 38 km from the project footprint), therefore the species is considered to have a low likelihood of occurrence.
Prasophyllum bagoense	Bago Leek Orchid	CE	CE	Yes	PCT 1196 and 1224	Snowy Mountains	Known	0	0	101.61	101.61	Assumed present (recorded adjacent to the project footprint only).	*Prasophyllum bagoense* was recorded within the Snowy Mountains IBRA subregion adjacent to the project footprint (39 individuals), therefore it is assumed that species habitat would be impacted by the project.
Prasophyllum innubum	Brandy Marys Leek-orchid	CE	CE	Yes	PCT 1221	Snowy Mountains	Known	0	0	8.83	8.83	Assumed present	*Prasophyllum innubum* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. There are seven previous records in the IBRA subregion, two of which occur within 5 km of the project footprint. Given the close proximity of previous records, the presence of potential

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													habitat in the project footprint and the low number of surveys undertaken, the likelihood of occurrence is considered high.
Prasophyllum keltonii	Kelton's Leek Orchid	CE	CE	Yes	PCT 1196	Snowy Mountains	Known	0	0	92.78	92.78	Assumed present (recorded adjacent to the project footprint)	*Prasophyllum keltonii* was recorded adjacent to (ie within 750 m) the project footprint within the Snowy Mountains IBRA subregion. A total of 14 individuals were recorded. 330 individuals have been historically recorded by the NSW Forestry Corporation (all during 2016) within the vicinity of the project footprint. Three of these historic records directly intersected the project footprint. Given the presence of known and historic records within the vicinity of the project footprint, the species is assumed present within impacted habitats.

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
Prasophyllum petilum	Tarengo Leek Orchid	E	E	-	PCT 277, 1191 and 1330	Inland Slopes	Known	22.07	0	133.61	133.61	Assumed present	*Prasophyllum petilum* was not identified during targeted surveys and there are no previous records in the Murrumbateman IBRA subregion, and 26 previous records in the Inland Slopes IBRA subregion, none of which occur within 20 km of the project footprint. This species' likelihood of occurrence is therefore considered low.
						Murrumbateman	Predicted	54.77	0	145.92	145.92	Assumed present	
Prasophyllum sp. Wybong	-	-	CE	-	PCT 266 and 277	Inland Slopes	Predicted	111.33	0	976.17	976.17	Assumed present	*Prasophyllum sp. Wybong* was not recorded in the project footprint during targeted surveys and there are no previous records in the Inland Slopes IBRA subregion, but the species has been assumed present over a portion of the project footprint due to the extent of potential habitat and survey limitations. This species has a low likelihood of occurrence.

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
Pterostylis alpina	Alpine Greenhood	V	-	-	PCT 679 and 1196	Snowy Mountains	Known	18.75	0	92.07	92.07	Assumed present	*Pterostylis alpina* was not recorded in the project footprint during targeted surveys, however the species has been assumed present over a portion of the project footprint due to survey limitations. The species occurs in the Southern Tablelands south from Bondo State forest, with one record from 2005 less than 1 km from the project footprint. This species is considered to have a moderate likelihood of occurrence.
Pterostylis foliata	Slender Greenhood	V	-	-	PCT 638, 679 and 1196	Snowy Mountains	Known	48.85	0	126.57	126.57	Assumed present	*Pterostylis foliata* was not recorded in the project footprint during targeted surveys, however the species has been assumed present over a portion of the project footprint due to survey limitations. This species occurs mainly in the Southern Tablelands south from Batlow, with two records less than 2 km from the project footprint.

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													This species is considered to have a moderate likelihood of occurrence.
Pterostylis oreophila	Blue-tongued Greenhood	CE	CE	Yes	PCT 939 and 9997 (waterbodies)	Snowy Mountains	Known	0	0	2.95	2.95	Assumed present	*Pterostylis oreophila* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. There are eight previous records in the IBRA subregion, four of which occur within 20 km of the project footprint, and three of which occur within 5 km of the project footprint. The species is considered moderately likely to occur and potential habitat for the species would be impacted by the project.
Pultenaea humilis	Dwarf Bush-pea	V	-	-	PCT 268, 287, 290, 294, 306 and 343	Inland Slopes	Known	49.45	0	118.59	118.59	Assumed present	Dwarf Bush-pea was not recorded in the project footprint during targeted surveys, however the species has been assumed present over a portion of the project footprint due

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													to survey limitations. It is considered to have a low likelihood of occurrence in the Inland Slopes IBRA subregion due to its rarity and the location of the nearest record in Tumut (approximately 10 km from the project footprint) (DPE, 2022).
Rutidosis leiolepis	Monaro Golden Daisy	V	V	-	PCT 1224	Snowy Mountains	Known	2.11	0	6.72	6.72	Assumed present	*Rutidosis leiolepis* was not identified during targeted surveys, however the species has been assumed present over a portion of the project footprint due to survey limitations. There are 51 previous records in the Snowy Mountains IBRA subregion, none of which occur within 20 km of the project footprint. This species is considered to have a low likelihood of occurrence.
Senecio garlandii	Wooly Ragwort	V	-	-	PCT 287, 290 and 343	Inland Slopes	Known	9.45	0	39.53	39.53	Assumed present	Wooly Ragwort was not recorded in the project footprint during targeted surveys, however the

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													species has been assumed present over a portion of the project footprint due to survey limitations. The species is thought to occur in Burrinjack, approximately 10 km from the project footprint, therefore is considered to have a low likelihood of occurrence in the Inland Slopes IBRA subregion.
Solanum armourense	-	E	-	Yes	PCT 870 and 1093	Bungonia	Known	18.97	0	7.17	7.17	Assumed present	*Solanum armourense* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. There are two nearby records, the closest being 6.5 km from the project footprint boundary (DPE, 2022), and suitable habitat was identified during field surveys. The species is considered moderately likely to occur within the project footprint.

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
Swainsona recta	Small purple-pea	E	E	-	PCT 266, 268, 277, 294 and 1330	Inland Slopes	Known	201.18	0	1047.64	1047.64	Assumed present	The species has not been recorded in the project footprint, but has been assumed present due to survey limitations. The species has a low likelihood of occurrence in the Murrumbateman IBRA subregion due to sufficient survey effort and the absence of records within 20 km and a moderate likelihood of occurrence within the Inland Slopes due to presence of records within 20 km of the project footprint.
						Murrumbateman	Known	148.65	0	475.99	475.99	Assumed present	
Swainsona sericea	Silky Swainson-pea	V	-	-	PCT 266, 277, 280, 283, 290, 322, 1191 and 1330	Bungonia	Predicted	28.54	0	115.02	115.02	Assumed present	*Swainsona sericea* has not recorded within the project footprint but has been assumed present over a portion of the project footprint due to survey limitations. The species is considered likely to occur within the Inland Slopes and Murrumbateman IBRA subregion based on indicative mapping and
						Inland Slopes	Known	144.40	0	1541.90	1541.90	Assumed present	
						Murrumbateman	Known	180.55	0	595.08	595.08	Assumed present	

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													previous records within 20 km of the project footprint. The species has a low likelihood of occurrence within the Bungonia IBRA subregion due to the absence of previous records.
Thelymitra alpicola	Alpine Sun-orchid	V	-	-	PCT 939	Snowy Mountains	Known	0	0	2.54	2.54	Assumed present	The species has not recorded within the project footprint but has been assumed present over a portion of the project footprint due to survey limitations. There is one record within 5 km in Maragle State Forest, therefore this species is considered moderately likely to occur.
Thesium australe	Austral Toadflax	V	V	-	PCT 679, 1191, 1196, 1224	Bungonia	Predicted	13.16	0	127.74	127.74	Assumed present	The species has not recorded within the project footprint but has been assumed present over a portion of the
						Crookwell	Predicted	25.56	0	310.26	310.26	Assumed present	
						Murrumbateman	Predicted	84.87	0	506.73	506.73	Assumed present	

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
					and 1330	Snowy Mountains	Known	20.66	0	98.99	98.99	Assumed present	project footprint due to survey limitations. The species is considered likely to occur within the Snowy Mountains IBRA subregion based on indicative mapping and habitat assessments. Potential habitat for the species occurs within PCTs 679, 191, 1224 and 1330. The species has a low likelihood of occurrence within Bungonia, Crookwell and Murrumbateman IBRA subregions due to absence of previous records.
Xerochrysum palustre	Swamp Everlasting	-	V	-	PCT 679 and 939	Snowy Mountains	Known	7.75	1.03	11.79	12.82	Recorded- 6 individuals within PCT 953	Six individuals were recorded within the project footprint. Habitat comprised PCTs 679 and 939 within the Snowy Mountains IBRA subregion. The species has been assumed present and potential habitat for the species would be impacted by the project.

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet, 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
Zieria obcordata	Granite Zieria	E	E	Yes	PCT 268, 280 and 287	Inland Slopes	Known	45.89	0	594.30	594.30	Assumed present	*Zieria obcordata* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. The species is only known from two sites in NSW: one in the Wuuluman area near Wellington and the other at Crackerjack Rock/ Rock Forests area north-west of Bathurst (nearest known location is approximately 224 km from the project footprint), therefore the species likelihood of occurrence is low.

* EPBC Act and BC Act conservation status: CE- Critically Endangered; E -Endangered; V- Vulnerable.

7.3 Threatened fauna

7.3.1 Fauna habitats

Fauna habitat assessments were undertaken for all accessible lands within the project footprint to assess habitat suitability for threatened fauna species (those species known or predicted to occur within the locality from existing data collection, literature, and database review). Based on the collected field data (habitat, vegetation type and condition and features of interest mapping), habitats were stratified into nine general types within the project footprint, which included:

- grassland habitat
- semi-arid woodland
- tall wet sclerophyll forest (old growth)
- dry sclerophyll open woodland
- alpine fen habitat
- aquatic and riparian habitat (wetlands, creeks, and floodplains)
- rocky habitat (outcrops, karsts, and overhangs)
- wet sclerophyll forest
- artificial habitats (including existing road culverts and bridges).

Each general habitat type and key fauna resources are described in detail below in Table 7-3.

Table 7-3: Fauna habitat types present within the project footprint

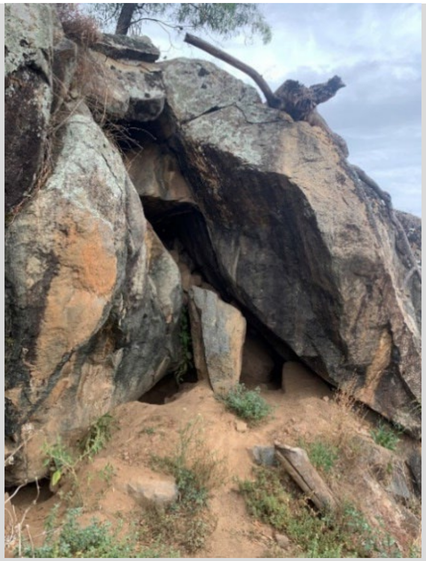
Habitat type and photos	Associated PCTs	General description	Fallen logs and other woody debris	Foraging resources	Hollow-bearing trees and/or nests	Aquatic habitat	Other foraging/ sheltering/ nesting resources
Grassland habitats  *Plate 1 Example of grassland habitat within the Yass area.*	Grassland PCTs: 1224. Grassy woodland Derived Native Grasslands PCTs: 266, 268, 277, 278, 280, 283, 301, 316, 679, 731, 952, 1191, 1196 and 1330.	The grassland habitats within the project footprint are typically dominated by moderately tall to tall dense to open native tussock grasses. The community is often treeless, or sparsely treed. The community supports a range of fauna species, some of which are unique to grassland communities or derived native grasslands eg Pink-tailed Legless Lizard, Stripped Legless Lizard and Golden Sun Moth.	**Occasional** - Fallen woody debris is occasionally found on the edge of grassy woodland habitats. Rock outcrops and boulder fields are common within this habitat type and are utilised by insects and reptiles for sheltering and foraging.	**Common –** Grazing (grass roots and seeds) grounds for species like Eastern Grey Kangaroos (*Macropus giganteus*), Red-rumped Parrot (*Psephotus haematonotus*), Eastern Rosella (*Platycercus eximius*) and less frequently species such as Superb Parrot. Species such as Spotted Harrier (*Circus assimilis*), and Little Eagle (*Hieraaetus morphnoides*) use grassland and open woodland habitats as foraging grounds for hawking small mammals, and reptiles.	**Occasional** - Hollow-bearing trees (scattered paddock trees) and ground nests.	**Occasional** - Seasonal or ephemeral wet areas within a site may occur, containing a range of wetland flora species, including rushes, sedges, and a variety of wetland specialist forbs. Farm dams are also commonly found in proximity to grassland habitats.	Reptiles such as Striped Legless Lizard and Pink-tailed Legless Lizard were found in grasslands with significant amounts of surface rocks, which are used for shelter, as they actively hunt for spiders, crickets, moth larvae and cockroaches. Grasslands dominated by Wallaby grasses are typically low and open - the bare ground between the tussocks is thought to be an important microhabitat feature for Golden Sun Moth (DAWE, 2021). The species occupies this microhabitat for all stages of its lifecycle. Grassland habitats provide refugia, and runways for terrestrial mammals, and nesting and

Habitat type and photos	Associated PCTs	General description	Fallen logs and other woody debris	Foraging resources	Hollow-bearing trees and/or nests	Aquatic habitat	Other foraging/ sheltering/ nesting resources
							foraging resources for small grassland bird species.
Wet sclerophyll forest  *Plate 2 Wet sclerophyll forest (PCT 1107)*	PCTs 295, 300, 638, 1097 and 1107.	Wet sclerophyll forest habitat supports a diverse range of birds (for nesting and foraging [nectar, blossom, and insectivorous feeders]), mammals (arboreal, terrestrial, and flying), amphibians, reptiles, and invertebrates.	**Common –** Dense to patchy distribution of leaf litter and a high abundance of fallen woody debris and rock habitats. Detritus, clubmosses and ferns occur in many areas.	**Common -** Generally good levels of food resources such as insects, nectar, pollen, and sap.	**Common -** There is a moderate to high diversity of hollows (small to extra-large hollows) in limbs and trunks of live trees, dead trees (stags) and ground logs. **Occasional –** medium to large canopy sticknests.	**Common –** This habitat type has a mesic understorey, which contains creeks, fens, and ephemeral soaks, suitable for many fauna groups.	Generally contains eucalypt species such as Alpine Ash, Snow Gum, Mountain Gum, and Brown Barrel. These species as they mature, provide many different types of nest or home sites for fauna (eg large forest owls, cockatoos, gliders, and other arboreal mammals). Rock outcrops and riparian habitats also occur in this habitat type.
Open dry sclerophyll woodland	PCTs 285, 287, 290, 294, 296, 297, 299, 306, 314, 322, 343, 349, 351, 352, 727, 870, 953, 1093, 1150 and 1151.	This habitat type provides a wide range of food and shelter for vertebrate fauna. Trees from the family Myrtaceae generally dominate the upper canopy in these areas and	**Common -** Dense to patchy distribution of leaf litter and a high abundance of fallen woody debris.	**Common -** Many myrtaceous and proteaceous shrubs and canopy species that would be suitable for nectivorous birds, insects, and mammals.	**Common -** Many hollow-bearing trees (all size classes) within open woodland habitat. A variety of tree hollows	**Common -** Ephemeral drainage lines, second and third-order streams. The creeklines (ephemeral and permanent) within the project footprint support	Natural grassland habitats also occur in pockets of open woodland and are generally associated with this habitat type. As such, there are areas of surface rock, cobbles, and boulders. This

Habitat type and photos	Associated PCTs	General description	Fallen logs and other woody debris	Foraging resources	Hollow-bearing trees and/or nests	Aquatic habitat	Other foraging/ sheltering/ nesting resources
 *Plate 3 Open woodland habitat (PCT 349)* 		supply direct (foliage, nectar, exudates) and indirect food (arthropods) for a range of vertebrates, particularly birds and arboreal mammals. Tree hollows (formed in dead trees [stags] and mature trees) provide nesting and roosting habitat for hollow-dwelling fauna. The connectivity of open woodland habitats within the project footprint varies in scale from scattered, isolated patches to highly connected landscapes facilitating fauna dispersal.			were seen throughout the project footprint. These are likely to provide suitable den and nesting habitat for a range of birds, arboreal mammals, and microbats.	pooling habitat suitable for breeding, foraging (aquatic macroinvertebrates, amphibians, larval fish, gudgeons and attracts terrestrial invertebrates), refuge and basking.	provides additional foraging, nesting, and ground refugia for small mammals, birds, and reptiles.

Habitat type and photos	Associated PCTs	General description	Fallen logs and other woody debris	Foraging resources	Hollow-bearing trees and/or nests	Aquatic habitat	Other foraging/ sheltering/ nesting resources
Plate 4 Scattered trees and fallen woody debris							
Alpine Fens  *Plate 5 Alpine wetland/ fen habitat*	PCT 939	Alpine wetland habitat is found within the Snowy Mountain IBRA subregion portion of the project footprint, comprising either dense to open patches of or more open and shorter communities of herbs and sedges (fens). The habitat type is interspersed with woodland habitat within a small portion of the project footprint.	**Occasional -** Some fallen woody debris from the surrounding Snow Gum dominated woodland.	**Common -** Herbs, forbs, sedges, and myrtaceous shrubs that would be suitable for nectivorous birds, insects, and mammals.	**Occasional -** Tree cover is open to sparse or absent. It can include typical cool riparian species such as *Eucalyptus pauciflora, E.viminalis* or *E.dalrymplean a.*	**Common –** GDE habitat, however, also influenced by surface water. *Carex spp.* dominated fen/ wetland habitat which provides habitat for a range of aquatic and terrestrial fauna.	Dense sedge layer, ground cover, which also provides refuge and nesting/ breeding opportunities for fauna such as small mammals and amphibians.
Aquatic and riparian habitats	PCTs 5,278, 299 and 356.	There are many floodplains, freshwater wetlands and at least 135 streams (of various types and condition) that intersect the project footprint. Major waterbodies such as the Goobarragandra	**Common –** Snags and undercut banks, often have a build-up of woody debris on creek bends, which are used by many aquatic and terrestrial species.	**Common –** Bat species such as Southern Myotis rely on suitable-sized waterbodies within the project footprint for gleaning prey (insects and/or larval fish). Avifauna rely on aquatic and riparian habitats within the	**Common –** Along fertile riparian corridors and gullies, hollow-bearing trees are common within the project footprint.	**Common –** There is a variety of aquatic habitat within the project footprint. These habitats include ephemeral drainage lines, sub-surface flows, freshwater wetlands, floodplain, soaks,	Threatened bats use these features for drinking, foraging, and thermoregulation. Frogs relies on pooling habitat, and permanent water sources for all stages of their lifecycle (development,

 *Plate 6 First order stream in the Bungonia IBRA subregion*  *Plate 7 Riparian habitat*		River, Gocup Creek, Tumut River, Murrumbidgee River, Adjungbilly Creek, and Lachlan River are important to their bioregions for several species.		project footprint as a source of food (eg aquatic insects, amphibians, seeds, molluscs, fish, turtles, eels, crayfish prey) and water. Aquatic habitats also attract significant prey for raptors.		fens, dams, first, second and third order streams with pooling habitat, and riffles.	sheltering, breeding, foraging). Avifauna use aquatic habitats for nesting, sheltering, and foraging. Riparian shrub layers, creek embankments, rocks and fallen timber all provide shelter and foraging habitat for invertebrates, frogs, lizards, snakes, small mammals and monotremes. Aquatic habitats also provide a permanent drinking water resource for all terrestrial fauna.
Rocky habitats (outcrops, karst and overhangs)	All PCTs within the project	Rocky habitats are important in	**Occasional –** Woody debris can be found	**Common –** rocky habitats typically	**Occasional –** Nests in	**Occasional -** Artesian/sub-	Rocky outcrops provide critical

Habitat type and photos	Associated PCTs	General description	Fallen logs and other woody debris	Foraging resources	Hollow-bearing trees and/or nests	Aquatic habitat	Other foraging/ sheltering/ nesting resources
 *Plate 8 Granitic outcrops* 	footprint supported rocky habitats to varying degrees	providing habitat for a variety of fauna. Steep cliffs, and overhangs are likely to support microhabitats for several fauna species (especially microchiropteran bats and reptiles). The project footprint also supports rocky landscape features in the form of sandstone and/or granite and outcrops, granite boulders and cobbles.	amongst rocky outcrops on hillslopes.	support a sparse scattering of vegetation for herbivores, and insects (including stygofauna), reptile, and amphibian prey for mammalian (bats) and avian (owls) predators.	overhangs and caves eg Fairy Martins (*Petrochelidon ariel*), Superb Lyrebird (*Menura novaehollandiae*) and sometimes, avian predators such as Masked Owl and Sooty Owl.	surface water flows and adjacent waterbodies.	habitat for threatened native reptiles, such as the Striped Legless Lizard and the Pink-tailed Worm Lizard. Karsts and overhangs provide critical sheltering, nesting, and roosting sites for reptiles, as well as many top order mammalian and avian predators. Suitable cave habitat can be used for breeding by threatened bat species such as Large-eared Pied Bat, Large Bent-winged Bat and Little Bent-winged Bat. No breeding habitat has been identified within areas surveyed in the project footprint.

Habitat type and photos	Associated PCTs	General description	Fallen logs and other woody debris	Foraging resources	Hollow-bearing trees and/or nests	Aquatic habitat	Other foraging/ sheltering/ nesting resources
Plate 9 Granite boulders, which could be karstic							
Artificial habitats  *Plate 10 Farm dam potentially used by a variety of fauna species*	**N/A**	Culverts, bridges, dilapidated buildings identified within the project footprint are considered potential habitat for roosting bats at different times of the year.	**N/A**	**Common -** Threatened bats use the waterbodies that are adjacent to these structures for drinking, foraging and sometimes thermoregulation.	**N/A**	**Common -** Ephemeral drainage lines, second and third-order streams typically intersect culvert and bridge structures within the project footprint. Farm dams are another form of artificial habitat and are commonly found across the project footprint and considered ecologically important (foraging, breeding, and sheltering habitat for many fauna species).	Within the project footprint, there appears to be one 'definite' culvert, six 'definite' road bridges and 22 possible man-made structures which intersect suitable waterbodies and may support roosting habitat for threatened microbats. Additionally, lumber plantations (Radiata Pine) have been identified within sections of the project footprint. These plantations provide additional landscape connectivity and refuge for fauna dispersal.

7.3.2 Candidate threatened fauna species

A total of 47 candidate threatened fauna species (including dual credit species) with potential habitat within the project footprint (across all project IBRA subregions) were identified by the BAM-C (refer to Table 7-4). Two endangered populations were also predicted (refer to Table 7-4).

The habitat suitability assessment for each species is provided in Table 7-4, including justification for species inclusion/exclusion from further assessment. Of the 47 potential candidate species, 14 species were excluded from further assessment based on lack of suitable habitat/habitat constraints/geographic limitations or vagrancy as described in Table 7-4.

A total of 33 threatened species and two endangered populations were identified as requiring further assessment. Several of these candidate species and/ or populations occur across multiple IBRA subregions. Of the 33 candidate species identified, the following number occur in each of the IBRA subregions associated with the project:

- 20 in Bungonia
- 16 in Bondo
- 16 in Crookwell
- 18 in Murrumbateman
- 25 in Inland Slopes
- 18 in Snowy Mountains.

The two endangered populations associated with the project are:

- Squirrel Glider in the Wagga Wagga City LGA, situated within the Inland Slopes IBRA subregion
- Yellow-bellied Glider population on the Bago Plateau, situated within the Snowy Mountains IBRA subregion.

The justification for inclusion/exclusion from further assessment for each species and/ or population is provided in Table 7-4. Species-specific information presented in Table 7-4 below was obtained from information sources as outlined in Section 4.6.1.

Table 7-4: Candidate threatened fauna species credit species

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON[9]	BUN[10]	CRO[11]	MUR[12]	INL[13]	SNO[14]	
Birds													
Anthochaera phrygia	Regent Honeyeater	CE	CE	Dual	Yes (Important area mapping)	As per mapped areas	Excluded	Excluded	Excluded	Excluded	Excluded	-	**Excluded – Vagrant** (as per section 5.2 of the BAM, Step 4) Project footprint is outside of BAM Important Areas mapping for the species and does not support breeding habitat for the species. Foraging habitats only.
Burhinus grallarius	Bush Stone-curlew	E	-	Species	-	Fallen/standing dead timber including logs	-	-	-	-	Included	-	**Included** Associated PCTs and habitat occurs within the project footprint. Generally low levels of woody debris within associated PCTs.

9 Bondo IBRA subregion

10 Bungonia IBRA subregion

11 Crookwell IBRA subregion

12 Murrumbateman IBRA subregion

13 Inland Slopes IBRA subregion

14 Snowy Mountain IBRA subregion

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
Callocephalon fimbriatum	Gang-gang Cockatoo	V	E	Dual	-	Hollow bearing trees; Eucalypt tree species with hollows greater than 9 cm diameter	Included	Included	Included	Included	Included	Included	**Included** Associated PCTs and habitat occurs within the project footprint. Hollows of suitable size for breeding occur throughout at varying densities subject to land use.
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	Dual	-	Hollow bearing trees; Living or dead tree with hollows greater than 15 cm diameter and greater than 8 m above ground.	Included	Included	Included	Included	Included	-	**Included** Associated PCTs and habitat occurs within the project footprint. Hollows of suitable size for breeding occur throughout at varying densities subject to land use.
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-	Dual (breeding)	-	Living or dead mature trees within suitable vegetation within 1 km of a rivers, lakes, large dams or creeks, wetlands and coastlines	Excluded	Excluded	Included	Included	Included	Excluded	**Included- Crookwell, Murrumbateman and Inland Slopes only** Associated PCTs and habitat including larger waterways and

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
													waterbodies with potential to support foraging activity occur within a number of IBRA subregions within the project footprint. No large waterways required for foraging and supporting associated PCTs were situated within 1 km of the project footprint within the Bondo, Bungonia and Snowy Mountains IBRA subregions (excluded from these IBRA subregions as per section 5.2 of the BAM, Step 2).
Hieraaetus morphnoides	Little Eagle	V	-	Dual (breeding)	-	Nest trees - live (occasionally dead) large old trees within vegetation.	-	Includ ed	Includ ed	Includ ed	Includ ed	Include d	**Included** Associated PCTs and habitat occurs within the project footprint. Mapping of nest trees limited due

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
													to land access constraints. Presence of nests assumed within associated PCTs.
Lathamus discolor	Swift Parrot	E	CE	Dual	Yes (Important areas mapping)	As per mapped areas	-	Excluded	-	Excluded	Excluded	-	**Excluded: Vagrant (**as per section 5.2 of the BAM, Step 4) Project footprint outside of BAM Important Areas mapping for the species and does not support breeding habitat for the species. Foraging habitats only.
Lophoictinia isura	Square-tailed Kite	V	-	Dual (Breeding)	-	Nest Trees	Included	-	-	Included	Included	-	**Included** Associated PCTs and habitat occurs within the project footprint. Mapping of nest trees limited due to land access constraints. Presence of nests assumed within associated PCTs.

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
Ninox connivens	Barking Owl	V	-	Dual (Breeding)	-	Hollow bearing trees; Living or dead trees with hollows greater than 20 cm diameter and greater than 4 m above the ground.	Includ ed	Includ ed	-	-	Includ ed	Include d	**Included** Associated PCTs and habitat occurs within the project footprint. Hollows of suitable size for breeding occur throughout at varying densities subject to land use.
Ninox strenua	Powerful Owl	V	-	Dual (Breeding)	-	Hollow bearing trees; Living or dead trees with hollow greater than 20 cm diameter	Includ ed	Includ ed	Includ ed	Includ ed	Includ ed	Include d	**Included** Associated PCTs and habitat occurs within the project footprint. Hollows of suitable size for breeding occur throughout at varying densities subject to land use.
Petroica rodinogaster	Pink Robin	V	-	Species	-	NA	Includ ed	Includ ed	-	-	Includ ed	Include d	**Included** Associated PCTs and habitat occurs within the project footprint.
Polytelis swainsonii	Superb Parrot	V	V	Dual	-	Hollow bearing trees; Living or dead *E. blakelyi, E.*	-	-	Includ ed	Includ ed	Includ ed	-	**Included** Birds breeding in this region are

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
						melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta with hollows greater than 5 cm diameter; greater than 4 m above ground or trees with a DBH of greater than 30 cm.							mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. Associated PCTs and habitat occur within the project footprint. Hollows of suitable size for breeding occur throughout at varying densities subject to land use. Many hollow-bearing trees are situated within a matrix of non-native vegetation.

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON[9]	BUN[10]	CRO[11]	MUR[12]	INL[13]	SNO[14]	
Tyto novaehollandiae	Masked Owl	V	-	Dual (Breeding)	-	Hollow bearing trees; Living or dead trees with hollows greater than 20 cm diameter.	Included	Included	-	-	Included	Included	**Included** Associated PCTs and habitat occurs within the project footprint. Hollows of suitable size for breeding occur throughout at varying densities subject to land use.
Tyto tenebricosa	Sooty Owl	V	-	Dual (Breeding)	Yes (Breeding)	Caves; Caves or cliffIines/ledges| Hollow bearing trees; Living or dead trees with hollows greater than 20 cm diameter.	-	Excluded	-	-	-	Included	**Included- Snowy Mountains only** Associated PCTs and habitat occurs within the Snowy Mountains IBRA subregion only (excluded from Bungonia IBRA subregion as per section 5.2 of the BAM, Step 1). Hollows of suitable size for breeding occur throughout at varying densities subject to land use.
Mammals													

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
Cercartetus nanus	Eastern Pygmy-possum	V	-	Species	-	NA	Included	Included	Included	Included	Included	Included	**Included** Associated TECs and habitat occurs within the project footprint. Two individuals identified within the project footprint in Murrumbateman IBRA subregion, and another individual was identified within the Snowy Mountains.
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Species	Yes (Breeding)	Cliffs; Within two km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two km of old mines or tunnels.	-	Included	-	-	Included	-	**Included** Associated PCTs and habitat occurs within the project footprint. Species found mainly in areas with extensive cliffs and caves. Roosts in caves (near their entrances), crevices in cliffs, frequenting low to mid-elevation dry open forest and woodland close to these

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
													features. Potential Karst and/ or cliffline habitats were mapped in proximity (ie <500m) to the project footprint within the Bungonia and Inland Slopes subregions. No individuals have been detected during acoustic or trapping surveys carried out within potential habitats.
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E	E	Species	-	Requires dense ground cover in a variety of habitats.	-	Excluded	-	-	-	-	**Excluded – Vagrant** (as per section 5.2 of the BAM, Step 2) The species is found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River, southern coastal Victoria and the Grampian Ranges.

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
Mastacomys fuscus	Broad-toothed Rat	V	V	Species	-	NA	-	-	-	-	-	Include d	**Included** One record from 2004 approximately 100m west of the Snowy Mountains project footprint. Associated PCTs and habitat occurs within the project footprint.
Miniopterus australis	Little Bent-winged Bat	V	-	Dual	Yes (Breedin g)	Caves; Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave'; observation type code 'E nest-roost'; with numbers of individuals >500; or from the scientific literature.	-	Exclud ed	-	-	-	-	**Excluded- no known roosts and potential habitats degraded** (as per section 5.2 of the BAM, Step 2 and 3) The species forages in moist eucalypt forest, and dry sclerophyll forests. Generally found in well-timbered areas. Often share roosting sites with the Large Bent-winged Bat. Associated PCTs within 100 m of potential roosts are degraded due

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON[9]	BUN[10]	CRO[11]	MUR[12]	INL[13]	SNO[14]	
													to historic clearing (ie degraded grasslands).
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	Dual	Yes (Breeding)	Caves: Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave;" observation type code "E nest-roost;" with numbers of individuals >500	Included	Included	Included	Included	Included	Included	**Included** Seasonal migration patterns and maternity roosts for this species are well documented for this species and therefore, maternity roost is unlikely to be found within the project footprint. However, the project footprint may support intermittent roosting sites and staging site for gravid females enroute to maternity colonies (e.g., Church Cave, 25 km east of the project footprint). As such, supplementary habitat modelling

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
													is required in areas that were inaccessible, to determine the suitability of areas within project footprint to support breeding habitat.
Myotis macropus	Southern Myotis	V	-	Species	-	Hollow bearing trees; Within 200 m of riparian zone| Bridges, caves or artificial structures within 200 m of riparian zone| Waterbodies; rivers, creeks, billabongs, lagoons, dams and other waterbodies on or within 200 m of the site	Included	Included	-	Included	Included	-	**Included** Potential habitat includes associated PCTs within 200 m of any medium to large permanent creeks, rivers, lakes or other waterways (ie with pools/ stretches 3 m or wider). Associated PCTs and habitat occurs within the project footprint.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Dual	-	Breeding camps	-	Excluded	Excluded	Excluded	Excluded	-	**Excluded** (as per section 5.2 of the BAM, Step 2) Grey-headed flying fox is a generalist, nomadic species that occurs in subtropical and

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
													temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Associated PCTs and foraging habitat occurs within the project footprint. No breeding camps were recorded or are known to occur within the project footprint.
Pseudomys fumeus	Smoky Mouse	CE	E	Species	Yes	NA	Included	-	-	-	-	Included	**Included** In NSW there are 3 records from Kosciuszko National Park and 2 records adjacent to the park in Bondo and Ingebyra State forests. Associated PCTs and habitats are situated within the project footprint.

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
Petauroides volans	Greater Glider	E	E	Species		Hollow bearing trees	Included	Included	Included	Included	Included	Included	**Included** Utilise large trees with hollows (<50 m spaced) in patches of tall forest >5 ha in size for refuge, nesting and foraging. Associated PCTs and habitat occurs within the project footprint. Hollows of suitable size for breeding occur throughout at varying densities subject to land use.
Petaurus norfolcensis	Squirrel Glider	V	-	Species	-	NA	Included	Included	Included	Included	Included	Included	**Included** Utilises large trees with hollows (<50 m spaced) for refuge, nesting and foraging. May occur within mature Box-Ironbark woodlands, with abundant hollows and moderate to high connectivity

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
													within the project footprint.
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	Species	Yes	Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines	-	Includ ed	-	-	Exclud ed	-	**Included- Bungonia only** Patchily distributed along the Great Dividing Range, predominantly on the eastern scarp with known outlying populations at Warrumbungle Ranges and Mt Kaputar. One record from 1997 about 8km north of the project near Wombeyan Caves. Potential habitat situated immediately north of Tarlo River National Park. The species is considered vagrant within the Inland Slopes due to a lack of records and poor connectivity to potential source

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
													populations (excluded as per section 5.2 of the BAM, Step 2).
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	Species	-	NA	Included	-	-	-	Included	Included	**Included** The Brush-tailed Phascogale has a patchy distribution, and in NSW it is mainly found east of the Great Dividing Range although there are occasional records west of the divide. Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs, or leaf litter, however, can also be found in a range of habitats. Associated PCTs and habitat occurs within the project footprint.
Phascolarctos cinereus	Koala	E	E	Species	-	NA	Included	Included	Included	Included	Included	Included	**Included** Associated PCTs and habitat

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
													occurs within the project footprint in all studied IBRA bioregions.
Potorous tridactylus	Long-nosed Potoroo	V	V	Species	-	Dense shrub layer or alternatively high canopy cover exceeding 70% (i.e. to capture populations inhabiting wet sclerophyll and rainforest)	-	Excluded	-	-	-	-	**Excluded – Vagrant** (as per section 5.2 of the BAM, Step 2) In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm. Outside of known species range (vagrant).
Sminthopsis leucopus	White-footed Dunnart	V	-	Species	-	NA	-	Excluded	-	-	-	-	**Excluded – Vagrant (**as per section 5.2 of the BAM, Step 2) No suitable habitat is present, and known populations are isolated, to the east of the project footprint.
Reptiles													

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
Aprasia parapulchella	Pink-tailed Legless Lizard	V	V	Species	-	Rocky areas; Or within 50 m of rocky areas / South of Grabben Gullen (Cro); West of Dalton (Mur)	-	Includ ed	Includ ed	Includ ed	Includ ed	-	**Included** Associated PCTs and habitat occurs within the project footprint. These support varying amounts of surface rock.
Cyclodomorphus praealtus	Alpine She-oak Skink	E	E	Species	-	NA	-	-	-	-	-	Include d	**Included** In NSW, the Alpine She-oak Skink has only been observed within Kosciuszko National Park between Smiggin Holes and Kiandra. However, the project footprint supports potential habitat within native grassland /heath greater than 1200 m in elevation.
Delma impar	Striped Legless Lizard	V	V	Species	-	NA	-	Includ ed	Includ ed	Includ ed	Includ ed	-	**Included** Populations of this species are known in the Goulburn, Yass, Queanbeyan, Cooma,

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
													Muswellbrook and Tumut areas. Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component. Associated PCTs and habitat occurs within the project footprint.
Hoplocephalus bungaroides	Broad-headed Snake	E	V	Dual	Yes	Rocky areas; Including escarpments, outcrops and pogodas within the Sydney Sandstone geologies	-	Exclud ed	-	-	-	-	**Excluded – Vagrant** (as per section 5.2 of the BAM, Step 2) The Broad-headed Snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250 km of Sydney.

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
													Species excluded based on previous advice received from BCD, and no Sydney sandstone geologies occur within the project footprint.
Liopholis guthega	Guthega Skink	E	E	Species	-	Granite substrate and decomposing granite soils. Rocky areas; Including sub-surface boulders	-	-	-	-	-	Excluded	**Excluded – Vagrant** (as per section 5.2 of the BAM, Step 2) The Guthega Skink is highly restricted to locations above 1,600 m in the Australian Alps, in the vicinity of Mt Kosciuszko, NSW. Outside of known species range (vagrant).
Invertebrates													
Keyacris scurra	Key's Matchstick Grasshopper	E	E	Species	-		-	Included	Included	Included	Included	-	**Included** Key's Matchstick Grasshopper was originally distributed from Victoria to Orange (NSW) across the wheat/sheep belt. The species is

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
													typically recorded in native grasslands and grassy woodland. The species was recorded in the Murrumbateman IBRA subregion within moderate condition PCT 280 (derived grassland).
Synemon plana	Golden Sun Moth	V	V	Species	-	Wallaby grass (*Rytidosperma* sp), Chilean Needle Grass (*Nassella nessiana*) or Serrated Tussock (*Nassella trichotoma*)	-	-	-	Includ ed	Includ ed	-	**Included** Suitable habitat occurs in the project footprint. Numerous BioNet records indicate the presence of a population within the Murrumbateman IBRA subregion region roughly centred on Yass and overlapping the project footprint at this locality. There is a single older record (2000) located north-east of Tumut and

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
													potential habitat is known to exist there.
Amphibians													
Crinia sloanei	Sloane's Froglet	V	E	Species	-	Semi-permanent/ephemeral wet areas; Containing relatively shallow sections with submergent and emergent vegetation, or within 500 m of wet area |Swamps; Within 500 m of swamps| Waterbodies; Within 500 m of waterbody	-	-	-	-	Included	-	**Included** The species is typically associated with ephemeral, periodically inundated areas in grassland, woodland habitats. Associated PCTs and habitat occurs within the project footprint.
Heleioporus australiacus	Giant Burrowing Frog	V	V	Species	-	NA	-	Excluded	Excluded	-	-	-	**Excluded- Vagrant** (as per section 5.2 of the BAM, Step 2) The species is predominant restricted to coastal areas. The species is coastal, and reliant on Sydney sandstone geologies. No

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
													Sydney sandstone geologies occur within the project footprint and therefore the species has been excluded on that basis.
Litoria aurea	Green and Golden Bell Frog	E	V	Species	-	Semi-permanent/ephemeral wet areas; Within 1 km of wet areas| Swamps; Within 1 km of swamp| Waterbodies; Within 1 km of waterbody	-		Excluded	Excluded	-	-	**Excluded – Vagrant** (as per section 5.2 of the BAM, Step 2) Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. The closest known population is within the Molonglo area. Whilst there are marginal habitats within the project footprint, the species is considered vagrant due to poor connectivity with source

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
													populations and and absence of confirmed records.
Litoria booroolongensis	Booroolong Frog	E	E	Species	-	NA	Included	Excluded	Included	Excluded	Included	-	**Included** Suitable stream habitats intersect the project footprint within the Bondo, Crookwell and Inland IBRA subregions, as advised by the BCD Booroolong Frog Habitat Mapping and supplementary advice (provided via email 15/11/2022). Habitats include rocky/cobble streams, with fringing vegetation cover such as ferns, sedges, or grasses within the project footprint. **Excluded – Vagrant** from Bungonia and Murrumbateman

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
													IBRA subregions (as per section 5.2 of the BAM, Step 2). BCD Booroolong Frog Habitat Mapping did not intersect these subregions.
Litoria castanea	Yellow-spotted Tree Frog	CE	CE	Species	Yes	NA	-	-	Included	Included	-	Included	**Included** Suitable habitat in open dry sclerophyll forest with permanent streams, fringing vegetation, and rocky pooling habitats within the project footprint.
Litoria spenceri	Spotted Tree Frog	CE	CE	Species	Yes	Waterbodies; River environments with rocky habitat or with 500 m of rocky river	-	-	-	-	-	Excluded	**Excluded – Vagrant** (as per section 5.2 of the BAM, Step 2) The Spotted Tree Frog is extremely rare and occurs in scattered, geographically isolated populations. No known populations are

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
													near the project footprint.
Litoria verreauxii alpina	Alpine Tree Frog	E	V	Species	-	Above 1000 m altitude	-	-	-	-	-	Excluded	**Excluded – Vagrant** (as per section 5.2 of the BAM, Step 2) The species is restricted to elevations above 1000 m within Kosciuszko and adjacent State forest.
Mixophyes balbus	Stuttering Frog	E	V	Species	Yes	NA	-	Included	-	-	-	-	**Included** Suitable wet sclerophyll forest habitat and permanent streams are situated within the Bungonia IBRA subregion portion of the project footprint. However, closest records are recorded near Ruby Creek in Blue Mountains.
Pseudophryne corroboree	Southern Corroboree Frog	CE	CE	Species	Yes	Swamps; Within 200 m of high montane and sub-alpine bog or	-	-	-	-	-	Included	**Included** The Southern Corroboree Frog is limited to

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
						ephemeral pool environments / Above 1000 m altitude							sphagnum bogs of the northern Snowy Mountains, in a strip from the Maragle Range in the north-west, through Mt Jagungal to Smiggin Holes in the south. Its range is entirely within Kosciuszko National Park. Based on the species highly specific habitat requirements and endemic distribution (Kosciusko NP), the species is considered vagrant within the project footprint.
Pseudophryne pengilleyi	Northern Corroboree Frog	CE	CE	Species	Yes	Above 700 m altitude	-	-	-	-	-	Exclud ed	**Excluded – Vagrant** (as per section 5.2 of the BAM, Step 2) The species has been excluded as the project footprint does not intersect the

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status	SAII	Habitat/ Geographic constraints	IBRA subregion						Justification for inclusion/ exclusion
							BON [9]	BUN [10]	CRO [11]	MUR [12]	INL [13]	SNO [14]	
													species known distribution.
Endangered populations													
Petaurus norfolcensis- endangered population	Squirrel Glider in the Wagga Wagga LGA	E	-	Species	-	N/A	-	-	-	-	Includ ed	-	**Included- Wagga Wagga LGA only** Suitable habitats are situated within the project footprint intersecting the Wagga Wagga LGA.
Petaurus australis- endangered population	Yellow-bellied Glider population on the Bago Plateau	E	-	Species	-	N/A	-	-	-	-	-	Include d	**Included- Bago Plateau only** Suitable habitats occur within Bago State Forest and adjacent private lands.

* EPBC Act and BC Act conservation status: CE- Critically Endangered; E -Endangered; V- Vulnerable.

7.3.3 Threatened fauna results

Targeted surveys undertaken to inform the presence/ absence of candidate threatened fauna species are documented in Section 4.6. Two-hundred and thirty-two (232) native fauna species were recorded during the surveys across the six IBRA subregions comprising 13 frog, 135 bird, 46 mammal, 37 reptile and one fish species. A list of fauna recorded within and/or adjacent to the project footprint is provided in Attachment 14, along with their relative abundance.

Of the 232 species recorded, 28 species are threatened species listed under the schedules of the BC Act and/or EPBC Act. The location of threatened fauna recorded during field surveys is shown in Figure 7-2 (Attachment 1). Additional details regarding observations of threatened species throughout the project footprint are included in Attachment 14.

Of the 28 listed species recorded, 14 are ecosystem credit species (refer to Section 7.3.5), 14 are species credit species (candidate species) and three of the threatened species are identified as migratory species under the EPBC Act (refer to Table 11-5). Two species detected are also associated with endangered populations: Squirrel Glider and Yellow-bellied Glider.

No further assessment is required for ecosystem credit species as detailed further in Section 7.3.5. The presence and further assessment of migratory species under the EPBC Act is addressed in Section 11.6. For most of the candidate species, surveying all areas of potential habitat/associated PCTs with sufficient effort to determine presence/absence from the whole project footprint was not possible.

Table 7-5 presents a summary of candidate threatened fauna species and populations that have been confirmed present or assumed present within the disturbance area, including the relevant IBRA subregions and associated PCTs. The extent of potential habitat excluded by means of field survey is also noted. A detailed overview of the approach to the survey effort review and final species polygon development is presented in Attachment 12. It should be noted that habitats where candidate species have been assumed present include:

- potential breeding habitat for hollow-dependent dual credit species (ie owls, cockatoos, Superb Parrot) that was not surveyed to confirm the presence/ absence of breeding activities. As such, breeding habitats are assumed present for these dual credit species based on the presence of breeding habitat constraints.
- habitats where the total survey effort fell short of BAM survey guidelines requirements (ie insufficient survey replicates or unsuitable timing) but for which the species is considered unlikely to occur.
- habitats where survey access was not possible and fauna habitat constraints, such as surface rock and tree hollows, were assumed present but may not actually occur.
- habitats for which some species are considered unlikely to occur, as detailed in Table 7-5.

One recorded candidate species (Large Bent-winged Bat) is considered a potential SAII candidate in line with section 6.7 of the BC Regulation (Attachment 13). Seven of the candidate fauna species where presence has been assumed are also subject to SAII (Table 7-5). Information required to assess SAII is detailed in Attachment 13 with a summary provided in Section 13.6.

Table 7-5: Threatened fauna species confirmed or assumed present

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
Frogs													
Crinia sloanei	Sloane's Froglet	V	E	-	PCT 5, 9997 (waterbodies)	Inland Slopes	Known	0	0	64.65	64.65	Assumed present	Sloane's Froglet has not been recorded in the project footprint but is considered likely to occur based on indicative mapping and habitat assessments. Assumed present over a portion of the project footprint due to survey limitations.
Litoria booroolongensis	Booroolong Frog	E	E	-	PCT 280, 290, 1330, 9997 (waterbodies)	Bondo	Known	0	0	0.31	0.31	Assumed present	Booroolong Frog has not been recorded in the project footprint but is considered likely to occur based on BCD stream mapping and agency consultation. The species assumed present within BCD mapped streams.
						Crookwell	Known	0	0	4.72	4.72	Assumed present	
						Inland Slopes	Known	0	0	5.42	5.42	Assumed present	
Litoria castanea	Yellow-spotted Tree Frog	CE	E	Yes	PCT 335, 939, 1256, 9997 (waterbodies)	Crookwell	Predicted	0	0	23.78	23.78	Assumed present	Yellow-spotted Tree Frog was not recorded in the project footprint. The species has a moderate likelihood of occurrence within the Murrumbateman IBRA subregion where suitable permanent streams occur and historic records are known. Species presence has been assumed within Crookwell and Snowy Mountains IBRA subregions despite a low likelihood of occurrence as the species cannot be confirmed absent due to survey limitations.
						Murrumbateman	Known	0	0	9.25	9.25	Assumed present	
						Snowy Mountains	Predicted	0	0	2.95	2.95	Assumed present	

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
Mixophyes balbus	Stuttering Frog	E	V	Yes	PCT 870, 1097, 1107, 1150	Bungonia	Known	0	0	78.35	78.35	Assumed present	Stuttering Frog was not recorded in the project footprint. Suitable wet sclerophyll forest habitat and permanent streams occur within the Bungonia IBRA subregion however the closest historic records are within the Blue Mountains (about 40 km north). The species has been assumed present over a portion of the project footprint due to survey limitations.
Pseudophryne corroboree	Southern Corroboree Frog	CE	CE	Yes	PCT 679 and 1196	Snowy Mountains	Known	0	0	43.94	43.94	Assumed present	Southern Corroboree Frog was not recorded in the project footprint. Some patches of suitable sphagnum bog habitats occur within the Snowy Mountains IBRA subregion. The species has been assumed present within these areas due to survey limitations. However, the known range of the species is limited to Kosciuszko National Park (nearest known location is approximately 12 km from the project footprint) and the species is considered unlikely to occur.
Birds													
Burhinus grallarius	Bush Stone-curlew	E	-	-	PCT 5, 266, 277, 280, 287, 290, 343, 352 and 1330	Inland Slopes	Known	0	0	556.28	556.28	Assumed present	The species is assumed present over a portion of the project footprint due to survey limitations. However the species is considered to have a low likelihood of occurrence as there is generally low

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													levels of woody debris within associated PCTs.
Callocephalon fimbriatum	Gang-gang Cockatoo	V	E	-	PCT 5, 266, 268, 277, 278, 280, 283, 287, 290, 294, 294, 299, 300, 314, 316, 322, 343, 349, 351, 352, 638, 679, 727, 731, 870, 52, 953, 1093, 1097, 1107, 1150, 1151, 1191, 1196 and 1330	Bondo	Known	0	9.81	77.06	77.06	Recorded- 13 individuals within PCT 295, 299, 300 and 953	The Gang-gang Cockatoo is known to occur within the project footprint in all IBRA subregions impacted, with multiple species sightings and suitable foraging and potential nesting habitat recorded. Breeding pairs were also identified in Bungonia, with breeding habitat likely nearby.
						Bungonia	Known	0	9.36	101.46	101.46	Recorded- 10 individuals within PCT 1150 and 1330	
						Crookwell	Known	0	9.37	176.51	176.51	Recorded- 5 individuals within PCT 679, 727 and 731	
						Inland Slopes	Known	0	3.98	340.87	340.87	Recorded- 13 individuals within PCT 268, 277 and 280	
						Murrumbateman	Known	0	1.51	233.96	233.96	Recorded - 14 individuals within PCT	

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
												1330 and 349	
						Snowy Mountains	Known	0	56.7	416.04	416.04	Recorded- 42 individuals within PCT 300, 679, 953 and 1196	
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	V	-	PCT 266, 290, 322, 343, 731, 870, 1093, 1097, 1107, 1150, 1151, 1191 and 1330	Bungonia	Known	0	8.66	83.09	83.09	Recorded- 2 individuals within PCT 1150	The Glossy Black Cockatoo is known to occur in the project footprint in Bungonia and has a high likelihood of occurrence in Inland Slopes. The species has been assumed present within Crookwell, and Murrumbateman IBRA subregions due to survey limitations.
						Crookwell	Known	0	0	121.27	121.27	Assumed present	
						Inland Slopes	Known	0	0	87.85	87.85	Assumed present	
						Murrumbateman	Known	0	0	128.46	128.46	Assumed present	
Haliaeetus leucogaster	White-bellied Sea Eagle	V	-	-	PCT 5, 85, 266 277, 280, 283, 278, 287, 290, 299, 314, 316, 352, 679, 953, 1191 and 1330	Crookwell	Known	0	0	7.36	7.36	Assumed present	The species has been recorded in Murrumbateman IBRA subregion and is assumed present within portions of the project footprint due to survey limitations. The species is considered likely to occur.
						Murrumbateman	Known	0	2.24	49.61	52.14	Recorded- 1 individual within PCT 1330	
						Inland Slopes	Known	0	0	114.3	114.3	Assumed present	
Hieraaetus morphnoides	Little Eagle	V	-	-	PCT 5, 266, 268, 277, 278, 280, 283,	Bondo	Known	0	0	142.35	142.35	Assumed present	The species is known to occur within Inland Slopes and Murrumbateman IBRA subregions. The species has been assumed
						Bungonia	Known	0	0	137.2	137.2	Assumed present	

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
					285, 287, 290, 294, 295, 296, 297, 299, 300, 301, 306, 314, 316, 322, 335, 343, 349, 351, 352, 638, 679, 727, 731, 870, 939, 952, 953, 1093, 1097, 1107, 1150, 1191, 1196 and 1330	Crookwell	Known	0	0	206.1	206.1	Assumed present	present across a portion of the project footprint due to survey limitations. Breeding habitat for the species is considered likely to occur due to its broad nesting preferences.
						Inland Slopes	Known	0	0.02	1067.64	1070.63	Recorded- 1 individual within PCT 277	
						Murrumbateman	Known	0	1.76	308.19	316.43	Recorded- 3 individuals within PCT 287 and 1330	
						Snowy Mountains	Known	0	0	485.63	485.63	Assumed present	
Lophoictinia isura	Square-tailed Kite	V	-	-	PCT 5, 266, 268, 277, 278, 280, 283, 287, 290, 294, 322, 352, 731, 953 and 1093	Bondo	Known	0	0	107.52	107.52	Assumed present	The species is known to occur within Inland Slopes and Murrumbateman IBRA subregions. The species has been assumed present across a portion of the project footprint due to survey limitations. Breeding habitat for the species is considered likely to occur due to its broad nesting preferences.
						Inland Slopes	Known	0	0	688.44	688.44	Assumed present	
						Murrumbateman	Known	0	0	160.99	160.99	Assumed present	
Ninox connivens	Barking Owl	V	-	-	PCT 5, 266, 268, 277, 278, 280, 283,	Bondo	Known	0	0	66.47	66.47	Assumed present	The species was recorded in Snowy Mountains IBRA subregion and is assumed present over a portion of the project footprint due to survey
						Bungonia	Known	0	0	102.11	102.11	Assumed present	

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
					290, 295, 314, 343, 638, 870, 953, 1093, 1097, 1107, 1150, 1191 and 1330	Inland Slopes	Known	0	0	309.26	309.26	Assumed present	limitations. Potential breeding habitat is considered likely to occur where suitable nest trees are present or likely to be present.
						Snowy Mountains	Known	0	2.39	274.38	274.38	Recorded- 1 individual within PCT 953	
Ninox strenua	Powerful Owl	V	-	-	PCT 5, 283, 287, 290, 295, 300, 314, 351, 352, 638, 727, 731, 870, 953, 1093, 1097, 1107, 1150, 1151, 1191 and 1330	Bondo	Known	0	0	66.64	66.64	Assumed present	The species was recorded in Bungonia and Inland Slopes IBRA subregions and is assumed present over a portion of the project footprint due to survey limitations. Potential breeding habitat is considered likely to occur where suitable nest trees are present or likely to be present.
						Bungonia	Known	0	2.5	102.11	102.11	Recorded- 1 individual within PCT 1330	
						Crookwell	Known	0	0	151.37	151.37	Assumed present	
						Inland Slopes	Known	0	0	28.47	28.47	Recorded- 1 individual within derived PCT 268	
						Murrumbateman	Known	0	0	215.84	215.84	Assumed present	
						Snowy Mountains	Known	0	0	314.22	314.22	Assumed present	
Petroica rodinogaster	Pink Robin	V	-	-	PCT 299, 300, 638, 679, 953, 1097, 1107, 1150,	Bondo	Known	0	0	128.85	128.85	Assumed present	The Pink Robin is assumed present over a portion of the project footprint due to survey limitations and is considered likely to be present.
						Bungonia	Known	0	0	67.87	67.87	Assumed present	
						Inland Slopes	Known	0	0	5.89	5.89	Assumed present	

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
					1191 and 1196	Snowy Mountains	Known	0	0	484.19	484.19	Assumed present	
Polytelis swainsonii	Superb Parrot	V	V	-	PCT 5, 266, 277, 278, 280, 283, 322, 343, 349, 352, 1330 and Non-native	Crookwell	Known	0	0	45.4	45.4	Assumed present	The Superb Parrot is known to occur within the project footprint in the Murrumbateman and Inland Slopes IBRA subregions, with suitable foraging and potential nesting habitat occurring in grassy box woodland. It also has a moderate likelihood of occurrence in Bondo and Crookwell as a forager, with suitable open woodland habitats occurring.
						Inland Slopes	Known	0	1.87	263.24	263.24	Recorded- 5 individuals within PCT 343 and 277	
						Murrumbateman	Known	0	1.36	144.05	144.05	Recorded- 5 individuals within PCT 1330 and Non-native	
Tyto novaehollandiae	Masked Owl	V	-	-	PCT 266, 277, 280, 290, 294, 638, 870, 953, 1093, 1097, 1107, 1150, 1191 and 1330	Bondo	Known	0	0	62.8	62.8	Assumed present	The species is assumed present over a portion of the project footprint due to survey limitations. Potential breeding habitat is considered likely to occur where suitable nest trees are present or likely to be present.
						Bungonia	Known	0	0	101.1	101.1	Assumed present	
						Inland Slopes	Known	0	0	207.75	207.75	Assumed present	
						Snowy Mountains	Known	0	0	274.38	274.38	Assumed present	
Tyto tenebricosa	Sooty Owl	V	-	Yes	PCT 638	Snowy Mountains	Known	0	0	46.78	46.78	Assumed present	The species is assumed present over a portion of the project footprint due to survey limitations. Potential breeding habitat is considered likely to occur where suitable nest trees are present or likely to be present.
Insects													

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
Keyacris scurra	Key's Matchstick Grasshopper	E	E	-	PCT 266, 277, 278, 283 and 1330	Bungonia	Known	0	0	143.56	143.56	Assumed present	Key's Matchstick Grasshopper was opportunistically detected in the Murrumbateman IBRA subregion. It is assumed present and has moderate likelihood of occurrence within the project footprint within suitable grassland habitat. The species is considered to have a low likelihood of occurrence within the Crookwell IBRA subregion, but has been assumed present subregion due to survey limitations.
						Crookwell	Predicted	0	0	342.28	342.28	Assumed present	
						Inland Slopes	Predicted	0	0	1156.42	1156.42	Assumed present	
						Murrumbateman	Known	0	0	633.09	635.15	Recorded- 4 individuals within PCT 280	
Synemon plana	Golden Sun Moth	V	V	-	PCT 266, 277, 352 and 1330	Inland Slopes	Known	0	0	19.81	19.81	Expert report	Likely within mapped habitats as determined by a species expert.
						Murrumbateman	Known	0	0	16.08	16.08	Expert report	
Mammals													
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Yes	PCT 1093 and 1330	Bungonia	Known	0	0	62.36 (foraging)	62.36 (foraging)	Assumed present	No individuals or roosting sites were recorded within the project footprint during targeted surveys. The Large-eared Pied Bat has a medium likelihood of occurrence in the Bungonia IBRA subregion due to the presence of suitable foraging habitats and multiple species records. Foraging habitats have been assumed within 2 km of mapped potential karst and cliff lines, due to survey limitations.
Miniopterus orianae	Large Bent-	V	-	Yes	PCT 1290, 351, 1093 and 1330	Bungonia	Known	0	0	1.12	1.12	Recorded- 8 passes within PCT	Large Bent-winged Bat was recorded in the project footprint. Potential breeding habitat for the

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
oceanensis	winged Bat											1150 and 1330	species has not been recorded however a singly rocky gully situated in the Murrumbateman IBRA subregion has been identified as potential habitat. The species is considered likely to occur.
						Inland Slopes	Known	0	0	0.86	0.86	Recorded- 136 passes within PCT 266, 277 and 278	
						Murrumbateman	Known	0	0	5.75	5.75	Recorded- 64 passes within PCT 351, 352 and 283	
Myotis macropus	Southern Myotis	V	-	-	PCT5, 299, 349, 352, 870, 1107, 191 and 1330	Bondo	Known	0	0	18.32	18.32	Assumed present	The species has been recorded within Bungonia, Inland Slopes and Murrumbateman IBRA subregions and is assumed present across a portion of the project footprint due to survey limitations. The species is considered likely to occur.
						Bungonia	Known	0.3	1.12	19.43	26.64	Recorded- 4 passes within PCT 1150	
						Inland Slopes	Known	0	0	26.46	39.31	Recorded- 127 passes within PCT 266 and 277	
						Murrumbateman	Known	3.59	2.29	58.9	76.09	Recorded- 14 individuals within PCT 280, 352 and 731	
Cercartetus nanus	Eastern Pygmy-	V	-	-	PCT 268, 277, 280, 283, 285, 287, 290,	Bondo	Known	9.91	0	78.6	78.6	Assumed present	The species is known to occur in the project footprint and is assumed present across portions of the project footprint due to survey
						Bungonia	Known	0	0	44.79	44.79	Assumed present	

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
	possum				294, 295, 97, 299, 300, 314, 349, 352, 638, 727, 731, 952, 1093, 1097, 1107, 1150, 1151, 1191, 1196 and 1330	Crookwell	Known	0	0	75.74	75.74	Assumed present	limitations. The species is considered likely to be present within suitable habitats.
						Inland Slopes	Known	53.26	0	181.7	181.7	Assumed present	
						Murrumbateman	Known	99.75	1.95	60.6	65.32	Recorded- 2 individuals within PCT 280 and 1093.	
						Snowy Mountains	Known	57.85	0	248.14	248.14	Assumed present	
Petauroides volans	Greater Glider	-	V	-	PCT 299, 300, 316, 351, 638, 727, 870, 952, 953, 1093, 1097, 1107, 1150, 1151, 1191, 1196 and 1330	Bondo	Known	0	0	59.67	69.05	Recorded- 18 individuals within PCT 300	The Greater Glider is known to occur within the project footprint in the Bondo, Bungonia and Snowy Mountains IBRA subregions in high condition, mature remnants. It also has a moderate likelihood of occurrence in the Crookwell, Inland Slopes and Murrumbateman IBRA subregions in intact remnants, with moderate to high connectivity.
						Bungonia	Known	0	4.48	93.13	98.35	Recorded - 2 individuals within PCT 1150 and 1107	
						Crookwell	Known	93.34	0	19.69	19.69	Assumed present	
						Inland Slopes	Known	0	0	22.83	22.83	Assumed present	
						Murrumbateman	Known	105.68	0	18.77	18.77	Assumed present	
						Snowy Mountains	Known	227.61	1.5	156.86	161.8	Recorded- 15 individuals	

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
												within PCT 638 and 953	
Petaurus australis	Yellow-bellied Glider population on the Bago Plateau	E	-	-	PCT 638	Snowy Mountains	Known	0	0	41.3	41.3	Assumed present	The species was recorded within the project footprint in Bago State Forest but has been assumed present due to survey limitations. The species is considered likely to be present.
Petaurus norfolcensis	Squirrel Glider	V	-	-	PCT 5, 266, 268, 277, 278, 280, 283, 287, 290, 294, 314, 316, 322, 343, 349, 351, 352, 731, 870, 953, 1093, 1150, 1151 and 1330	Bondo	Known	0	0	64.2	64.2	Assumed present	The species has been recorded in the project footprint and has also been assumed present in portions of the project footprint due to survey limitations. The species is considered likely to be present in areas of assumed presence.
						Bungonia	Known	0	0	100.85	100.85	Assumed present	
						Crookwell	Known	76.78	4.74	72.57	77.92	Recorded- 3 individuals within PCT 1151	
						Inland Slopes	Known	12.71	4.4	341.87	346.8	Recorded- 2 individuals within PCT 277 and 268	
						Murrumbateman	Known	138.48	0	112.84	117.52	Recorded- 2 individuals within PCT 283	
						Snowy Mountains	Known	55.13	0	170.58	172.74	Recorded- 1 individual within PCT 1196	

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
Petaurus norfolcensis	Squirrel Glider in the Wagga Wagga Local Government Area	E	-	-	PCT 5, 266, 277, 278, 280, 319, and 343	Inland Slopes	Known	0	0	39.04	39.04	Assumed present	The species has been assumed present in portions of the project footprint due to survey limitations. The species is considered likely to be present in areas of assumed presence.
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	Yes	PCT 283, 870, 1093, 1107, 1150 and 1330	Bungonia	Known	36.21	0	10.96	10.96	Assumed present	Brush-tailed Rock Wallaby was not recorded in the project footprint. The closest known record (1997) is about 8 km north of the project at Wombeyan Caves. There is potential for habitat to occur immediately north of Tarlo River National Park within a large patch of remnant vegetation. The species has been assumed present within this area due to survey limitations. The species is considered unlikely to be present.
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	-	PCT 638 and 953	Bondo	Predicted	0	0	64.21	64.21	Assumed present	The species has been assumed present in portions of the project footprint due to survey limitations. The species is considered likely to be present in areas of assumed presence in Snowy Mountains IBRA subregion, but considered unlikely to occur in Bondo IBRA subregion.
						Snowy Mountains	Known	0	0	291.57	291.57	Assumed present	
Phascolarctos cinereus	Koala	E	E	-	PCT 5, 266, 268, 277, 278, 280, 283,	Bondo	Known	0	0	141.63	141.63	Assumed present	The species was not recorded during field surveys but is considered likely to occur based on the high number of local records
						Bungonia	Known	0	0	138.6	138.6	Assumed present	

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
					285, 287, 290, 294, 295, 296, 297, 299, 300, 301, 306, 314, 316, 322, 335, 343, 349, 351, 352, 638, 679, 727, 731, 870, 939, 953, 1093, 1097, 1107, 1150, 1151, 1191, 1196 and 1330	Crookwell	Known	0	0	260.39	260.39	Assumed present	and the occurrence of Koala feed tree species.
						Inland Slopes	Known	0	0	1115.83	1115.83	Assumed present	
						Murrumbateman	Known	0	0	349.56	349.56	Assumed present	
						Snowy Mountains	Known	0	0	485.63	485.63	Assumed present	
Mastacomys fuscus	Broad-toothed Rat	V	V	-	PCT 679	Snowy Mountains	Known	5.2	0	10.74	10.74	Assumed present	The Broad-toothed Rat has not been recorded in the project footprint but is considered to have a high likelihood of occurrence. The species has been assumed present over a portion of the project footprint due to survey limitations.
Pseudomys fumeus	Smoky Mouse	CE	E	Yes	PCT 638, 953 and 1196	Bondo	Known	0	0	0.45	0.45	Assumed present	Smoky Mouse was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations.
						Snowy Mountains	Known	40.98	0	385.65	385.65	Assumed present	

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
													The species is considered to have a moderate likelihood of occurrence.
Reptiles													
Aprasia parapulchella	Pink-tailed Legless Lizard	V	V	-	PCT 266, 277, 278, 280, 283, 290, 294, 319, 322, 351, 731, 1191 and 1330	Bungonia	Known	0	0	67.83	67.83	Assumed present	Pink-tailed Legless Lizard was recorded in the Murrumbateman IBRA subregion. The species has been assumed present in Bungonia, Crookwell and Inland Slopes IBRA subregions due to survey limitations and is considered likely to occur.
						Crookwell	Known	0	0	115.18	115.18	Assumed present	
						Inland Slopes	Known	0	0	918.03	918.03	Assumed present	
						Murrumbateman	Known	0	14.49	408.34	422.93	Recorded- 5 individuals within PCT 1330	
Cyclodomorphus praealtus	Alpine She-oak Skink	E	E	-	PCT 679 and 1196	Snowy Mountains	Known	59.6	0	46.18	46.18	Assumed present	The species has not been recorded in the project footprint. The species has been assumed present in Snowy Mountains IBRA subregion due to survey limitations, but is considered to have a low likelihood of occurrence. Based on consultation with the BCD, the species is unlikely to occur west of Maragle at elevations less than 1200 m elevation. Given this, the project footprint is considered outside of the known range of the species.
Delma impar		V	V	-	PCT 277, 1330 and	Bungonia	Predicted	0	0	140.9	140.9	Assumed present	The species was not recorded in the project footprint, but has been

Scientific name	Common name	BC Act Status*	EPBC Act Status*	SAII	Associated PCTs	IBRA subregion	Species habitat status within IBRA subregion (BioNet 2022)	Habitat within the project footprint (ha)				Assessment outcome	Likelihood of occurrence
								Excluded by field survey	Confirmed by field survey	Assumed presence	Total habitat		
	Striped Legless Lizard				Non-native	Crookwell	Predicted	0	0	313.5	313.5	Assumed present	assumed present in Bungonia, Crookwell, Inland Slopes and Murrumbateman due to survey limitations. Grassland habitat containing foraging and shelter (rock boulder fields) resources potentially used by this species occur within the project footprint. The species is considered likely to occur.
						Inland Slopes	Known	0	0	769.73	769.73	Assumed present	
						Murrumbateman	Known	0	0	592.42	592.42	Assumed present	

* EPBC Act and BC Act conservation status: CE- Critically Endangered; E -Endangered; V- Vulnerable.

* EPBC Act and BC Act conservation status: CE- Critically Endangered; E -Endangered; V- Vulnerable.

7.3.4 Expert reports

An expert report has been prepared to inform the assessment and delineation of species polygons for the Golden Sun Moth. A summary of the proposed approach to the expert report is presented below. Additional expert reports would be prepared to address the BAM assessment requirements for candidate species where required in further consultation with the BCD.

Golden Sun Moth

Alison Rowell, as an expert for Golden Sun Moth (*Synemon plana*)(recently approved by the BCD), was engaged to review floristic and condition score data from relevant BAM plots within potentially suitable Golden Sun Moth habitat within the project footprint to identify species polygon requirements for the species. The plot data was reviewed against data obtained from the point intercept 100 metre Golden Sun Moth habitat assessment transects that have been conducted in a sample of areas of the project footprint that were identified as suitable or unsuitable habitat. A spatial representation of a sub-set of the existing Golden Sun Moth habitat data was field validated with the aim of visiting enough replicates to substantiate the dataset. The field validation site selection was conducted based on several geographical justifications. Such justifications included:

- sites within closest proximity to BioNet Atlas records of Golden Sun Moth sightings
- private properties where land access could be facilitated
- areas containing relevant PCTs in suitable condition
- low lying but well-drained grasslands in association with waterways (eg potential primary grasslands)
- sites which could be easily accessed
- sites supporting a mix of suitable and unsuitable grasslands, based on the Golden Sun Moth habitat assessment results.

Incorporating these factors, a range of sites were chosen across the project footprint to better understand the distribution of suitable habitat and substantiate the existing Golden Sun Moth transect data.

Likely areas of habitat were identified based on vegetation mapping, field observations and the pre-settlement distribution of Natural Temperate Grasslands (VIS_ID 4099, NSW DPE, 2015). The VIS_ID 4099 dataset has previously been used to inform expert assessment of the likely presence of threatened Natural Temperate Grasslands (NTGs) fauna species (Capital Ecology, 2018) and is considered reliable when delineating potential remnant NTGs.

A set of parameters indicating the potential for habitat to support Golden Sun Moth populations were developed based on Alison Rowell's knowledge (Table 7-6). These parameters were cross-referenced with BAM floristics and survey data within likely areas of habitat to generate species polygons for the Golden Sun Moth. Areas of potential Golden Sun Moth habitat were identified by means of the following mapping process and incorporating the criteria outlined in Table 7-6:

- associated PCTs occurring within the Murrumbateman and Inland Slopes IBRA subregions
- excluding lands supporting unsuitable land uses (ie cropping, horticulture, pasture improvement)
- excluding grassy ground layer of forest or dense woodland communities (ie subject to shading)
- excluding grasslands with unsuitable floristics based on the review of field-based plot and habitat transect data (Table 7-6)
- excluding grasslands with no bare ground, high litter or exotic broadleaf cover.

A subset of suitable Golden Sun Moth habitats were identified as preferred habitats where they intersect with the pre-settlement distribution of Natural Temperate Grasslands or within a 200 metres of a historic Golden Sun Moth record.

Table 7-6: Parameters for identifying potential Golden Sun Moth habitats

Criteria	Potential Golden Sun Moth habitat
Land use	• Habitat excludes unsuitable land uses based on cross reference with NSW Landuse 2017 layer and aerial photo interpretation. This includes lands subject to ploughing, cropping, recent/ frequent superphosphate application or pasture improvement resulting in continuous cover of pasture species such as Phalaris, Lolium, and Subterranean Clover.
Shading	• Grasslands and woodlands supporting less than 10 percent canopy or midstorey cover.
Floristics	• Patch does not support dense cover of negative indicator species such as *Microlaena stipoides* or *Themeda triandra,* or species associated with forest or dense woodland communities such as *Rytidosperma pallidum, Austrostipa densiflora, Wahlenbergia stricta, Lomandra multiflora, L. longifolia, Hardenbergia violacea, Dianella revoluta, Cheiranthera* and *Patersonia sp.* • Patch supports more than 10% cover suitable larval food plants such as *Rytidosperma carphoides, R. auriculatum, R. laeve, Austrostipa bigeniculata and A. scabra. R. caespitosum, R. setaceum, R. erianthum, R. racemosum* and *Bothriochloa macra.* • Patch contains native forbs associated with Natural Temperate Grasslands.
Bare ground/ litter cover/ exotic broadleaf	• Greater than 3% bare ground • Less than 25% litter cover • Less than 10% exotic broadleaf cover

7.3.5 Predicted ecosystem credit species

Ecosystem credit species are threatened species whose occurrence can generally be predicted by vegetation surrogates and/or landscape features, or that have a low probability of detection using targeted surveys. Targeted surveys are not required to identify or confirm the presence of ecosystem credit species.

In accordance with the BAM, assessing habitat suitability for an ecosystem credit species involves the following steps:

- Step 1: All PCTs, associated vegetation zones and plot data are loaded into the BAM-C and a list of predicted ecosystem credit species is generated (Table 7-7)
- Step 2: Habitat constraints and vagrant species are assessed to exclude/ include ecosystem credit species from the assessment.

For the purpose of this assessment, it is assumed that all predicted species may have potential habitat in the project footprint and therefore no predicted species have been excluded from the assessment.

A total of 50 ecosystem credit species were identified by the BAM-C. Table 7-7 presents a summary of the status, survey results, associated PCTs and presence within each IBRA subregion for each of the ecosystem credit species predicted by the BAM-C. A total of 14 ecosystem credit species were directly recorded during field surveys.

Table 7-7: Predicted ecosystem credit species (BAM-C 2022)

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status (SAII)	Associated PCTs within project footprint	Status	IBRA subregion					
							BON	BUN	CRO	MUR	INL	SNO
Birds												
Anthochaera phrygia	Regent Honeyeater	CE	CE	Dual	5, 266, 268, 277, 280, 283, 287, 319, 343, 352, 731, 870, 963, 1093, 1097, 1109, 1191, 1330	Assumed present (foraging only)	-	Assumed present	Assumed present	Assumed present	Assumed present	-
Artamus cyanopterus	Dusky Woodswallow	V	-	Ecosystem	300, 638, 679, 939, 953, 1196, 1224	Recorded	Assumed present	Assumed present	Assumed present	Recorded	Recorded	Assumed present
Botaurus poiciloptilus	Australasian Bittern	E	E	Ecosystem	1256	Assumed present	-	-	Assumed present	Assumed present	-	-
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	Dual	5, 266, 268, 277, 278, 280, 283, 285, 287, 288, 290, 295, 296, 297, 299, 300, 306, 314, 322, 343, 351, 352, 638, 679, 727, 731, 870, 952, 953, 1093, 1097, 1107, 1150, 1151, 1191, 1196, 1330, 99997	Recorded (BUN: breeding pairs identified, and heard at dusk during stagwatching surveys (likely nearby breeding habitat)	Recorded	Recorded	Recorded	Recorded	Recorded	Recorded
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	Dual	266, 290, 322, 343, 356, 731, 870, 963, 1093, 1097, 1107, 1150, 1151, 1191, 1330	Recorded within BUN (no nest/breeding sites identified within the project	Assumed present	Recorded	Assumed present	Assumed present	Assumed present	-

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status (SAII)	Associated PCTs within project footprint	Status	IBRA subregion					
							BON	BUN	CRO	MUR	INL	SNO
						footprint). Assumed present in other IBRA subregions.						
Chthonicola sagittata	Speckled Warbler	V	-	Ecosystem	266, 268, 277, 278, 280, 283, 287, 290, 297, 319, 322, 343, 349, 351, 352, 727, 731, 870, 952, 1093, 1097, 1191, 1330	Recorded	Assumed present	Assumed present	Assumed present	Assumed present	Recorded	-
Circus assimilis	Spotted Harrier	V	-	Ecosystem	5, 266, 277, 278, 322, 335, 939, 1191, 1224, 1256, 99997	Recorded	-	-	Assumed present	Recorded	Assumed present	Assumed present
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	-	Ecosystem	266, 268, 277, 278, 280, 283, 287, 290, 298, 306, 314, 322, 343, 349, 351, 352, 727, 731, 870, 1093, 1191, 1191, 1330	Recorded	Recorded	Assumed present	Assumed present	Assumed present	Recorded	Recorded
Daphoenositta chrysoptera	Varied Sittella	V	-	Ecosystem	5, 266, 268, 277, 278, 280, 283, 285, 287, 290, 295, 297, 299, 300, 201, 306, 314, 319, 322, 343, 349, 351, 352, 638, 679,	Recorded	Assumed present	Assumed present	Assumed present	Recorded	Recorded	Assumed present

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status (SAII)	Associated PCTs within project footprint	Status	IBRA subregion					
							BON	BUN	CRO	MUR	INL	SNO
					727, 731, 870, 952, 953, 1093, 1097, 1107, 1150, 1151, 1190, 1191, 1196, 1330							
Epthianura albifrons	White-fronted Chat	V	-	Ecosystem	1256	Assumed present	-	-	Assumed present	Assumed present	-	-
Falco subniger	Black Falcon	V	-	Ecosystem	5, 266, 277, 283, 287, 335, 352, 1330	Assumed present	-	Assumed present	Assumed present	-	Assumed present	-
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	V	-	Ecosystem	5, 266	Assumed present	-	-	-	-	Assumed present	-
Glossopsitta pusilla	Little Lorikeet			Ecosystem	5, 266, 268, 277, 280, 283, 287, 290, 319, 343, 349, 352, 371, 727, 731, 870, 1093, 1097, 1107, 1150, 1191, 1330	Assumed present	-	Assumed present	Assumed present	Assumed present	Assumed present	-
Grantiella picta	Painted Honeyeater	V	V	Ecosystem	5, 266, 268, 277, 278, 280, 287, 290, 319, 343, 352, 731, 1093, 1097, 1330	Assumed present	Assumed present	Assumed present	Assumed present	Assumed present	Assumed present	-
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-	Dual (breeding)	5, 266, 268, 277, 278, 280, 283, 285, 287, 288, 290, 295, 296, 297, 299, 300, 301, 306, 314, 319, 322, 335,	Recorded	Assumed present	Assumed present	Assumed present	Recorded	Assumed present	Assumed present

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status (SAII)	Associated PCTs within project footprint	Status	IBRA subregion					
							BON	BUN	CRO	MUR	INL	SNO
					336, 343, 349, 352, 679, 939, 953, 1191, 1196, 1224, 1256, 1330							
Hieraaetus morphnoides	Little Eagle	V	-	Dual (breeding)	5, 266, 268, 277, 278, 280, 283, 285, 287, 288, 290, 295, 298, 297, 299, 300, 301, 306, 314, 319, 322, 335, 336, 343, 349, 351, 352, 356, 638, 679, 727, 731, 870, 939, 952, 953, 1093, 1097, 1107, 1150, 1191, 1196, 1224, 1256, 1330, 99997	Recorded	Assumed present	Assumed present	Assumed present	Recorded	Recorded	Assumed present
Hirundapus caudacutus	White-throated Needletail		VM	Ecosystem	5, 266, 268, 277, 278, 280, 283, 285, 287, 290, 295, 297, 299, 300, 301, 306, 314, 319, 335, 343, 352, 638, 679, 727, 731, 939, 952, 953, 1093, 1151, 1191, 1196, 1224, 1256, 1330	Assumed present	Assumed present	Assumed present	Assumed present	Assumed present	Assumed present	Assumed present
Lathamus discolor	Swift Parrot	E	CE	Dual	5, 266, 268, 277, 278, 280, 283,	Assumed present	-	Assumed present	-	Assumed present	Assumed present	-

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status (SAII)	Associated PCTs within project footprint	Status	IBRA subregion					
							BON	BUN	CRO	MUR	INL	SNO
					285, 287, 288, 290, 295, 296, 297, 299, 300, 301, 306, 314, 319, 322, 335, 343, 349, 351, 352, 356, 727, 731, 870, 1093, 1097, 1107, 1150, 1151, 1330, 99997							
Leipoa ocellata	Malleefowl	E	V	Ecosystem	343	Assumed present	-	-	-	-	Assumed present	-
Lophoictinia isura	Square-tailed Kite	V	-	Dual (Breeding)	5, 266, 268, 277, 280, 283, 287, 290, 322, 352, 356, 638, 731, 870, 963, 1093, 1097, 1107, 1150	Assumed present	Assumed present	-	-	Assumed present	Assumed present	-
Melanodryas cucullata cucullata	Hooded Robin	V	-	Ecosystem	5, 266, 268, 277, 278, 287, 280, 283, 287, 290, 297, 314, 316, 319, 322, 343, 349, 306, 352, 731, 1093, 1191, 1330	Assumed present	Assumed present	Assumed present	Assumed present	Assumed present	Assumed present	-
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern			Ecosystem	5, 266, 268, 277, 278, 280, 283, 287, 290, 319, 343, 352, 731, 1330	Assumed present	-	Assumed present	Assumed present	Assumed present	Assumed present	-

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status (SAII)	Associated PCTs within project footprint	Status	IBRA subregion					
							BON	BUN	CRO	MUR	INL	SNO
	subspecies)											
Neophema pulchella	Turquoise Parrot	V	-	Ecosystem	5, 266, 268, 277, 278, 280, 287, 290, 319, 322, 343, 349, 351, 352, 731, 1093, 1191, 1256, 1330	Assumed present	Assumed present	Assumed present	-	Assumed present	Assumed present	-
Ninox connivens	Barking Owl	V	-	Dual (Breeding)	5, 266, 268, 277, 278, 280, 283, 287, 290, 295, 314, 319, 322, 343, 349, 351, 352, 356, 638, 727, 731, 870, 953, 963, 1093, 1097, 1107, 1150, 1151, 1191, 1330	Recorded	Assumed present	Assumed present	-	-	Assumed present	Recorded
Ninox strenua	Powerful Owl	V	-	Dual (Breeding)	5, 283, 287, 290, 295-297, 300, 314, 351, 352, 356, 638, 679, 727, 731, 870, 953, 1093, 1097, 1107, 1150, 1151, 1191, 1330	Recorded	Recorded	Assumed present	Assumed present	Assumed present	Recorded	Assumed present
Pachycephala inornata	Gilbert's Whistler	V	-	Ecosystem	5	Assumed present	-	-	-	-	Assumed present	-
Pachycephala olivacea	Olive Whistler	V	-	Ecosystem	300, 638, 939, 1097	Recorded	-	Assumed present	-	-	-	Recorded
Petroica boodang	Scarlet Robin	V	-	Ecosystem	5, 266, 268, 277, 278, 280, 283, 285, 287, 290,	Recorded	Recorded	Recorded	Recorded	Recorded	Recorded	Assumed present

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status (SAII)	Associated PCTs within project footprint	Status	IBRA subregion					
							BON	BUN	CRO	MUR	INL	SNO
					295, 297, 299, 300, 301, 306, 314, 319, 322, 343, 349, 351, 352, 638, 679, 727, 731, 870, 939, 952, 953, 1093, 1097, 1107, 1150, 1151, 1190, 1191, 1196, 1256, 1330							
Petroica phoenicea	Flame Robin	V	-	Ecosystem	5, 266, 268, 277, 278, 280, 283, 285, 287, 290, 295, 297, 299, 300, 301, 306, 314, 322, 343, 349, 351, 352, 638, 679, 727, 731, 870, 939, 952, 953, 1093, 1097, 1107, 1150, 1151, 1190, 1191, 1196, 1224, 1256, 1330	Recorded	Recorded	Recorded	Assumed present	Assumed present	Recorded	Recorded
Polytelis swainsonii	Superb Parrot	V	V	Dual (SAII breeding)	5, 266, 277, 278, 280, 283, 322, 343, 349, 352, 356, 1330, 99997	Recorded	-	-	Assumed present	Recorded	Recorded	-
Pomatostomus temporalis temporalis	Grey-crowned Babbler			Ecosystem	85, 266, 277, 278, 283, 287, 319	Recorded	-	-	-	-	Recorded	-

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status (SAII)	Associated PCTs within project footprint	Status	IBRA subregion					
							BON	BUN	CRO	MUR	INL	SNO
Rostratula australis	Australian Painted Snipe	E	E	Ecosystem	5, 1256	Assumed present	-	-	Assumed present	Assumed present	Assumed present	-
Stagonopleura guttata	Diamond Firetail	V	-	Ecosystem	5, 266, 268, 277, 278, 280, 283, 285, 287, 290, 295, 297, 301, 306, 314, 319, 322, 343, 349, 351, 352, 727, 731, 870, 1093, 1097, 1191, 1330, 99997	Recorded	Assumed present	Assumed present	Assumed present	Recorded	Recorded	-
Stictonetta naevosa	Freckled Duck	V	-	Ecosystem	5	Assumed present	-	-	-	-	Assumed present	-
Tyto novaehollandiae	Masked Owl	V	-	Dual (Breeding)	266, 277, 280, 287, 290, 322, 351, 352, 356, 638, 727, 731, 870, 953, 1093, 1097, 1107, 1150, 1151, 1191, 1330	Assumed present	Assumed present	Assumed present	-	-	Assumed present	Assumed present
Tyto tenebricosa	Sooty Owl	V	-	Dual (Breeding)	638	Assumed present	-	-	-	-	-	Assumed present
Mammals												
Chalinolobus picatus	Little Pied Bat	V	-	Ecosystem	5, 278	Assumed present	-	-	-	-	Assumed present	-
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Ecosystem	5, 266, 268, 277, 278, 280, 283, 285, 287, 290, 295, 297, 299, 300, 306, 314,	Assumed present	Assumed present	Assumed present	Assumed present	Assumed present	Assumed present	Assumed present

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status (SAII)	Associated PCTs within project footprint	Status	IBRA subregion					
							BON	BUN	CRO	MUR	INL	SNO
					316, 322, 343, 349, 351, 352, 638, 679, 731, 870, 939, 953, 1093, 1097, 1107, 1150, 1191, 1196, 1256, 1330							
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Ecosystem	266, 268, 277, 278, 280, 285, 287, 290, 295, 297, 299, 300, 343, 351, 352, 638, 679, 731, 870, 939, 952, 953, 1093, 1097, 1107, 1150, 1190, 1191, 1196, 1256, 1330	Recorded	Assumed present	Recorded	Recorded	Recorded	Recorded	Recorded
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-	Ecosystem	870, 1107, 1150	Assumed present	-	Assumed present	-	-	-	-
Miniopterus australis	Little Bent-winged Bat	V	-	Dual	870, 1097, 1107, 1150	Assumed present (no breeding habitat identified)	-	Assumed present	-	-	-	-
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	Dual	266, 277, 278, 280, 283, 285, 290, 295, 297, 299, 300, 306, 322, 349, 351, 352, 638, 679,	Assumed present (no breeding habitat identified)	Assumed present	Recorded	Recorded	Recorded	Recorded	Recorded

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status (SAII)	Associated PCTs within project footprint	Status	IBRA subregion					
							BON	BUN	CRO	MUR	INL	SNO
					727, 731, 870, 939, 952, 953, 1093, 1097, 1107, 1150, 1151, 1191, 1196, 1256, 1330, 99997							
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	Ecosystem	266	Assumed present	-	-	-	-	Assumed present	-
Petaurus australis	Yellow-bellied Glider	V	-	Ecosystem	299, 300, 351, 638, 731, 870, 952, 953, 1093, 1097, 1107, 1150, 1191, 1196, 1330	Recorded	Recorded	Assumed present	Assumed present	Assumed present	Recorded	Recorded
Pseudomys novaehollandiae	New Holland Mouse	-	V	Ecosystem	290	Assumed present	-	-	-	-	Assumed present	-
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Ecosystem	5, 266, 277, 280, 283, 287, 290, 352, 731, 870, 1093, 1097, 1107, 1150, 1330	Assumed present	-	Assumed present	-	-	Assumed present	-
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Ecosystem	731, 870, 1093, 1097, 1107, 1150, 1151, 1191, 1256, 1330	Recorded	-	Recorded	Recorded	Recorded	Recorded	Recorded
Reptiles												
Hoplocephalus bungaroides	Broad-headed Snake	E	V	Dual	870, 1107, 1150, 1256	Assumed present	-	Assumed present	-	-	-	-

Scientific name	Common name	BC Act status*	EPBC Act status*	Credit status (SAII)	Associated PCTs within project footprint	Status	IBRA subregion					
							BON	BUN	CRO	MUR	INL	SNO
Suta flagellum	Little Whip Snake	V	-	Ecosystem	1191, 1330	Assumed present	-	Assumed present	Assumed present	Assumed present	-	-
Varanus rosenbergi	Rosenberg's Goanna	V	-	Ecosystem	268, 278, 280, 285, 290, 295, 297, 299, 306, 314, 349, 350, 352, 727, 731, 870, 952, 1093, 1150, 1191, 1196, 1256, 1330	Recorded	Assumed present	Assumed present	Assumed present	Assumed present	Assumed present	Assumed present

* EPBC Act and BC Act conservation status: CE- Critically Endangered; E -Endangered; V- Vulnerable.

7.4 Candidate species polygon development

Species polygons were developed for all candidate threatened flora and fauna species (species credit species area and count species) where recorded or assumed present within the disturbance area. This process followed the BAM section 5.2.5 to 5.2.6 and relevant polygon requirements as documented in the TBDC, BioNet species profiles or approval survey guidelines (Table 1-5 and Table 4-15).

Details regarding the development of the species polygon for each relevant candidate species is provided in Attachment 12. The condition of habitats associated with species polygons is presented in the BAM credit summary report provided in Attachment 20.

7.5 Pest animals

Pest animals directly sighted within the project footprint during field surveys are detailed in Table 7-8. Note: an 'X' denotes where a pest species was recorded within an IBRA subregion.

Table 7-8: Pest animals recorded within the project footprint

Scientific name	Common name	IBRA subregion					
		BUN	CRO	MUR	INL	BON	SNO
Anas platyrhynchos	Mallard			x			
Capra hircus	Goat			x	x		
Cervus sp.	Unidentified Deer			x	x		
Cyprinus carpio	Carp			x			
Dama dama	Fallow Deer						x
Equus caballus	Horse						x
Felis catus	Cat			x	x		
Gambusia holbrooki	Mosquito Fish			x			
Mus musculus	House Mouse			x	x	x	
Oryctolagus cuniculus	Rabbit		x	x	x	x	
Rabbit sp.	Brown Hare\Rabbit		x	x		x	
Rattus rattus	Black Rat	x		x	x		
Spilopelia chinensis	Spotted Turtle-Dove				x		
Sturnus vulgaris	Common Starling		x	x	x		
Sus scrofa	Pig	x	x		x		
Turdus merula	Eurasian Blackbird	x		x	x		
Vulpes vulpes	Fox	x	x	x	x	x	

7.6 Threatened aquatic biota

A total of eight threatened aquatic fauna species and TECs listed under the FM Act and EPBC Act (Table 7-9) have been identified through the aquatic desktop assessment and field investigation as having the potential to occur within the project footprint (Figure 10-1 Attachment 1). This includes seven fish species and one endangered ecological community. These species and communities are considered in detail in Section 10.2.

Table 7-9: Threatened aquatic species likely to occur within the project footprint

Scientific name	Common name	FM Act status*	EPBC Act status*
Aquatic Ecological Community In The Natural Drainage System Of The Lower Murray River Catchment	Lowland Murray River EEC	EEC	-
Bidyanus bidyanus	Silver Perch	V	CE
Euastacus armatus	Murray Crayfish	V	-

Scientific name	Common name	FM Act status*	EPBC Act status*
Galaxias rostratus	Flatheaded Galaxias	CE	CE
Nannoperca australis	Southern Pygmy Perch	E	V
Maccullochella macquariensis	Trout Cod	E	E
Maccullochella peelii	Murray Cod	-	V
Macquaria australasica	Macquarie Perch	E	E

* FM Act and EPBC Act conservation status: EEC- Endangered Ecological Community; CE: Critically Endangered; E- Endangered; V- Vulnerable.

8 Identifying prescribed impacts

Prescribed biodiversity impacts are impacts on biodiversity values in addition to, or instead of, impacts from clearing vegetation and/or loss of habitat. Prescribed biodiversity impacts (prescribed impacts) that must be assessed under the BOS and addressed as a part of the BDAR are outlined in Clause 6.1 of the BC Regulation. These are:

- the impacts of development on the following habitat of threatened species or ecological communities:
  - karst, caves, crevices, cliffs and other geological features of significance
  - rocks
  - human made structures
  - non-native vegetation and Category 1 exempt lands.
- the impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range
- the impacts of development on movement of threatened species that maintains their lifecycle
- the impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development)
- the impacts of wind turbine strike on protected animals
- the impact of vehicle strikes on threatened species or animals that are part of a threatened ecological community.

Prescribed impacts relevant to the project and potentially affected threatened entities are identified and described in Table 8-1. They include all prescribed impacts listed above except impacts relating to movement of threatened species that maintains their lifecycle (addressed in relation to impacts to habitat connectivity) and impacts relating to wind turbine strike. Supporting assessments and analysis are provided in Attachment 21. The assessment of prescribed impacts has been carried out for all prescribed impact entities identified and is presented in Section 13.3.

For the purpose of the assessment:

- Threatened and/ or migratory species with a potential risk of collision where identified within a 10 km buffer to the project footprint.
- A 1 km buffer was then applied to identify areas subject to highest risk of transmission line collision.
- Specific criteria used to delineate potential impacts to habitat connectivity are detailed in Attachment 21.

Table 8-1: Prescribed biodiversity impacts relevant to the project

Prescribed impact	Present	Description	Relevant threatened entities
Karst, caves, crevices, cliffs, rocks, and other geological features of significance	Yes	Across the project footprint, there are numerous limestone deposits displaying features that are generally expected in karst environments. Some of those limestone deposits are of the same formation group and epoch as karst environments in the broader region (e.g. Bungonia Caves and Careys Cave). There are no confirmed 'maternity' microbat roosts within karsts, crevices, or cliffs within the project footprint. However, there is important cave roosting habitat beyond the project footprint, including Large Bent-winged Bat roosts located at: • Black Andrew Mine (within 14 km) • Dip Cave, Wee Jasper (within 28 km) • Punchbowl Cave (within 27 km, known roosting site and staging site for gravid females enroute to Church Cave maternity site) • Pylon 58 Cave (within 20 km) • Church Cave (within 27 km) (maternity roost site) • Drum Cave (within 37 km) (maternity roost site). Masked Owl and Sooty Owl roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes in caves for nesting. These species were not detected during spotlighting surveys undertaken as a part of the project. However, suitable habitats occur within the project footprint. Areas of typical rocky hillslope and rock overhangs occur throughout the project footprint, in areas with moderate to high topographic relief. Steep cliffs, and overhangs that intersect the project footprint are likely to support microhabitats that may provide potential nest habitat for Sooty Owl suitable roosting habitat for cave-dependant microbats.	Potential impacts to karsts, cliffs, or overhangs within the project footprint, may result in impacts to the following species: • Cave roosting/breeding microbat species such as, Large-eared Pied Bat, Large Bent-winged bat, and Little Bent-winged Bat. • Masked Owl • Sooty Owl.
Human-made structures (culverts and bridges)	Yes	Culverts and bridges identified within the project footprint are considered potential habitat for roosting bats at different times of the year. Performing an intersection analysis in ArcGIS of the NSW Road Segment and Hydrology (Strahler order greater than or equal to 3) layers within the project footprint, there appears to be one 'definite' culvert, six 'definite' road bridges and 22 possible structures (ie bridges/ culverts) which intersect suitable waterbodies and may support roosting habitat for threatened microbats within the project footprint:	Culverts, bridges, and dilapidated structures may be used by roosting bats such as, Large Bent-winged Bat, Little Bent-winged Bat, Greater Broad-nosed Bat and Southern Myotis. Niche surveys identified the following microbat species within proximity of human-made structures: **Crookwell IBRA subregion:** Large Bent-winged Bat was acoustically recorded 2 km from road bridge at Middle Creek.

Prescribed impact	Present	Description	Relevant threatened entities
		Bondo IBRA-subregion: 5 possible structures **Crookwell IBRA-subregion**: 1 possible structure, 1 definite road bridge and 1 definite culvert **Inland Slopes IBRA-subregion**: 1 definite road bridge and 2 possible structures **Murrumbateman IBRA-subregion**: 2 possible structures and one definite road bridge **Snowy Mountains IBRA-subregion**: 7 possible structures and one definite road bridge. No upgrade or replacement works are proposed for these structures as part of the project. No removal or upgrades of human-made structures is proposed at this stage. No direct impact or removal of existing culverts or bridges is proposed. No impacts to human-made structures are to occur as a result of the project. Therefore, impacts to human-made structures are not relevant to the project and have not been discussed further.	Southern Myotis recorded less than 2 km from road culvert at Cowper's Creek. **Murrumbateman IBRA subregion:** Southern Myotis recorded 9 km from Jerrawa Creek road bridge. Large Bent-winged Bat was recorded 5 km from unknown structure at Dowlings Creek. **Snowy Mountains IBRA subregion:** Two Large Bent-winged Bat records within 1 km of unknown structure at Logbridge Creek. Greater Broad-nosed Bat recorded acoustically in the immediate vicinity of Honey Suckle Creek Road bridge. **Inland Slopes IBRA subregion:** Greater Broad-nosed Bat within 4 km of unknown structure at Tywong Creek. Southern Myotis within 1 km of an unknown structure on an unnamed Strahler order 2 creek, within the Murrumbidgee Catchment area.
Non-native vegetation offering habitat for threatened species	Yes	Exotic vegetation within the project footprint may provide supplementary foraging and/or shelter habitat for some candidate fauna species. For species such as Golden Sun Moth, primary habitat is native grasslands (including derived grasslands) or grassy woodlands within the species geographic distribution. However, the species is also known to colonise exotic grasslands dominated by the exotic weed Chilean Needle Grass (*Nassella neesiana*) (DAWE 2009). However, Chilean Needle Grass dominated grasslands have not been identified within accessible areas of the project footprint. Striped Legless Lizard has also been previously identified in sites dominated by exotic grasses such as *Phalaris aquatica, Nasella trichotoma and Hypochaeris radicata* (Robertson and Smith 2010). Occasionally, Pink-tailed Legless Lizard has been found in disturbed areas dominated by exotic species such as oats (*Avena barbata*), squirrel tail grass (*Vulpia bromoides*), flatweed (*Hypocheirus radicata*), soft brome (*Bromus hordaceous*), delicate hairgrass (*Aira elegantissima*), haresfoot clover (*Trifolium arvense*) (Jones 1999).	Threatened fauna species that may be impacted by the removal of non-native vegetation, include: • Grey-headed Flying-fox • Golden Sun Moth • Striped Legless Lizard • Pink-tailed Legless Lizard.

Prescribed impact	Present	Description	Relevant threatened entities
		Resident populations of Grey-headed Flying-fox in human-modified landscapes (urban, peri-urban, and agricultural), have been documented utilising exotic vegetation, as an alternate food source throughout the year, as well as vegetation suitable for roosting (Parry-Jones and Augee 2001, Timmiss *et al*. 2020 and Yabsley *et al.* 2021).	
Habitat connectivity	Yes	**Threatened fauna** Areas of vegetation identified for removal for the transmission line easement and the installation of the transmission line structures may potentially impact habitat connectivity for threatened fauna. The barrier created from vegetation removal may result in reduced ability for terrestrial fauna (including threatened fauna) to move safely across the landscape to access nearby habitats. However, the extent of such impacts is likely to be limited given historic clearing and existing land use intensity within the project footprint. The ability of arboreal and gliding fauna to safely traverse across remaining patches of vegetation would become constrained with the increase in distance between patches, and it may represent a barrier for gliding species. During the field campaigns, Greater Glider (Snowy Mountain IBRA region), Squirrel Glider (Inland Slopes IBRA subregion), and Yellow-bellied Glider (Snowy Mountain IBRA region), were recorded in several locations throughout the project footprint (Table 7-5). For the woodland bird species like the Varied Sitella, reduced landscape connectivity may create movement barriers (the sedentary nature of the species makes cleared land a potential barrier). Species such as Flame Robin and Scarlet Robin require connected corridors of vegetation for movement. Isolation of patches of habitat, particularly where these patches are smaller than 10 ha, may result in isolated individuals. For other fauna species with limited dispersal ability/mobility (highly restricted home ranges), such as Golden Sun Moth, Rosenberg's Goanna, Pink-tailed Legless Lizard and Striped Legless Lizard; the reduction in habitat connectivity may, depending on the location, effectively isolate individuals or populations, leading to a decline in the species population. The increased distance between vegetation patches intersecting the project footprint is unlikely to impact the lifecycle of highly mobile species (such as some microbats species, megabats and birds). However, the project may	Threatened microbat species that require cluttered or edge environments for foraging and may be affected by reduced connectivity: • Large-eared Pied Bat • Southern Myotis • Eastern False Pipistrelle. Terrestrial and arboreal mammals potentially affected by reduced landscape connectivity: • Broad-toothed Rat • Koala • Eastern Pygmy-possum • Greater Glider • Yellow-bellied Glider • Squirrel Glider. Small, sedentary (short dispersal distances) woodland birds which may be affected by reduced connectivity: • Flame Robin • Scarlet Robin • Varied Sitella. Reptiles which may be affected by reduced connectivity: • Pink-tailed Legless Lizard • Striped Legless Lizard. Amphibians which may be affected by reduced riparian connectivity: • Sloane’s Froglet • Booroolong Frog

Prescribed impact	Present	Description	Relevant threatened entities
		result in fauna injury and/ or mortality from transmission line collision, entanglement or electrocution. For amphibian species like Sloane's Froglet, Booroolong Frog and Yellow-spotted Tree Frog, the installation of maintenance access tracks across waterways (formal or informal) may reduce stream connectivity, and breeding success of individuals. **Threatened flora** For threatened flora species such as Small Snake Orchid, clearing, or reduced connectivity of habitat may reduce pollination and dispersal success of the species. **TECs** For TECs, increased fragmentation may result in loss of community composition, structure and function.	• Yellow-spotted Tree Frog. TECs potentially affected by reduced connectivity: *Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South-western Slopes and South-eastern Highlands Bioregions* *Monaro Tableland Cool Temperate Grassy Woodland in the South-Eastern Highlands Bioregion* *Tableland Basalt Forest in the Sydney Basin and South-Eastern Highlands Bioregions.*
Waterbodies, water quality and hydrological processes	Yes	**Threatened fauna** There are at least 135 streams (of various types and condition) that intersect the project footprint. Major waterways such as the Goobarragandra River, Gocup Creek, Tumut River, Murrumbidgee River, Adjungbilly Creek and Lachlan River are important to their bioregions for a number of species. Threatened bats use these features for drinking, foraging, and thermoregulation. Southern Myotis require waterways for foraging with proximity to and condition of suitable aquatic habitats being the primary force driving roost selection by this species (Campbell 2009, Gonsalves and Law 2017). Given the species' affinity with waterways, the species can, directly and indirectly, be exposed to pollutants associated with run-off and sedimentation. Threatened frog species with potential to occur that are sensitive to hydrological changes, include: • Sloane's Froglet • Booroolong Frog • Yellow-spotted Tree Frog • Spotted Tree Frog. **TECs**	Fauna groups which would be sensitive to impacts to waterbodies, reductions in water quality and altered hydrological processes include,threatened microbats that use waterbodies as part of their foraging strategy or a primary source of food: • Southern Myotis (confirmed present) • Greater Broad-nosed Bat (confirmed present) • threatened frogs: • Sloane's Froglet • Booroolong Frog • Yellow-spotted Tree Frog • Spotted Tree Frog. TECs affected by altered hydrological regimes: • *Monaro Tableland Cool Temperate Grassy Woodland in the South-Eastern Highlands Bioregion* • *White Box Yellow Box Blakely's Red Gum Woodland* • *Tableland Basalt Forest* • *Montane Peatlands and Swamps*.

Prescribed impact	Present	Description	Relevant threatened entities
		Altered hydrological regimes have the potential to change the floristic and faunal composition of the following TECs: • *Monaro Tableland Cool Temperate Grassy Woodland in the South-Eastern Highlands Bioregion* • *White Box Yellow Box Blakely's Red Gum Woodland* • *Tableland Basalt Forest*. The project has the potential to impact waterways, water quality and/or hydrological processes such that threatened species and TECs may be impacted. As such, this prescribed impact is relevant.	
Vehicle strikes	Yes	Vehicle strike risk is likely to increase during construction of the project. The risk of mortality or injury from vehicle strike is likely to be higher at certain times of the year for terrestrial/ arboreal mammals when their mobility and home range sizes increases, particularly during the breeding season. Further, vehicle strike risk is likely to be higher in connected landscapes (eg large patches of vegetation) versus highly fragmented landscapes (such as heavily cleared farmlands) within the project footprint. The clearing of vegetation in some areas within the project footprint may increase the risk of harm/death to local fauna through increased exposure to vehicle strike as they attempt to move to nearby habitats. Some bird species feed on carrion or seeds along road corridors/easements, which may result in them being struck by or trampled by vehicles/machinery.	The following candidate fauna species with vehicle strike listed as a Key Threatened Process (KTP) to their conservation (under the BC Act), include: • Koala • Eastern Pygmy-possum • Squirrel Glider • Superb Parrot • Powerful Owl • Masked Owl.

9 Bushfire impacts and assessment considerations

This chapter addresses the impacts of bushfire within the project footprint and important considerations for the assessment.

9.1 Overview of the 2019-20 bushfires

The Dunns Road bushfire impacted the project footprint in the 2019/2020 fire season. The bushfire started on 27 December 2019 from a lightning strike in a private pine plantation near Adelong. A total of 333,980 hectares of land was impacted (NPWS, 2020). Within the project footprint, approximately 2,038 hectares of land was impacted across three IBRA subregions: Bondo, Inland Slopes and Snowy Mountains.

Areas within the project footprint affected by the 2019-20 fire were assessed in accordance with the DPIE (2020e) Guideline, with reference to the extent of severity as detailed in DPIE (2020f) FESM. FESM burn severity classes are defined in Table 9-1, with severely burnt vegetation classified as those aligning with burn classes of High and Extreme. The results of the burnt land assessments are documented in Attachment 4 and summarised in Section 9.2. The extent of severely burnt vegetation in the 2019-20 bushfire across the project footprint is detailed in Table 9-2.

Table 9-1: FESM burn severity classes (DPIE, 2020f)

Burn severity	Definition
Low	Burnt surface with unburnt canopy
Moderate	Partial canopy scorch
High	Full canopy scorch (± partial canopy consumption)
Extreme	Full canopy consumption

9.2 Severely burnt vegetation within the project footprint

Initial site assessments were completed by ELA only nine months post-fire and indicated that most of the assessed vegetation within burnt lands was severely impacted. Subsequent site assessments were completed by Niche over two years post-fire (ie October 2021 and April 2022) and in this time substantial vegetation recovery was noted.

Evidence of severe bushfire was observed throughout the project footprint. However, this was largely limited to lands mapped as a high or extreme burn severity class (according to the DPIE (2020f) FESM). Within these sites, observed impacts to floristic structure as a result of the fire included a dominance of pioneer species, reduction in species diversity and increase in the vegetative cover. Given the length of time since fire, much of the understorey and groundcover vegetation within fire affected areas had regenerated, and it is no longer evident the extent to which these strata were consumed. Similarly, white ash and charred organic matter was not recorded. Whilst burnt logs were observed, impacts to log and leaf litter cover were not notable given the time since fire and ongoing accumulation of debris.

Vegetation within land mapped as subject to moderate and low severity burns showed little evidence of bushfire impacts. This was typically limited to scorch marks on tree trunks with some epicormic growth and occasional burnt logs also observed. The canopy appeared to be mostly intact with no apparent impacts to species diversity observed across strata.

A number of burnt land site assessments were undertaken, in accordance with the DPIE (2020e) Guideline, to assist in delineating severely burnt vegetation within the project footprint (Figure 9-1 Attachment 1). The results of the assessment are presented in Attachment 4.

Given the coarse nature of the FESM mapping and some noted variation in the positioning of vegetation zones within the landscape, a conservative approach was adopted in assigning burn severity to woody vegetation zones. All woody vegetation zones intersecting lands with a high or extreme burnt severity according to the FESM (DPIE, 2020f) have been assessed as severely burnt. This includes a total of 526.8 hectares of native vegetation situated within the following IBRA subregions (Figure 9-1 Attachment 1):

- **Inland Slopes**: 249.4 hectares
- **Bondo:** 108.8 hectares
- **Snowy Mountains:** 168.6 hectares.

Severely burnt vegetation within the project footprint comprises 13 PCTs in varying condition states. 1.21 ha of severely burnt vegetation within the project footprint intersects with the approved Snowy 2.0 project footprint. As the Snowy 2.0 footprint was excluded from this impact assessment, this area of severely burnt vegetation was not included in the calculations provided below (Table 9.2).

Table 9-2: Severely burnt vegetation within the project footprint

PCT ID	Condition	BC Act TEC	EPBC Act TEC	Extent within project footprint (hectares)		% Vegetation Zone severely burnt
				Severely burnt vegetation (by IBRA)	Total (ha) of Vegetation Zone (by IBRA)	
Snowy Mountains						
1196	High	Non-TEC	Non-TEC	39.3	89.9	43.7
300	Moderate	Non-TEC	Non-TEC	0.8	1.1	72.7
	High	Non-TEC	Non-TEC	24.1	41.6	57.9
638	High	Non TEC	Non TEC	22.3	64.4	34.6
679	High	Non-TEC	Non-TEC	8.5	18.5	45.9
939	Very high	Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregion	Alpine Sphagnum Bogs and Associated Fens	1.8	2.5	72.0
953	Moderate	Non-TEC	Non-TEC	0.1	0.1	100.0
	High	Non-TEC	Non-TEC	0.02	0.21	9.5
	Very High	Non-TEC	Non-TEC	71.9	252	28.5
Inland Slopes						
268	High	White Box - Yellow Box - Blakely’s Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregion	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	27.6	69	40.0

PCT ID	Condition	BC Act TEC	EPBC Act TEC	Extent within project footprint (hectares)		% Vegetation Zone severely burnt
				Severely burnt vegetation (by IBRA)	Total (ha) of Vegetation Zone (by IBRA)	
	Very high	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregion	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	0.2	3	6.7
287	Moderate	Non-TEC	Non-TEC	39.4	49.1	80.2
290	High	Non-TEC	Non-TEC	1.6	9.1	17.6
297	Moderate	Non-TEC	Non-TEC	9.9	19.4	51.0
299	Moderate	Non-TEC	Non-TEC	1.8	7.8	23.1
306	High	Non-TEC	Non-TEC	2.0	6.9	29.0
	Very high	Non-TEC	Non-TEC	1.4	1.43	97.9
314	Moderate	Non-TEC	Non-TEC	71.1	94.1	75.6
	Very high	Non-TEC	Non-TEC	94.3	98.4	95.8
Bondo						
299	Moderate	Non-TEC	Non-TEC	14.4	18.8	76.6
300	High	Non-TEC	Non-TEC	1.7	2.5	68.0
953	High	Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions	Non-TEC	92.1	102.6	89.8
	Very high	Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions	Non-TEC	0.6	0.7	85.7

9.3 Application of the BAM in severely burnt sites

9.3.1 Native vegetation and threatened ecological communities

PCTs were effectively delineated within burnt areas where the dominant species within the various strata could be readily identified. Where the crowns of canopy trees were fully consumed at the time of field survey, juvenile/epicormic growth was used to support plant species identification (refer to Attachment 4). Given a substantial amount of regeneration was noted within the understorey and ground layers, regenerating plant material was generally available during the field survey and provided a suitable means for identifying dominant species within these strata. PCTs were stratified into condition classes based on the observed floristic structure and land use patterns of adjacent unburnt areas. Condition classes in burnt areas were assigned conservatively, with consideration of canopy and understorey condition (refer to Attachment 4). Where a PCT within the burnt areas met all requirements for a moderate, high or very high condition class, the relevant EPBC Act TEC was assigned. All PCTs in a condition class other than "Non-native" that aligned with a BC Act TEC were assigned the relevant BC Act TEC (refer to Table 9-2).

Vegetation integrity was assessed for each severely burnt vegetation zone using the following approach:

- Use of plot data gathered from unburnt sections of each vegetation zone situated within the project footprint.
- Where suitable unburnt areas could not be identified within the project footprint, plots were situated adjacent (ie within 500 metres) to the project footprint.
- Where suitable unburnt areas could not be identified for sampling within or adjacent to the project footprint, plot data was duplicated from an adjacent IBRA subregion that occurred within the same IBRA region.
- Where the above options were not feasible, benchmark condition was assumed for any remaining plot shortfall.

9.3.2 Threatened flora and fauna species

Ecosystem credit species predicted to occur within severely burnt habitats were assumed present.

For candidate species credit threatened species, the following approach was adopted to assess habitat suitability where land access was possible:

- Surveys were carried out within severely burnt sites to confirm the presence/ absence of habitat features unlikely to be affected or consumed by fire (ie surface rock, caves, streams etc).
- The presence/ absence of other relevant habitat constraints susceptible to bushfire impact was informed by field observations and plot data gathered from adjacent unburnt lands and surrogate sites.

A review of candidate species credit threatened species likely to occur within severely burnt habitats has been carried out, including a review of literature on species response to fire for all candidate species, with the aim to inform:

- the suitability of undertaking targeted surveys for species credit threatened species (ie known fire respondent species)
- determining species credit threatened species to be assumed present where fire response is found to be poor
- requirement for supporting expert report.

Some important considerations were made during this review:

- Habitat constraints that are components of vegetation were not determined as being absent from severely burnt lands unless it was apparent that the constraint was not present prior to the bushfire (ie stick nests and tree hollows generally absent from very low to low condition class).
- Surveys for threatened plant species were considered suitable where evidence indicated the species, if present, would be identifiable above ground (i.e., reference to studies noting species presence within three years post-fire).

The complete review is provided in Attachment 15. The key findings regarding responses to fire for flora and fauna were as follows:

- The response of flora was found to be highly variable, with some species responding very positively to fire, while others responded neutrally or poorly.
- The response of microbats was found to be highly variable, depending on the species of bat and their differing ecology and biology.
- The response of birds was also found to be highly variable, with small insectivorous birds generally responding well, while large hollow nesters appeared to respond poorly.
- Reptiles and amphibians were found to generally respond well or at least neutrally to fire, therefore surveys targeting these species were considered to be sufficient for determining the species presence/absence.
- There is a current lack of literature on the impacts of bushfires on invertebrates, thus it is uncertain how species credit threatened invertebrates respond to fire. These species have been assumed present in associated PCTs that were severely burned within the project footprint.

In summary, with respect to survey effort undertaken within severely burned sites, the following was determined:

- 33 species credit threatened flora species were observed to respond positively to fire, therefore surveys conducted targeting these species were considered sufficient for determining the species presence/absence.
- 7 species credit threatened flora species were observed to respond either neutrally or negatively to fire, therefore surveys targeting these species were considered insufficient for determining the species presence/absence. These species have been assumed present in associated PCTs that were severely burned within the project footprint.
- 22 species credit threatened fauna species were observed to respond positively to fire, therefore surveys targeting these species were considered sufficient for determining the species presence/absence.
- 8 species credit threatened fauna species were observed to respond either neutrally or negatively to fire, therefore surveys targeting these species were considered insufficient for determining the species presence/absence. These species have been assumed present in associated PCTs that were severely burned within the project footprint.

9.4 Resource flows and sinks

In accordance with the DPIE (2020e) guideline, locations of likely resource flows and sinks include locations where moisture and nutrients are likely to accumulate and support more rapid regeneration of vegetation post-fire. These sites are considered important for the recovery of bushfire affected lands within the locality and would be retained where practicable. Likely resource flows and sinks within the project footprint are shown in Figure 9-1 (Attachment 1) and include:

- low lying areas containing swampy and riparian vegetation
- mapped waterways, as these are likely to transport and accumulate nutrients and sediments.

10 Aquatic species and habitats

This section addresses threatened aquatic species and matters relating to the FM Act and EPBC Act.

A total of 1,139 streams are located within the project footprint (refer to Figure 10-1 Attachment 1) which traverses the Hawkesbury-Nepean, Lachlan and Murrumbidgee catchments. Seventy-nine per cent of these waterways are first and second order streams, reflecting the dominance of smaller streams within the project footprint. Major rivers that occur within the project footprint include the Lachlan River, Murrumbidgee River and Tumut River as well as several major creeks that are tributaries of these major rivers.

The assessment of aquatic species and habitats addresses the two most relevant aims of the FM Act. First, the conservation of threatened species, populations or ecological communities (Figure 10-1 Attachment 1). Second, an assessment of potential impacts to mapped KFHs (Figure 10-1 Attachment 1). A description of waterways within the project footprint considered to have potential to support threatened species habitats are addressed in Section 10.1, with an assessment of the likelihood of threatened species, populations and ecological communities occurring within the alignment undertaken in Section 10.2. Key Fish habitats that are likely to be subject to direct impacts are described in Section 10.3.

10.1 Assessment of threatened aquatic species habitats

Thirty threatened aquatic species desktop assessment points were identified as shown in Table 10-1. These points were defined as the intersection of streams with the indicative distribution of threatened freshwater species (DPI 2022a) and the project footprint (as described in Section 4.8.2). The desktop assessment of these points has been augmented by information gathered opportunistically during field investigation at 17 of these sites, where access to Niche field teams was available. These points are presented to inform the assessment of potential impacts to threatened aquatic biota as a result of the project.

Of the 1,139 streams located within the project footprint, 30 of these were identified as threatened aquatic species desktop assessment points. These threatened aquatic species desktop assessment points are typically within the larger streams present within the project footprint (generally Strahler order four and above). Twenty-four of the 30 streams are also mapped as KFH and are covered by freshwater fish community status mapping (DPI 2022a). All of these are classed as "Very Poor" condition, with one classed as "Poor" condition (point 15 on the Murrumbidgee River, Figure 10-1 Attachment 1). These prevailing poor conditions align with the condition assessment informed by the desktop assessment points and field inspection across the project footprint, particularly in rural settings.

The threatened aquatic species desktop assessment points (Table 10-1) included sensitive aquatic habitat features such as aquatic macrophytes, deep pools and large woody debris (LWD). However, these features were typically limited in extent. All points were subject to some form of degradation including clearing, grazing or cropping within the riparian zone, channel incision, bank erosion or weed ingress (the most prevalent among these). These factors contribute to an overall picture of existing modified landscapes supporting generally low condition stream habitats within the project footprint.

Table 10-1: Threatened aquatic species desktop assessment points

No.	Stream		DPI indicative threatened species distribution	DPI fish community status / Key Fish Habitat (KFH)	Catchment / IBRA subregion	Habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Field inspection photograph
	Name	Strahler order						
1	Unnamed waterway	1	Southern Pygmy Perch	-	Lachlan / Crookwell	Cleared Downstream dams Ephemeral Highly modified	-34.629068, 149.402674	No field investigation.
2	Humes Creek	3	Southern Pygmy Perch	Very Poor KFH	Lachlan / Crookwell	Remnant stand of riparian vegetation Pools dominant with small riffle habitats Pebble dominated Boulders and snags Bridge upstream Grazed banks Channel incision Perennial	-34.636407, 149.376408	

No.	Stream		DPI indicative threatened species distribution	DPI fish community status / Key Fish Habitat (KFH)	Catchment / IBRA subregion	Habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Field inspection photograph
	Name	Strahler order						
3	Merrill Creek	4	Southern Pygmy Perch	Very Poor KFH	Lachlan / Murrumbateman	Landscape mostly cleared with some riparian vegetation remaining Some channel incision evident Fine sediment deposits occur within the low flow channel forming lateral bars Channel generally shallow with some intermittently deeper pools	-34.678799, 149.220811	
4	Lachlan River	6	Southern Pygmy Perch, Macquarie Perch	Very Poor KFH	Lachlan / Murrumbateman	Highly diminished riparian zone, extensive sediment present Snags and coarse woody debris Grazing on banks Meandering low flow channel with lateral and point bars/benches	-34.682167, 149.213147	

No.	Stream		DPI indicative threatened species distribution	DPI fish community status / Key Fish Habitat (KFH)	Catchment / IBRA subregion	Habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Field inspection photograph
	Name	Strahler order						
5	Oolong Creek	4	Southern Pygmy Perch	Very Poor KFH	Lachlan / Murrumbateman	Cleared and grazed Existing access track crossing Riparian vegetation lacking Incised channel Perennial Turbid discoloured water Some aquatic vegetation Bank erosion	-34.695208, 149.181595	No photo available.
6	Jerrawa Creek	5	Southern Pygmy Perch	Very Poor KFH	Lachlan / Murrumbateman	Cleared and grazed Lacking riparian vegetation Incised channel Perennial with some degree of disconnectivity between ponds	-34.696637, 149.179757	No field investigation.
7	Jerrawa Creek	5	Southern Pygmy Perch	Very Poor KFH	Lachlan / Murrumbateman	Cleared and grazed Highly diminished riparian vegetation Willows and weed ingress Undercut banks and some fringing macrophytes present along lateral bars. Poor water clarity Eroded banks Existing dirt road network adjacent to stream	-34.702367, 149.164819	

No.	Stream		DPI indicative threatened species distribution	DPI fish community status / Key Fish Habitat (KFH)	Catchment / IBRA subregion	Habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Field inspection photograph
	Name	Strahler order						
8	Jerrawa Creek	5	Southern Pygmy Perch	Very Poor KFH	Lachlan / Murrumbateman	Willows present Riparian vegetation largely absent *Phragmites* sp., LWD present and undercut banks Deep pools with some submerged macrophytes. Bank erosion and grazing	-34.704703, 149.157912	
9	Flacknell Creek	4	Southern Pygmy Perch	Very Poor KFH	Lachlan / Murrumbateman	Lacking riparian vegetation Cleared and grazed Perennial water in deep pools Incised channel Some aquatic vegetation present Bank erosion	-34.728129, 149.099331	

No.	Stream		DPI indicative threatened species distribution	DPI fish community status / Key Fish Habitat (KFH)	Catchment / IBRA subregion	Habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Field inspection photograph
	Name	Strahler order						
10	Three Waterholes Creek	3	Southern Pygmy Perch	N/A KFH	Murrumbidgee / Murrumbateman	Very poor condition Riparian vegetation absent Highly incised Turbid and discoloured water Some fringing aquatic vegetation and large woody debris present	-34.765993, 149.020098	
11	Manton's Creek	2	Southern Pygmy Perch	N/A	Murrumbidgee / Murrumbateman	Limited riparian vegetation present Cleared and grazed Highly incised channel Limited LWD and habitat cover Clear water surface conditions Bank erosion	-34.771855, 149.007875	

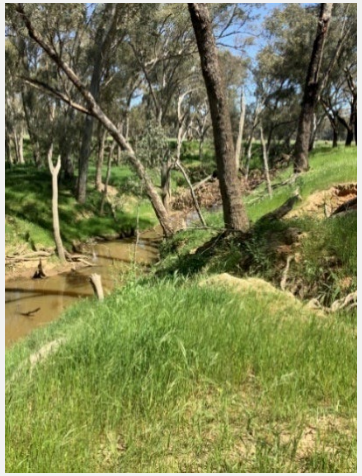
No.	Stream		DPI indicative threatened species distribution	DPI fish community status / Key Fish Habitat (KFH)	Catchment / IBRA subregion	Habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Field inspection photograph
	Name	Strahler order						
12	Yellow Creek	3	Southern Pygmy Perch	N/A KFH	Murrumbidgee / Murrumbateman	Eroded and incised banks Low flow channel with shallow pools between a knickpoint Limited overstorey riparian vegetation present Minor fringing aquatic vegetation present	-34.770108, 148.988969	
13	Bango Creek	4	Southern Pygmy Perch	N/A KFH	Murrumbidgee / Inland Slopes	Cleared with minor riparian vegetation present Eroded and incised banks Small riffles and undercut banks Grazing on banks	-34.766795, 148.971004	

No.	Stream		DPI indicative threatened species distribution	DPI fish community status / Key Fish Habitat (KFH)	Catchment / IBRA subregion	Habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Field inspection photograph
	Name	Strahler order						
14	Cooks Creek	4	Southern Pygmy Perch	N/A KFH	Murrumbidgee / Inland Slopes	Cleared with minor riparian vegetation present Eroded and heavily incised banks Channel modification Grazing on banks Floating and emergent macrophytes present in patches Some filamentous algae Exotic vegetation species	-34. 767441, 148.929639	
15	Murrumbidgee River	9	Murray Crayfish, Trout Cod, Silver Perch	Poor KFH	Murrumbidgee / Inland Slopes	Major river Limited stands of riparian vegetation Broader landscape heavily modified Submerged macrophytes Grazing on banks	-34.911798, 148.531736	

No.	Stream		DPI indicative threatened species distribution	DPI fish community status / Key Fish Habitat (KFH)	Catchment / IBRA subregion	Habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Field inspection photograph
	Name	Strahler order						
16	Oak Creek	5	Murray Crayfish	Very Poor KFH	Murrumbidgee / Inland Slopes	Cleared with minor riparian vegetation present Eroded and incised banks Grazing on both banks Fringing aquatic vegetation	-34.969044, 148.403546	
17	Adjungbilly Creek	6	Macquarie Perch	Very Poor KFH	Murrumbidgee / Inland Slopes	Cleared with limited riparian vegetation present	-35.091574, 148.36173	No field investigation.
18	Brungle Creek	5	Murray Crayfish	Very Poor KFH	Murrumbidgee / Inland Slopes	Cleared with riparian vegetation absent Eroded and incised banks Perennial	-35.186202, 148.335309	No field investigation.
19	Bombowlee Creek	5	Murray Crayfish	Very Poor KFH	Murrumbidgee / Inland Slopes	Cleared with minor riparian vegetation present	-35.265594, 148.325034	No field investigation.
20	Goobarragandra River	7	Murray Crayfish	Very Poor KFH	Murrumbidgee / Inland Slopes	Major river Limited riparian vegetation Cleared banks	-35.327382, 148.319832	No field investigation.
21	Tumut River	7	Murray Crayfish,	Very Poor	Murrumbidgee / Inland Slopes	Major river	-35.393812, 148.249178	No field investigation.

No.	Stream		DPI indicative threatened species distribution	DPI fish community status / Key Fish Habitat (KFH)	Catchment / IBRA subregion	Habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Field inspection photograph
	Name	Strahler order						
			Flathead Galaxias	KFH		Immediately downstream of the Blowering Reservoir Quarry and farming in the surrounding area as well as road/track networks		
22	Brungle Creek	5	Murray Crayfish	Very Poor KFH	Murrumbidgee / Inland Slopes	Cleared with riparian vegetation absent Incised banks Perennial	-35.175781, 148.330402	No field investigation.
23	Tumut River	8	Murray Crayfish, Flathead Galaxias	Very Poor KFH	Murrumbidgee / Inland Slopes	Major river Limited riparian vegetation Mostly cleared	-35.219707, 148.215689	No field investigation.
24	Tumut River (unmapped anabranch)	8	Murray Crayfish, Flathead Galaxias	Very Poor KFH	Murrumbidgee / Inland Slopes	Major river Limited riparian vegetation Mostly cleared	-35.221975, 148.213	No field investigation.
25	Gocup Creek	4	Murray Crayfish	Very Poor KFH	Murrumbidgee / Inland Slopes	Cleared with minor riparian vegetation present Eroded and incised banks Pools separated by ephemeral sections	-35.228606, 148.206504	No field investigation.

No.	Stream		DPI indicative threatened species distribution	DPI fish community status / Key Fish Habitat (KFH)	Catchment / IBRA subregion	Habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Field inspection photograph
	Name	Strahler order						
26	Adelong Creek	5	Murray Crayfish	Very Poor KFH	Murrumbidgee / Bondo	Steep forested slopes Forestry area Snags, boulders and undercut banks Downstream extent is cleared and grazed Perennial	-35.430833, 148.121639	
27	Tarcutta Creek	6	Murray Crayfish, Flathead Galaxias	Very Poor KFH	Murrumbidgee / Inland Slopes	Cleared with minor riparian vegetation present Channel incision Perennial	-35.349221, 147.781665	No field investigation.
28	Umbango Creek	7	Murray Crayfish, Flathead Galaxias	Very Poor KFH	Murrumbidgee / Inland Slopes	Cleared with limited linear riparian vegetation present Eroded and incised banks Perennial	-35.347722, 147.7768	No field investigation.

No.	Stream		DPI indicative threatened species distribution	DPI fish community status / Key Fish Habitat (KFH)	Catchment / IBRA subregion	Habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Field inspection photograph
	Name	Strahler order						
29	Kyeamba Creek	7	Flathead Galaxias	Very Poor KFH	Murrumbidgee / Inland Slopes	Cleared with limited riparian vegetation present Grazing on banks Pugging Willows Coarse woody debris Bank erosion	-35.287909, 147.523635	
30	O'Briens Creek	6	Flathead Galaxias	Very Poor KFH	Murrumbidgee / Inland Slopes	Cleared with limited linear riparian vegetation present Turbid low flow channel LWD and native riparian overstorey species present Some gullying and bank erosion Farm debris	-35.27587, 147.492651	

10.2 Threatened aquatic species and communities

Six threatened aquatic species and one threatened aquatic ecological community have been identified as having the potential to occur within the project footprint, as detailed in Table 7-9 and Section 7.6. An assessment of the likely occurrence of threatened aquatic biota following the assessment of habitats as documented in Section 10.1 is detailed in the following section.

10.2.1 Threatened aquatic species

Southern Pygmy Perch (*Nannoperca australis*)

The available information on the known distribution of Southern Pygmy Perch (Nannoperca australis) is somewhat at odds with the indicative distribution mapping published by DPI, given that the species may be close to extinction (Morris et al. 2001) and the poor dispersal capabilities of species (Hammer 2002 and Cook et al. 2007). The indicative distribution mapping includes a significant amount of stream length in the Upper Lachlan and Murray River catchments, presumably reflecting the inclusion of the MaxEnt predicted maximum extent of the species using environmental variables from known locations (DPI 2015b) in the dataset rather than recent records.

The Southern Pygmy Perch was once widely distributed throughout the Lachlan, Murrumbidgee and Murray River system. In NSW, the species is now restricted to sections of three waterways in New South Wales, which include a tributary of the Lachlan River (Blakney Creek near Yass) and two tributaries of the Murray River, aside from five additional conservation stocking sites (DPI 2013, Threatened Species Scientific Committee 2021, DAWE 2022b) the location of which do not appear to be published. The species is considered locally extinct in the Murrumbidgee River catchment. Lintermans (2007) notes that the Southern Pygmy Perch has now disappeared from most locations in NSW, with previously recorded populations from the Normans Lagoon and Millewa Forest sites now considered extinct (DPI 2015a). The Blakney Creek population of Southern Pygmy Perch was discovered in 2002, although subsequent surveys have failed to detect Southern Pygmy Perch outside Blakney Creek and its tributaries. In fact, recent surveys within Blakney Creek show a marked decline in both the abundance and distribution of this population over the survey period (DPI 2015a). A stocked population of Southern Pygmy Perch within Pudman Creek is surviving and recruiting, however there is no evidence of their colonisation away from the initial stocking locations (DPI 2015a). None of these known distributions occur within the project footprint. One remnant population of the Murray-Darling Basin lineage exists in Blakney Creek, a tributary draining northward into the upper Lachlan River catchment, near Yass (Threatened Species Scientific Committee 2021). Both Yellow Creek and Bango Creeks occur in proximity to the Blakney Creek sub-catchment and intersect with the project footprint, however the catchments of these streams are separate from that of Blakney Creek, instead draining south into the Yass River.

The Southern Pygmy Perch prefers slow flowing or still waters in small streams, billabongs, vegetated lakes and irrigation channels with dense aquatic vegetation and habitat cover (Lintermans 2007). These habitats are generally absent from the desktop assessment of aquatic habitats. Where these habitats do occur in some form, they are typically limited and have been subject to degradation from deleterious processes such as grazing and riparian clearing.

None of the known remaining populations of Southern Pygmy Perch would be impacted by the project. It is overall unlikely that the Southern Pygmy Perch would occur within the project footprint based upon the known distribution and habitat requirements of the species. Despite this, a precautionary approach has been adopted and potential impacts to the species are considered in Section 13.7.

Macquarie Perch (*Macquaria australasica*)

Macquarie Perch (Macquaria australasica) from the Murray-Darling Basin strain of the species may occur in the upstream reaches of the Lachlan, Murrumbidgee and Murray rivers. Indicative distribution mapping by DPI for the species includes the Lachlan River and Adjungbilly Creek within the project footprint, although a number of streams may be within the historic distribution of the species (DPI 2015c, DPI 2016a). The species is unlikely to occur within the Murrumbidgee River in the project footprint, with the population of this river occurring upstream, south of Canberra (DEE 2018).

The Macquarie Perch may occur in stream or lake habitats, with a preference for upper river reaches or tributaries, and lake dwelling individuals of the species would migrate into these habitats to spawn (DPI 2016b). Typical habitat for the species is described as being a large and moderately deep pool immediately upstream of fast-flowing broken water with aquatic vegetation and additional cover in the form of large boulders, debris and overhanging banks, with stream shading provided by steep rock faces, riparian trees or over hanging bank vegetation (DEE 2018).

Within the project footprint, the species has the potential to occur within the Lachlan River and Adjungbilly Creek. Potential impacts to the species are considered in Section 13.7.3.

Murray Crayfish (*Euastacus armatus*)

The majority of the Murray Crayfish (Euastacus armatus) population occurs in NSW, but the species is also found in the ACT, Victoria and South Australia. The species occurs in lotic waters in the southern Murray Darling Basin, including the Murray and Murrumbidgee catchments below approximately 700 metres above sea level, although the natural range may also include the headwaters of the Macquarie and Lachlan catchments (Fisheries Scientific Committee 2013). The Murray Crayfish may occur within the Murrumbidgee catchment, with indicative distribution mapping including 10 streams within the project footprint, as identified in Table 10-1. The species may occupy a range of habitats from pasturelands to sclerophyll forest with cool, well oxygenated flowing water (DPI 2019) and could occur within the project footprint. Potential impacts to the species are considered in Section 13.7.3.

Flatheaded Galaxias (*Galaxias rostratus*)

The Flatheaded Galaxias (Galaxias rostratus) is restricted to the southern Murray-Darling Basin (Lintermans 2007), although the species once occurred in the middle reaches of the Lachlan, Murrumbidgee and Murray River catchments in New South Wales (Threatened Species Scientific Committee 2016, DAWE 2022a). The last Flatheaded Galaxias record in the Murrumbidgee River was in 1971 and the Fisheries Scientific Committee (2008a) suggest the species may be locally extinct from Murrumbidgee and Lachlan rivers. This is contrary to the indicative habitat mapping (DPI 2022a) which includes large sections of these major waterways and associated stream networks.

The species occurs in still and gently flowing small streams, lakes, lagoons, billabongs and backwaters with coarse sand or muddy substrate and aquatic vegetation (DPI 2014). On the basis of these factors, it is considered unlikely to occur within the project footprint, however a precautionary approach has been adopted and potential impacts to the species are considered in Section 13.7.3.

Trout Cod (*Maccullochella macquariensis*)

The only known naturally reproducing (non-translocated) population of Trout Cod (Maccullochella macquariensis) occurs in the Murray River below Yarrawonga Weir (DPI 2006). Stocking has occurred at various locations within the Murrumbidgee River with some success. Stocking attempts however within the

Tumut River have been unsuccessful or at least undetermined (Lintermans 2007, Trout Cod Recovery Team 2008).

The species occurs in a variety of flowing habitats, typically in the mid to upper reaches of rivers and streams with cover in the form of woody debris or boulders (Trout Cod Recovery Team 2008). Habitats for the species require substantial amounts of large in-stream woody debris, which provides complex habitats supporting each life-cycle stage of the species (DPI 2017). Potential impacts to the species are considered in Section 13.7.3.

Silver Perch (*Bidyanus bidyanus*)

Silver perch (Bidyanus bidyanus) are endemic to the Murray-Darling system (including all states and sub-basins) and previously occurred in a range of habitats. Silver Perch are generally found in lowland areas outside of cooler upstream waters, although the species may undertake large scale migrations into upstream reaches. Indicative distribution mapping for the species within the project footprint includes the Murrumbidgee River (DPI 2016c, 2022a), although currently there is only one known strong viable natural population in the middle Murray region (Threatened Species Scientific Committee, 2013). Silver Perch are generally found in faster flowing streams, including rapid habitats, and in more open water habitats. However, the species has also been stocked into impoundments. The species has the potential to occur in major streams within the project footprint. Potential impacts to the species are considered in Section 13.7.3.

10.2.2 Threatened aquatic communities

Aquatic ecological community in the natural drainage system of the Lower Murray River Catchment

The lower Murray River aquatic ecological community (Aquatic ecological community in the natural drainage system of the Lower Murray River Catchment) includes the Murrumbidgee River below Burrinjuck Dam and the Tumut River below Blowering Dam (Figure 10-1 Attachment 1), while the Lachlan River and its tributaries are excluded from the aquatic ecological community. The lower Murray aquatic ecological community includes all native fish and aquatic invertebrates within all natural creeks, rivers and associated lagoons, billabongs and lakes of the regulated portions of the Murray, Murrumbidgee and Tumut rivers, as well as all their tributaries and branches (DPI 2007). Potential impacts to the TEC are considered in Section13.7.3.

10.2.3 Threatened aquatic species and communities not considered

Murray Cod (*Maccullochella peelii*)

Murray Cod (Maccullochella peelii) has the potential to occur within the project footprint in larger streams, particularly the Murrumbidgee River. However, any population present within these stream intersecting with the project footprint would not constitute part of any important population identified in the recovery plan for the species (National Murray Cod Recovery Team 2010). The closest important population occurs in the Murrumbidgee River between Wagga Wagga and Hay. The upstream extent of this important population (Wagga Wagga) is over 200 kilometres downstream of the project footprint. Furthermore, the waterways intersecting with the project footprint are not located at the limit of the species range and it is considered unlikely that any population that may occur within the project footprint would represent a key source population for breeding or necessary for maintaining the genetic diversity of the species. As such, no important populations would be impacted by the project and as the species is not listed under the FM Act, the species is not considered further. Despite this, it is noted that the avoidance and mitigation measures presented within this BDAR would apply to any individuals not part of the important population that may occur within the project footprint.

Eel-Tailed Catfish (*Tandanus Tandanus*)

SEARs advice provided by DPI (2022b) identified the Eel-Tailed Catfish (Tandanus Tandanus) as potentially occurring within the project footprint. The Eel-Tailed Catfish is not listed under the EPBC Act but is part of an Endangered Population within the Murray-Darling Basin listed under the FM Act. It is considered that there is an overall low likelihood of this species occurring within the project footprint, as the project footprint does not intersect with any indicative distribution mapping for the Endangered Population published by DPI (2022a) and the species is now virtually absent from the Murrumbidgee catchment (DPI N.D.). In addition to this, there are a lack of identified post-1980 records by Lintermans (2007) in proximity to the project footprint and it seems the species was always relatively uncommon upstream of Wagga Wagga on the Murrumbidgee River, even prior to the significant decline of local populations post-1970s (Fisheries Scientific Committee, 2008b). In consideration of these factors, the species is considered unlikely to occur within the project area and is not considered further within this BDAR.

Endangered ecological community of the Lachlan River

SEARs advice provided by DPI (2022b) identified the project footprint as including the Lachlan River EEC (Aquatic ecological community in the natural drainage system of the lowland catchment of the Lachlan River). However, an inspection of coarse distribution mapping published by DPI (2006) does not indicate any areas of this community that fall within the project footprint.

Furthermore, the project footprint does not intersect with any natural rivers, creeks, streams and associated lagoons, billabongs, lakes, wetlands, paleochannels, flood runners, effluent streams and the floodplains of the Lachlan River within the State of New South Wales that are considered part of the Endangered Ecological Community according to the Final Recommendation (Fisheries Scientific Committee N.D.). In consideration of these factors, the Lachlan River EEC is not considered further within this BDAR.

10.3 Access track and Key Fish Habitat assessment

The objective of this section is to address the existing condition and potential for impacts to mapped KFHs or indicative threatened species distributions (DPI 2022a) within the project footprint as a result of waterway crossings associated with access tracks.

The proposed construction methodology for the transmission line structures themselves avoid direct impacts to streams and waterways, discussed further in Section13.5.5. Importantly, this includes the major waterways and majority of streams included in KFH mapping within the project footprint. The maximum impact to aquatic environments likely to occur at any of the waterways relevant to transmission lines would be the removal or trimming of tree canopy on waterway banks to facilitate the construction and operation of the transmission lines spanning riparian areas, as necessary. Tree trunk bases and understorey species would be retained in-situ adjoining the waterway banks, with riparian areas retaining their current function. The construction of waterway crossings to support access for the project has been identified as the primary pathway of potential impact to aquatic habitats as this would result in the direct disturbance to aquatic ecosystems.

A total of 1,262 streams were identified as occurring within the project footprint, with 301 of these streams intersecting with indicative access track locations across waterways. Of these, 212 are first order and 65 are second order streams, combining to total 92 per cent of streams intersecting with indicative access track locations. This reflects the dominance of smaller streams within the project footprint. First and second order streams on gaining stream networks, as well as farm dams on first and second order streams or unmapped gullies are not considered KFH unless they support habitat of a threatened aquatic species (Fairfull 2013).

These streams that are intersected by indicative access track locations are reflective of the findings described in the previous Section (10.2.1), with the majority of these streams being in poor condition as a result of land clearing, online dam construction, clearing, grazing and cropping, as well as existing informal access track and waterway crossing construction. The existing impacts have resulted in deleterious processes such as bank erosion and channel incision and contribute to an overall picture of degraded aquatic habitats within the project footprint. Only indicative access tracks that occur within areas of mapped KFH, or indicative distribution mapping for threatened aquatic species (DPI 2022a), are considered further in detail in this section.

A total of 31 indicative access track crossings intersect with 26 streams that are mapped as KFH or indicative distribution mapping for threatened aquatic species (DPI 2022a), which are most likely to present higher ecological values, higher stream orders and more permanent water (as described in Section 4.8.3). This represents 9 per cent of all indicative access track locations that may require waterway crossings. A detailed desktop assessment of aquatic ecological conditions at these 31 indicative access track crossing locations is detailed in Table 10-2. Also included in Table 10-2 are an additional 14 desktop aquatic assessment sites considered as part of previous access track alignments that are no longer proposed, but aid in the comprehensiveness of the assessment and support the overall coverage of the aquatic assessment across the project footprint.

The majority of these 31 indicative access track crossings intersect with third order streams (ranging from first to sixth order), predominantly with a CLASS of two or three (moderate or minimal KFH respectively). Two streams have been assessed as aligning with the CLASS one criteria (major KFH), Derringullen Creek and Gilmore Creek. The remaining streams have been assessed as CLASS 3 or 4 streams (minimal and unlikely KFH respectively). The following CLASS descriptions have been applied, following Fairfull (2013):

- CLASS 1: Major Key Fish Habitat - Marine or estuarine waterway or permanently flowing or flooded freshwater waterway (eg river or major creek), habitat of a threatened or protected fish species or 'critical habitat'.
- CLASS 2: Moderate Key Fish Habitat - Non-permanently flowing (intermittent) stream, creek or waterway (generally named) with clearly defined bed and banks with semi-permanent to permanent waters in pools or in connected wetland areas. Freshwater aquatic vegetation is present. TYPE 1 and 2 habitats present.
- CLASS 3: Minimal Key Fish Habitat - Named or unnamed waterway with intermittent flow and sporadic refuge, breeding or feeding areas for aquatic fauna (eg fish, yabbies). Semi-permanent pools form within the waterway or adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or other CLASS 1-3 fish habitats.
- CLASS 4: Unlikely Key Fish Habitat - Waterway (generally unnamed) with intermittent flow following rain events only, little or no defined drainage channel, little or no flow or free standing water or pools post rain events (eg dry gullies or shallow floodplain depressions with no aquatic flora present).

These 26 streams subject to indicative access track crossings are typically degraded and in a relatively poor condition. Only three of these streams have received freshwater fish community grades, with each of these described as "Very Poor". Access track waterway crossings are likely to be constructed across two major streams, Derringullen Creek (V9-14) and Gilmore Creek (V9-28), stream orders of five and six respectively (Table 10-2, Figure 10-1 Attachment 1). Both major streams have been assigned "Very Poor" freshwater fish community grades (DPI 2022a).

Yellow Creek (V9-13) and an unnamed stream (V9-12) have been included in indicative distribution mapping for the Southern Pygmy Perch (DPI 2022a), identified in Table 10-2 and Figure 10-1 (Attachment 1). Neither have been assigned Freshwater Fish Community Status grades. Numerous informal access tracks and existing crossings are evident at these locations. Yellow Creek has been assessed as being a CLASS 2 stream and the unnamed stream as a CLASS 3 stream. Yellow Creek is described as poor condition, with channelisation, knickpoints and significant bank erosion apparent. Instream aquatic macrophytes appear to be absent at the field investigation site along Yellow Creek. The unnamed stream is a highly modified chain of online farm dams that are not connected by surface flow under normal conditions. This poor condition description is supported by field observations at Yellow Creek which include landscape clearing and grazing, channel incision and erosion. While it is possible the species may occur at these locations, in light of the above factors, and the fact that the crossing location is outside the known restricted range of the species (Section 10.2.1), habitats within the sections of these streams are not considered to be important to the species. It is anticipated that any constructed crossings associated with the project would be more sensitive than existing informal crossings and would not result in any additional deleterious processes.

Derringullen Creek (V9-14) is a major stream that flows into the Yass River and has been assessed as a CLASS 1 stream given the inferred permanence of stream flow at this location (Table 10-2). Derringullen Creek has not been included in any freshwater threatened species indicative distribution mapping. The stream appears to be perennial and presents a relative diversity of aquatic habitats for non-threatened fish species generally but is graded as having a "Very Poor" freshwater fish community status. Additionally, the surrounding landforms are highly modified with numerous access tracks occurring adjacent to Derringullen Creek.

Gilmore Creek (V9-28), a major stream that eventually flows into the Tumut River, has been assessed as a CLASS 1 stream due to the level of permanent flow observed. The desktop review indicates a variety of habitats are present, although Gilmore Creek has been assigned a “Very Poor” freshwater fish community status. An existing access track is present at the proposed indicative crossing location.

The desktop assessment of these 31 KFH and indicative access track crossing points (Figure 10-1 Attachment 1) was augmented by information gathered opportunistically during field investigation at eight of these sites, where access to Niche field teams was available. Where relevant, field inspections that have taken place in proximity to indicative access track crossing locations (eg a stream immediately downstream) have also been used to inform habitat assessments and provide context in terms of downstream receiving waters that may be impacted, identified in the photo captions Table 10-2.

Table 10-2: Key Fish Habitat and indicative access track crossing points

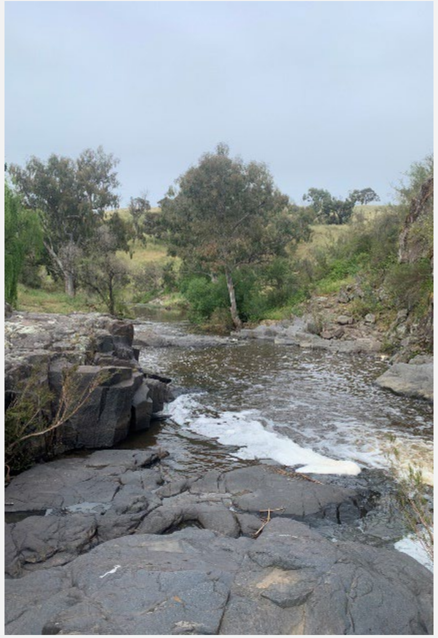
No.	Stream name	Stream order	DPI indicative threatened species distribution	DPI fish community status	Catchment / IBRA subregion	Waterway CLASS, habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Site photograph
Desktop aquatic assessment sites (v9)								
V9-1	Connors Creek	4	N/A	N/A	Hawkesbury -Nepean / Bungonia	<u>Connors Creek:</u> Connors Creek is located within a section of intact bushland. Connors Creek is predominantly a small stream over a mixture of substrate types, featuring occasional deeper pools. Connors Creek is largely unimpacted, apart from some grazing, although the landscape upstream and downstream of the project footprint has been cleared and grazed. The stream appears to be permanent and is assessed as a **CLASS 2 - Moderate KFH** (desktop assessment) stream.	-34.4272, 149.9669	
V9-2							-34.4274, 149.9649	
V9-3	Unnamed waterway	1	N/A	N/A	Hawkesbury -Nepean / Bungonia	<u>Unnamed Stream:</u> The unnamed stream is approximately 280 m in length. The stream appears to be ephemeral and is assessed as a **CLASS 4 - Unlikely KFH** (desktop assessment) stream, flowing over a steep gradient into Connors Creek.	-34.4277, 149.9665	No field investigation.

No.	Stream name	Stream order	DPI indicative threatened species distribution	DPI fish community status	Catchment / IBRA subregion	Waterway CLASS, habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Site photograph
V9-4	Unnamed waterway	3	N/A	N/A	Hawkesbury -Nepean / Bungonia	Unnamed Stream: The unnamed stream is part of a network of smaller tributaries that join and flow into Connors Creek. The stream occurs within a section of relatively intact bushland with a continuous riparian zone. The stream is assessed as a **CLASS 2 Moderate KFH** (desktop assessment) stream. Connors Creek: The unnamed stream flows over a short distance over a high gradient slope into Connors Creek (within the project footprint).	-34.4275, 149.9663	 **Connors Creek**
V9-5	Unnamed waterway	3	N/A	N/A	Hawkesbury -Nepean / Bungonia	The unnamed stream flows over approximately 1.1 km into Connors Creek outside the project footprint. The stream flows through a section of relatively intact bushland with some clearing of riparian vegetation present. Farm dams and existing crossings are present along its course and tributaries. The stream appears to be intermittent and is assessed as a **CLASS 2 - Moderate KFH** (desktop assessment) stream.	-34.4284, 149.9551	No field investigation.
V9-6							-34.4285, 149.9548	
V9-7							-34.4285, 149.9548	

No.	Stream name	Stream order	DPI indicative threatened species distribution	DPI fish community status	Catchment / IBRA subregion	Waterway CLASS, habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Site photograph
V9-8	Unnamed waterway	3	N/A	N/A	Hawkesbury -Nepean / Crookwell	The unnamed stream flows through cleared pasture. The stream is perennial with deeper pool sections separated by shallower section characterised by dense macrophytes occurring within the low flow channel and banks. Upstream field assessment recorded emergent macrophytes, with the channel dominated by fine sediment and evidence of grazing. Bank erosion is evident throughout the channel zone and stream extent. Tributaries of the stream are variable in condition, with some entering from relatively intact areas of bushland to those characterised by entirely modified landscapes and major channel erosion evident. The unnamed stream at the proposed indicative access track crossing is assessed as a **CLASS 2 Moderate KFH** stream.	-34.5031, 149.8047	
V9-9							-34.5038, 149.8012	
V9-10	Unnamed waterway	4	N/A	N/A	Hawkesbury -Nepean / Crookwell	The stream appears to be perennial with sections of deeper pools separated by shallower reaches. Bank erosion is evident throughout the channel zone and associated tributaries and the riparian zone is highly diminished. The unnamed stream at the proposed indicative access track crossing is assessed as a **CLASS 2 Moderate KFH** stream.	-34.5173, 149.7569	No field investigation.

No.	Stream name	Stream order	DPI indicative threatened species distribution	DPI fish community status	Catchment / IBRA subregion	Waterway CLASS, habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Site photograph
V9-11	Unnamed waterway	4	N/A	N/A	Hawkesbury-Nepean / Crookwell	The unnamed stream flows through cleared pasture. Upstream sections show a broad and densely vegetated channel zone fed by a network of tributaries that are subject to significant channel erosion. Riparian vegetation is restricted to occasional remnant stands but is largely absent. The water is discoloured in sections, but the presence of cobbles and overhanging bank vegetation present some habitat features, along with organic debris. The unnamed stream at the proposed indicative access track crossing is assessed as a **CLASS 2 Moderate KFH** stream.	-34.5416, 149.6779	
V9-12	Unnamed waterway	1	Southern Pygmy Perch	N/A	Lachlan / Crookwell	This mapped unnamed stream at the indicative access track location is highly modified, lacking channel definition or obvious flow, formed instead by a chain of online dams within a highly modified agricultural landscape. The indicative crossing location is situated at the most upstream extent of the mapped stream. The unnamed stream at the proposed indicative access track crossing is assessed as a **CLASS 3 Minimal KFH** stream. While mapped as part of the Southern Pygmy Perch indicative threatened species distribution, no freshwater fish community status classification is available. Informal farm tracks are evident at this location which runs adjacent to the mapped stream. The landscape has been modified for agriculture, although stands of remnant	-34.6291, 149.4027	No field investigation

No.	Stream name	Stream order	DPI indicative threatened species distribution	DPI fish community status	Catchment / IBRA subregion	Waterway CLASS, habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Site photograph
						canopy vegetation are scattered across the stream extent. The downstream Humes Creek appears to present variable conditions and habitats, eventually flowing into the Lachlan River. Humes Creek is included in a small section of Southern Pygmy Perch indicative distribution mapping, which is also assigned a "Very Poor" freshwater fish community status.		
V9-13	Yellow Creek	3	Southern Pygmy Perch	N/A	Murrumbidgee / Murrumbateman	This section of Yellow Creek appears to flow intermittently within a channelised stream with significant bank erosion apparent, in addition to a knickpoint downstream. No freshwater fish community status classification is available. Semi-continuous riparian vegetation occurs in thin bands along sections but is absent in others. Cleared land persists along both banks with minor fringing aquatic vegetation present. Numerous informal existing crossings are evident. The upstream stream network is similar in condition, with some online and offline dams present within the landscape. The upstream stream network does not extend into Bango Nature Reserve. Agricultural land use dominates the surrounding landscape. Yellow Creek at the proposed indicative access track crossing is assessed as a **CLASS 2 Moderate KFH** stream.	-34.7692, 148.9907	

No.	Stream name	Stream order	DPI indicative threatened species distribution	DPI fish community status	Catchment / IBRA subregion	Waterway CLASS, habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Site photograph
V9-14	Derringullen Creek	5	N/A	Very poor	Murrumbidgee / Murrumbateman	The indicative access track crossing location is located adjacent to an existing access track along the banks of Derringullen Creek. The stream is characterised by bedrock control with some boulders present. Water clarity was described as turbid at the field assessment location. A limited riparian zone occurs along the immediate banks of the stream formed by the regular occurrence of native overstorey species and fringing macrophytes. Scattered Willows *Salix* sp. are also present along Derringullen Creek. The wider landscape is cleared and grazed, with similar conditions in the Yass River into which Derringullen Creek flows, downstream of the project footprint. Derringullen Creek is assessed as a **CLASS 1 Major KFH** stream given the inferred permanence of stream flow at this location.	-34.8306, 148.8104	
V9-15	Woolgarlo Creek	3	N/A	N/A	Murrumbidgee / Murrumbateman	Woolgarlo Creek flows through modified pasture adjacent to an existing access track. Nearby field investigation results indicate Woolgarlo Creek is an unshaded gravel bed dominated stream with clear surface water conditions, with both fringing and emergent macrophytes recorded with some bank undercutting. Overstory riparian vegetation was found to be largely absent, with some bank erosion evident.	-34.8682, 148.7218	

No.	Stream name	Stream order	DPI indicative threatened species distribution	DPI fish community status	Catchment / IBRA subregion	Waterway CLASS, habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Site photograph
V9-16						The surrounding landscape is dominated by agriculture. Woolgarlo Creek at the proposed indicative access track crossing is assessed as a **CLASS 2 Moderate KFH** stream.	-34.8682, 148.7220	
V9-17	Cart Road Creek	4	N/A	N/A	Murrumbidgee / Inland Slopes	Cart Road Creek is a fourth order stream that appears to hold perennial pools with diminished semi-continuous riparian canopy species. The surrounding landscape has been heavily modified for agriculture with informal access tracks, dams and bank erosion evident. Cart Road Creek at the proposed indicative access track crossing is assessed as a **CLASS 2 Moderate KFH** stream.	-34.9876, 148.3978	No field assessment
V9-18	Unnamed waterway	3	N/A	N/A	Murrumbidgee / Inland Slopes	The unnamed stream flows over a short distance over a relatively steep cleared landscape into Killimicat Creek, which is classed as having a “Very Poor” freshwater fish community status. The unnamed stream appears to be small, formed by short pool sections amongst rocky habitat. The surrounding landscape is dominated by	-35.2168, 148.2630	No field investigation.

No.	Stream name	Stream order	DPI indicative threatened species distribution	DPI fish community status	Catchment / IBRA subregion	Waterway CLASS, habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Site photograph
						agriculture. The unnamed stream at the proposed indicative access track crossing is assessed as a **CLASS 2 Moderate KFH stream**.		
V9-19	Unnamed waterway	3	N/A	N/A	Murrumbidgee / Inland Slopes	The unnamed stream is downstream of an online dam and appears to be discontinuous at the proposed indicative crossing location. The broader landscape is highly modified by agriculture with the riparian zone severely diminished and downstream bank erosion evident. As the stream appears to be intermittent and is highly modified, it is assessed as a **CLASS 3 Minimal KFH** stream	-35.2195, 148.2784	No field investigation.
V9-20	Unnamed waterway	3	N/A	N/A	Murrumbidgee / Inland Slopes	The unnamed stream flows through cleared landscape into Killimicat Creek, which is classed as having a “Very Poor” freshwater fish community status. The unnamed stream is intermittent, with water held in bedrock pools along relatively high gradient slopes, with minor fringing and floating macrophytes. The surrounding landscape is dominated by agriculture with riparian vegetation absent. The unnamed stream at the proposed indicative access track crossing is assessed as a **CLASS 2 Moderate KFH** stream.	-35.2200, 148.2701	
V9-21	Unnamed waterway	3	N/A	N/A	Murrumbidgee / Inland Slopes	The unnamed stream is located between a series of online dams amongst severely modified agricultural lands. The unnamed stream appears to be intermittent, although macrophytes appear to occur within the channel zone. The surrounding landscape is dominated by agriculture with overstorey riparian vegetation absent. The unnamed stream at the proposed indicative	-35.3077, 147.6041	No field investigation.

No.	Stream name	Stream order	DPI indicative threatened species distribution	DPI fish community status	Catchment / IBRA subregion	Waterway CLASS, habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Site photograph
						access track crossing is assessed as a **CLASS 2 Moderate KFH** stream.		
V9-22	Unnamed waterway	2	N/A	N/A	Murrumbidgee / Inland Slopes	The unnamed stream flows through cleared pasture and lacks riparian vegetation. A dam occurs immediately upstream of the indicative access track crossing location, one of a series of dams along this stream network. The stream appears to be intermittent and is assessed as a **CLASS 3 Minimal KFH** stream.	-35.3118, 147.6225	No field investigation.
V9-23	Unnamed waterway	3	N/A	N/A	Murrumbidgee / Inland Slopes	The unnamed stream flows through cleared pasture and lacks riparian vegetation. The proposed indicative crossing location is between two online dams, part of a series of dams along this stream network. The stream appears to be intermittent and is assessed as a **CLASS 3 Minimal KFH** stream.	-35.3220, 147.6683	No field investigation.
V9-24	Unnamed waterway	2	N/A	N/A	Murrumbidgee / Inland Slopes	The unnamed stream appears to be intermittent and is assessed as a **CLASS 3 Minimal KFH** stream, with its extent entirely cleared and grazed. An eroded and incised channel is evident, with a series of on-line dams interrupting connectivity.	-35.3212, 147.6644	No field investigation.
V9-25	Unnamed waterway	3	N/A	N/A	Murrumbidgee / Inland Slopes	The unnamed stream is assessed as a **CLASS 2 Moderate KFH** stream, with defined banks. Its extent is entirely cleared and grazed. A series of elongate pools are evident within an incised channel. Wilds Road crosses the unnamed stream upstream of the indicative access track location.	-35.3289, 147.6975	No field investigation.
V9-26	Unnamed waterway	3	N/A	N/A	Murrumbidgee / Inland Slopes	The unnamed stream is assessed as a **CLASS 2 Moderate KFH** stream, with defined banks. Its extent is largely cleared within the project area, although stands of riparian vegetation exist upstream and downstream. The landscape is highly modified with dams present within	-35.3775, 147.9836	No field investigation.

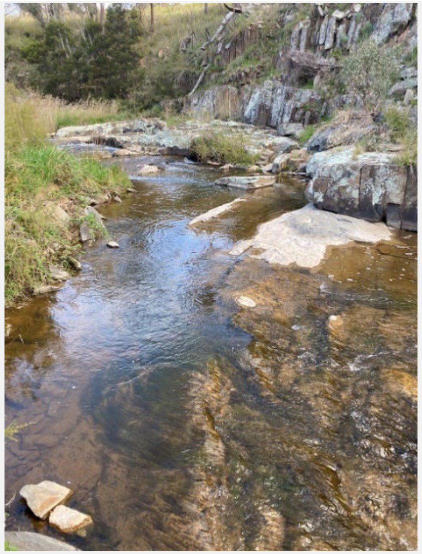
No.	Stream name	Stream order	DPI indicative threatened species distribution	DPI fish community status	Catchment / IBRA subregion	Waterway CLASS, habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Site photograph
						the landscape. There appears to be an existing informal crossing downstream.		
V9-27	Stony Creek	3	N/A	Very Poor	Murrumbidgee / Inland Slopes	Stony Creek is a bedrock dominated third order stream, assessed as a **CLASS 2 Moderate KFH** stream and has been assigned a "Very Poor" freshwater fish community status. Although the landscape is modified for agriculture, vegetation persists along the surrounding hillslope, with an existing access track present within this area of vegetation.	-35.4542, 148.1637	No field investigation.
V9-28	Gilmore Creek	6	N/A	Very Poor	Murrumbidgee / Bondo	Gilmore Creek is a bedrock dominated sixth order stream, assessed as a **CLASS 1 Major KFH** stream and has assigned a "Very Poor" freshwater fish community status. The landscape immediately surrounding the location has been cleared and modified for agriculture, although vegetation persists along the upstream extent of the waterway, particularly along the steeper gradients.	-35.4980, 148.1882	No field investigation.
V9-29	Unnamed waterway	2	N/A	N/A	Murrumbidgee / Inland Slopes	The unnamed stream flows through cleared pasture and lacks riparian vegetation. A dam occurs immediately upstream of the indicative access track crossing location, one of a series of dams along this stream network. The stream appears to be intermittent and is assessed as a **CLASS 3 Minimal KFH** stream.	-35.3258, 147.686	
V9-30	Big Sring Creek	4	N/A	N/A	Murrumbidgee / Inland Slopes	Big Sring Creek flows through modified paddocks, assessed as a **CLASS 2 Moderate KFH** stream. Its extent is largely cleared within the project footprint, although	-35.2629, 147.4697	No field investigation.

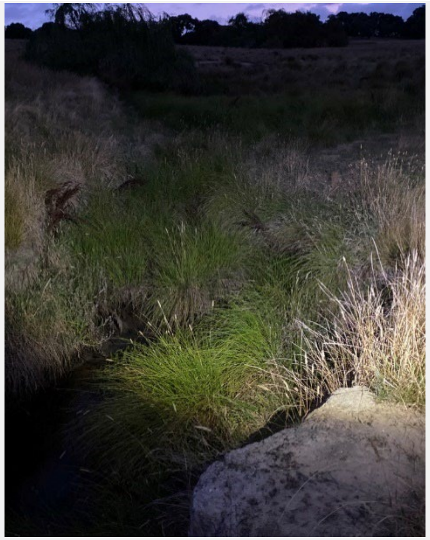
No.	Stream name	Stream order	DPI indicative threatened species distribution	DPI fish community status	Catchment / IBRA subregion	Waterway CLASS, habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Site photograph
						isolated stands of riparian vegetation exist upstream and downstream. The banks appear to be degraded and incised. The landscape is highly modified with dams present within the landscape. There appears to be several small existing informal crossings upstream and downstream.		
V9-31	Mudhole Creek	3	N/A	N/A	Murrumbidgee / Inland Slopes	Mudhole Creek flows through a steep gully, appearing to be bedrock or boulder dominated, and assessed as a **CLASS 2 Moderate KFH** stream. Within the project footprint, remnant riparian vegetation persists along the upstream extent, while downstream of the project footprint the landscape is cleared and modified, including surrounding Gilmore Creek, which Mudhole Creek flows into.	-35.4877, 148.1818	No field investigation.
Additional aquatic desktop assessment sites (no longer proposed crossing locations)								
A-1	Unnamed waterway	3	N/A	N/A	Hawkesbury-Nepean / Bungonia	The unnamed stream flows over approximately 1.1 km into Connors Creek outside the project footprint. The stream flows through a section of relatively intact bushland with some clearing of riparian vegetation present, with farm dams and existing crossings present along its course and tributaries. The stream appears to be intermittent and is assessed as a **CLASS 2 - Moderate KFH** (desktop assessment) stream.	-34.4275, 149.9563	No field investigation.
A-2	Unnamed waterway	1	N/A	Very Poor	Hawkesbury-Nepean / Crookwell	The indicative access track occurs at the confluence of the unnamed stream and larger Turrallo Creek that is crossed at this location by Black Arm Road. The stream appears to be ephemeral and is assessed as a **CLASS 4 Unlikely KFH** (desktop assessment) stream, with its extent entirely cleared and grazed and existing farm tracks crossing the stream. Turrallo Creek is also in very	-34.5309, 149.743	No field investigation.

No.	Stream name	Stream order	DPI indicative threatened species distribution	DPI fish community status	Catchment / IBRA subregion	Waterway CLASS, habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Site photograph
						poor condition, lacking riparian vegetation in the project footprint and major channel erosion evident.		
A-3	Unnamed waterway	2	N/A	N/A	Hawkesbury -Nepean / Crookwell	The indicative access track occurs near the confluence of the unnamed stream and larger Turrallo Creek. The stream appears to be intermittent and is assessed as a **CLASS 3 Minimal KFH** stream, with its extent entirely cleared and grazed and existing farm tracks crossing the stream. An eroded channel is evident. Turrallo Creek is also in very poor condition, lacking riparian vegetation in the project footprint and major channel erosion evident.	-34.529, 149.7442	No field investigation.
A-4	Unnamed waterway	1	N/A	N/A	Hawkesbury -Nepean / Crookwell	The indicative access track occurs near the confluence of the unnamed stream and larger Turrallo Creek. The stream appears to be intermittent and is assessed as a **CLASS 3 Minimal KFH** stream, with its extent entirely cleared and grazed and existing farm tracks crossing the stream. An eroded channel is evident. Turrallo Creek is also in very poor condition, lacking riparian vegetation in the project footprint and major channel erosion evident.	-34.5286, 149.7442	No field investigation.

No.	Stream name	Stream order	DPI indicative threatened species distribution	DPI fish community status	Catchment / IBRA subregion	Waterway CLASS, habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Site photograph
A-5	Unnamed waterway	1	N/A	N/A	Hawkesbury -Nepean / Crookwell	<u>Unnamed stream:</u> The unnamed stream flows over approximately 325 m into the larger Cowpers Creek. The stream appears to be intermittent and lacks riparian vegetation. The stream is assessed as a **CLASS 3 Minimal KFH** stream. <u>Cowpers Creek:</u> Cowpers Creek itself is a perennial stream flowing through cleared pasture, lacking riparian vegetation with some bank erosion evident.	-34.5019, 149.8144	 **Cowpers Creek**
A-6	Unnamed waterway	1	N/A	N/A	Hawkesbury -Nepean / Crookwell	The indicative access track occurs near the confluence of the unnamed stream and larger Turrallo Creek. The stream appears to be ephemeral and is assessed as a **CLASS 3 Minimal KFH** stream, with its extent entirely cleared and grazed and existing farm tracks crossing the stream. An eroded channel is evident although the stream appears to be intermittent. Turrallo Creek is also in very poor condition, lacking intact riparian vegetation in the project footprint and major channel erosion evident.	-34.526, 149.7442	No field investigation.
A-7	Unnamed waterway	2	N/A	N/A	Hawkesbury -Nepean	Within the project footprint the unnamed stream flows through cleared pasture, adjacent to stream No. 6. The stream appears to be intermittent with the channel zone	-34.5033, 149.8048	No field investigation.

No.	Stream name	Stream order	DPI indicative threatened species distribution	DPI fish community status	Catchment / IBRA subregion	Waterway CLASS, habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Site photograph
						evidenced by more lush vegetation indicating the presence of water and major channel erosion in more upstream sections. The unnamed stream is fed by a small network of minor tributaries flowing through cleared pasture. The unnamed stream at the indicative access track crossing is assessed as a **CLASS 3 Minimal KFH** stream.		
A-8	Unnamed waterway	2	N/A	N/A	Hawkesbury -Nepean / Crookwell	The indicative access track crossing is located just downstream of a dam. An existing access track runs across the base of the dam. The channel is highly incised with gullying evident along the microchannel banks. Limited riparian vegetation occurs within the microchannel with the landscape entirely cleared and grazed, with the unnamed stream interrupted by multiple farm dams before flowing into Pejar Dam. Due to the presence of the online dam's, the unnamed stream is intermittent and is assessed as a **CLASS 3 Minimal KFH** stream.	-34.5709, 149.5972	

No.	Stream name	Stream order	DPI indicative threatened species distribution	DPI fish community status	Catchment / IBRA subregion	Waterway CLASS, habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Site photograph
A-9	Unnamed waterway	1	N/A	N/A	Lachlan / Murrumbateman	Unnamed stream: The unnamed stream flows over approximately 837 m over a relatively steep gradient before entering the larger Merrill Creek. An existing informal access track appears to cross the stream at the indicative crossing location. The stream is assessed as a **CLASS 3 Minimal KFH** stream. Merrill Creek: Merrill Creek has been assigned a “Very Poor” fish community status condition but is included in the indicative distribution mapping for the Southern Pygmy Perch.	-34.6776, 149.2238	 **Merrill Creek**
A-10	Oolong Creek	4	Southern Pygmy Perch	Very Poor	Lachlan / Murrumbateman	An existing access track crossing occurs at the indicative crossing location. The landscape is cleared and grazed with riparian vegetation lacking and the channel incised with some bank erosion evident. The stream is perennial with some aquatic vegetation present. Water clarity was described as turbid. The stream is assessed as a **CLASS 2 Moderate KFH** waterway.	-34.6958, 149.1818	No photo available.

No.	Stream name	Stream order	DPI indicative threatened species distribution	DPI fish community status	Catchment / IBRA subregion	Waterway CLASS, habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Site photograph
A-11	Felled Timber Creek	3	N/A	N/A	Lachlan / Murrumbateman	Felled Timber Creek occurs within cleared pasture. Featuring a series of elongate pools separated by short sections of shallow or disconnected surface flows. Aquatic macrophytes occur within the channel zone that is dominated by fine sediment. Turbid conditions and bank erosion associated with grazing activity were observed. The stream is assessed as a **CLASS 2 Moderate KFH** stream.	-34.72, 149.1198	
A-12	Unnamed waterway	3	N/A	N/A	Murrumbidgee / Murrumbateman	The unnamed stream appears to be intermittent and is assessed as a **CLASS 3 Minimal KFH** stream, with its extent entirely cleared and grazed. An eroded and incised channel is evident, with a series of on-line dams interrupting connectivity. An existing informal crossing appears to be present at this location.	-34.8205, 148.8315	No field investigation.
A-14	Unnamed waterway	2	N/A	N/A	Murrumbidgee / Inland Slopes	The unnamed stream flows through cleared pasture and is generally lacking in riparian vegetation. A dam occurs immediately upstream of the indicative access track crossing location, one of a series of dams along this stream network. The stream appears to be intermittent and is assessed as a **CLASS 3 Minimal KFH** stream.	-35.2892, 147.5398	No field investigation.

No.	Stream name	Stream order	DPI indicative threatened species distribution	DPI fish community status	Catchment / IBRA subregion	Waterway CLASS, habitat features and condition factors (desktop assessment and / or field inspection)	Latitude and longitude	Site photograph
A-15	Unnamed waterway	2	N/A	N/A	Murrumbidgee / Inland Slopes	The unnamed stream flows through cleared pasture and is generally lacking in riparian vegetation. A dam occurs immediately downstream of the indicative access track crossing location, one of a series of dams along this stream network. The stream appears to be intermittent and is assessed as a **CLASS 3 Minimal KFH** stream.	-35.2904, 147.5484	No field investigation.

11 Matters of National Environmental Significance

This chapter addresses relevant MNES under the EPBC Act and supplementary SEARs requirements as detailed in Section 1.2.

A search of the EPBC Act PMST was undertaken on 27 April 2022 to inform potential MNES within 20 kilometres of the project footprint. A larger buffer radius (than the traditional 10 kilometre buffer) has been applied in this instance given the regional location of the project footprint to account for lower number of existing records. A likelihood of occurrence assessment was undertaken to identify EPBC Act listed threatened species and ecological communities with a likely presence within the project footprint. Attachment 16 documents the assessment criteria and results for all potential MNES. A summary of the assessment results is provided below.

An analysis of the impacts of the 2019-20 bushfires on relevant EPBC Act listed threatened species and communities is presented in Section 11.8. The assessment is intended to determine whether the remaining habitat within the project footprint is of substantially greater importance to the survival of listed threatened species following the fires and/ or whether the population of the species in the area is considered an important population. The outcomes of the assessment have been considered when determining appropriate avoidance, mitigation and offset measures for the project.

11.1 Ramsar wetlands

Ramsar wetlands are representative, rare or unique wetlands, or wetlands that are important for conserving biological diversity. A total of seven Ramsar wetlands were identified by the PMST search for the project footprint (refer to Table 11-1). All Ramsar wetlands listed are unlikely to be impacted as they are located at least 200 kilometres from the project footprint (as detailed in Table 11-1). As such they are not discussed further.

Table 11-1: Ramsar wetlands generated by the PSMT search for the locality

Name	Description	Distance from project footprint
Banrock Station Wetland Complex	This floodplain wetland is located on the Murray River floodplain immediately downstream of Kingston in South Australia. It comprises areas of freshwater and areas of secondary salinized floodplain with discrete wetland basins and channels.	600-700 km
Barmah Forest	The Barmah Forest Ramsar site is located on the Murray River floodplain in north Victoria. It is predominantly River Red Gum (*Eucalyptus camaldulensis*) forest and floodplain marshes.	200-300 km
Gunbower Forest	Gunbower Forest is one of a series of River Red Gum forests on the Murray River floodplain in northern Victoria. River red gums inhabit the low-lying, more frequently flooded areas whereas infrequently flooded areas support woodlands dominated by. Black Box (*Eucalyptus largiflorens*).	300-400 km
Hattah-kulkyne Lakes	The lakes are located in northern Victoria within the Murray-Darling Basin. The site contains 12 floodplain lakes, comprising of permanent freshwater lakes and seasonal intermittent freshwater lakes.	400-500 km
NSW Central Murray State forests	This site is located on the floodplain of the Murray River in south-central NSW, Australia. It is dominated by River Red Gum forest and woodland, wet grasslands and marshes as well as having significant areas of box woodland and sandhill communities.	200-300 km
Riverland	The Riverland is in South Australia, in the Murray-Darling Basin. The site covers two systems on the lower floodplain along 80 km of the river, the site	500-600 km

Name	Description	Distance from project footprint
	incorporates a series of creeks, channels, lagoons, billabongs, swamps and lakes.	
The Coorong, and Lakes Alexandrina and Albert Wetland	Are located at the downstream end of the Murray River, in south-east South Australia. The Coorong is a long, shallow, brackish to hypersaline lagoon. Lake Albert is a terminal lake connected to Lake Alexandrina by a narrow channel.	600-700 km

11.2 Threatened ecological communities

A total of six TECs were generated by the PMST search for the project footprint (Attachment 17). Section 6.5 of this BDAR provides results of the field investigation and determination of presence of EPBC Act TECs against key condition thresholds and diagnostic criteria.

Based on the results of the assessment, two EPBC Act listed TECs are known to occur within and/or adjacent to the project footprint:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland
- Alpine Sphagnum Bogs and Associated Fens.

TEC extent within the project footprint is shown in Figure 6-1 (Attachment 1). A total of 942.9 hectares of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland and 2.50 hectares of Alpine Sphagnum Bogs and Associated Fens has been mapped within the project footprint.

An assessment of project impacts to known and likely EPBC Act listed TECs is presented in Attachment 18 in accordance with the Commonwealth Significant Impact Guidelines 1.1: Matters of National Environmental Significance (DoE, 2013). The results of the assessment are presented in Section 13.8.1 of this BDAR.

11.3 Threatened flora

A total of 48 threatened flora were generated by the PMST search for the project footprint (Attachment 17). Each of the species from the PMST have been assessed in terms of their likelihood to occur within the project footprint (Attachment 16). Of these, 12 species were either recorded or considered to have a moderate or high likelihood of occurring within the project footprint. These are listed in Table 11-2. The five species recorded within and/ or immediately adjacent to the project footprint were:

- *Ammobium craspedioides* (Yass Daisy)
- *Leucochrysum albicans var. tricolor* (Hoary Sunray)
- *Prasophyllum bagoense* (Bago Leek Orchid)
- *Prasophyllum keltonii* (Kelton’s Leek Orchid)
- *Xerochrysum palustre* (Swamp Everlasting).

There were certain areas that could not be adequately surveyed due to project access and timing constraints (limitations outlined in Section 4.9). These areas have been identified as having potential to support habitat for eight additional EPBC Act listed threatened flora species (Table 11-2). The locations of threatened flora records are shown in Figure 7-1 (Attachment 1) and described further in Section 7.2.2. Candidate MNES threatened flora recorded or with potential to occur within the project footprint are summarised in Table 11-2.

An assessment of project impacts to these EPBC Act listed threatened flora is presented in Attachment 18 in accordance with the *Commonwealth Significant Impact Guidelines 1.1: Matters of National*

Environmental Significance (DoE, 2013). The results of the assessment are presented in Section 13.8.2 of this BDAR.

Note: The assessment outcomes shown in Table 11-2 below are subject to change following further consultation with the BCD.

Table 11-2: EPBC Act listed threatened flora species recorded or with the potential to occur within the project footprint

Scientific name	Common name	BC Act Status	EPBC Act Status	Associated PCTs	IBRA subregion	Assessment outcome
Acacia bynoeana	Bynoe's Wattle	E	V	PCT 1093	Bungonia	Assumed present
					Crookwell	Assumed present
Ammobium craspedioides	Yass Daisy	V	V	PCT 266, 268, 277, 283, 287, 290, 294, 343, 352, 727 and 1330	Bondo	Recorded- 2 individuals within PCT 299
					Crookwell	Recorded- 133 individuals within PCT 1093
					Inland Slopes	Assumed present
					Murrumbateman	Recorded- 6392 individuals within PCT 280
					Murrumbateman	Assumed present
Eucalyptus aggregata	Black Gum	V	V	PCT 679, 1191, 1256 and 1330	Crookwell	Assumed present
Kunzea cambagei	Cambage Kunea	V	V	PCT 1150	Bungonia	Assumed present
Leucochrysum albicans var. *tricolor*	Hoary Sunray	-	E	PCT 268, 349, 351, 352, 679, 727, 731, 952, 1093, 1097, 1191 and 1330	Crookwell	Recorded- 29,631 individuals within PCTs 952, 1330, 727, 1093, 280, 731, 679 and Non-native vegetation
					Murrumbateman	Recorded- 113,369 individuals within PCTs 280, 322, 1093, 1330 and Non-native vegetation
Pomaderris cotoneaster	Cotoneaster Pomaderris	E	E	PCT 1150	Bungonia	Assumed present
Prasophyllum bagoense	Bago Leek Orchid	CE	CE	PCT 1196 and 1224	Snowy Mountains	Recorded-39 individuals adjacent to the project footprint,

Scientific name	Common name	BC Act Status	EPBC Act Status	Associated PCTs	IBRA subregion	Assessment outcome
						within PCT 1224 and adjacent 953.
Prasophyllum innubum	Brandy Marys Leek-orchid	CE	CE	PCT 1221	Snowy Mountains	Assumed present
Prasophyllum keltonii	Kelton's Leek Orchid	CE	CE	PCT 1196	Snowy Mountains	Assumed present. Recorded adjacent to the project footprint.
Pterostylis oreophila	Blue-tongued Greenhood	CE	CE	PCT 939 and 9997 (waterbodies)	Snowy Mountains	Assumed present
					Inland Slopes	Assumed present
					Murrumbateman	Assumed present
Thesium australe	Austral Toadflax	V	V	PCT 679, 1191, 1196 and 1224	Snowy Mountains	Assumed present
Xerochrysum palustre	Swamp Everlasting	-	V	PCT 679 and 939	Snowy Mountains	Recorded- 6 individuals within PCT 953

* EPBC Act and BC Act conservation status: CE- Critically Endangered; E -Endangered; V- Vulnerable.

11.4 Threatened fauna

A total of 41 EPBC Act listed fauna were generated by the PMST search for the project footprint (Attachment 17). Each of the species from the PMST have been assessed in terms of their likelihood to occur within the project footprint (Attachment 16). Twenty-three species were determined to have a moderate, high, or known likelihood of occurring within the project footprint. Seven of these species were recorded within and/ or adjacent to the project footprint:

- Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Superb Parrot
- Greater Glider
- Yellow-bellied Glider
- Pink-tailed Legless Lizard
- Key's Matchstick Grasshopper.

Twelve EPBC Act listed species were generated by the BAM-C. Table 11-3 presents a summary of EPBC Act listed threatened fauna relevant to the assessment.

An assessment of project impacts to these species is presented in Attachment 18 in accordance with the Commonwealth Significant Impact Guidelines 1.1: Matters of National Environmental Significance (DoE, 2013). The results of the assessment are summarised in Section 13.8.3 of this BDAR.

Table 11-3: EPBC Act listed threatened fauna species recorded or with the potential to occur within the project footprint

Scientific name	Common name	BC Act Status*	EPBC Act Status*	IBRA subregion	Assessment outcome
Frogs					
Crinia sloanei	Sloane's Froglet	V	E	Inland Slopes	Assumed present
Litoria booroolongensis	Booroolong Frog	E	E	Bondo	Assumed present
				Crookwell	Assumed present
				Inland Slopes	Assumed present
Litoria castanea	Yellow-spotted Tree Frog	CE	E	Crookwell	Assumed present
				Murrumbateman	Assumed present
				Snowy Mountains	Assumed present
Birds					
Anthochaera phrygia	Regent Honeyeater	CE	CE	Inland Slopes	Assumed present
				Bungonia	Assumed present
				Crookwell	Assumed present
				Murrumbateman	Assumed present
				Murrumbateman	Assumed present
Callocephalon fimbriatum	Gang-gang Cockatoo	V	E	Bondo	Recorded- 13 individuals within PCT 295, 299, 300 and 953
				Bungonia	Recorded- 10 individuals within PCT 1150 and 1330
				Crookwell	Recorded- 5 individuals within PCT 679, 727 and 731
				Inland Slopes	Recorded- 13 individuals within PCT 268, 277 and 280
				Murrumbateman	Recorded - 14 individuals within PCT 1330 and 349
				Snowy Mountains	Recorded- 42 individuals within PCT 300, 679, 953 and 1196
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	V	Bungonia	Recorded- 2 individuals within PCT 1150
				Crookwell	Assumed present
				Inland Slopes	Assumed present
				Murrumbateman	Assumed present
Grantiella picta	Painted Honeyeater	V	V	Inland Slopes	Assumed present
			V	Bondo	Assumed present

Scientific name	Common name	BC Act Status*	EPBC Act Status*	IBRA subregion	Assessment outcome
Hirundapus caudacutus	White-throated Needletail			Bungonia	Assumed present
				Crookwell	Assumed present
				Inland Slopes	Assumed present
				Murrumbateman	Assumed present
				Snowy Mountains	Assumed present
Lathamus discolor	Swift Parrot	E	CE	Bungonia	Assumed present
				Murrumbateman	Assumed present
				Inland Slopes	Assumed present
Polytelis swainsonii	Superb Parrot	V	V	Crookwell	Assumed present
				Inland Slopes	Recorded- 5 individuals within PCT 343 and 277
				Murrumbateman	Recorded- 5 invididuals within PCT 1330 and Non-native
				Murrumbateman	Assumed present
				Inland Slopes	Assumed present
Pycnoptilus floccosus	Pilotbird	-	V	Bondo	Assumed present
				Inland Slopes	Assumed present
				Snowy Mountains	Assumed present
Insects					
Keyacris scurra	Key's Matchstick Grasshopper	E	E	Bungonia	Assumed present
				Crookwell	Assumed present
				Inland Slopes	Assumed present
				Murrumbateman	Recorded- 4 individuals within PCT 280
Synemon plana	Golden Sun Moth	V	V	Inland Slopes	Expert report
				Murrumbateman	Expert report
Mammals					
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Bungonia	Assumed present
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Bondo	Assumed present
				Bungonia	Assumed present
				Crookwell	Assumed present
				Inland Slopes	Assumed present
				Murrumbateman	Assumed present
				Snowy Mountains	Assumed present
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Bungonia	Assumed present
				Crookwell	Assumed present
				Inland Slopes	Assumed present
				Murrumbateman	Assumed present

Scientific name	Common name	BC Act Status*	EPBC Act Status*	IBRA subregion	Assessment outcome
Petauroides volans	Greater Glider	-	V	Bondo	Recorded- 3 individuals within PCT 300
				Bungonia	Recorded - 2 individuals within PCT 1150 and 1107
				Crookwell	Assumed present
				Inland Slopes	Assumed present
				Murrumbateman	Assumed present
				Snowy Mountains	Recorded- 4 individuals within PCT 638 and 953
Petaurus australis	Yellow-bellied Glider	EP	V	Bondo	Recorded
				Bungonia	Assumed present
				Inland slopes	Recorded
				Snowy Mountains	Recorded
Phascolarctos cinereus	Koala	E	E	Bondo	Assumed present
				Bungonia	Assumed present
				Crookwell	Assumed present
				Inland Slopes	Assumed present
				Murrumbateman	Assumed present
				Snowy Mountains	Assumed present
Mastacomys fuscus	Broad-toothed Rat	V	V	Snowy Mountains	Assumed present
Pseudomys fumeus	Smoky Mouse	CE	E	Bondo	Assumed present
				Snowy Mountains	Assumed present
Reptiles					
Aprasia parapulchella	Pink-tailed Legless Lizard	V	V	Bondo	Assumed present
				Bungonia	Assumed present
				Crookwell	Assumed present
				Inland Slopes	Assumed present
				Murrumbateman	Recorded- 5 individuals within PCT 1330
Delma impar	Striped Legless Lizard	V	V	Bungonia	Assumed present
				Crookwell	Assumed present
				Inland Slopes	Assumed present
				Murrumbateman	Assumed present

* EPBC Act and BC Act conservation status: CE- Critically Endangered; E -Endangered; V- Vulnerable.

11.5 Threatened aquatic species

Six EPBC Act listed threatened aquatic species were identified as having the potential to occur within the project footprint (Table 11-4). Assessments of Significance under the EPBC Act (Attachment 18) were completed for all species except the Murray Cod, as summarised in Table 11-4.

The Murray Cod has the potential to occur within the project footprint in larger streams, however any population present within the project footprint would not constitute part of an important population (as discussed in Section 10.2.3). As no important populations would be impacted by the project the species has not been subject to a formal assessment and is not considered further.

The other five potentially occurring aquatic species above have been assessed further due to the presence of potential habitat within the project footprint in Section 13.7.3.

Table 11-4: EPBC Act threatened aquatic species with the potential to occur within the project footprint

Scientific name	Common name	BC Act*	EPBC Act*	Source	Presence/absence	Further assessment required
Macquaria australasica	Macquarie Perch	E	E	PMST	Assumed present Considered to have a moderate likelihood of occurrence within the Lachlan River and Adjungbilly Creek within the project footprint as per indicative distribution mapping by DPI (DPI 2022a).	Yes
Nannoperca australis	Southern Pygmy Perch	E	V	PMST	Assumed present Despite indicative distribution mapping by DPI (2022a) suggesting this species may occur in the Upper Lachlan and Murray River catchments, its known distribution is restricted to three waterways outside of the impact footprint. The species has been assumed present on a precautionary basis.	Yes
Galaxias rostratus	Flatheaded Galaxias	CE	CE	PMST	Assumed present Despite indicative distribution mapping by DPI suggesting this species may occur in the Murrumbidgee and Lachlan rivers, the last record here was obtained in 1971, is therefore considered unlikely to occur. The species has been assumed present on a precautionary basis.	Yes
Maccullochella macquariensis	Trout Cod	E	E	PMST	Assumed present Trout Cod has the potential to occur within the project footprint in larger streams, particularly the Murrumbidgee River, where stocking has occurred with some success.	Yes
Bidyanus bidyanus	Silver Perch	V	CE	PMST	Assumed present Silver Perch has the potential to occur within the project footprint in larger streams, particularly the Murrumbidgee River.	Yes
Maccullochella peelii	Murray Cod	-	V	BAM-C, BioNet, PMST	Assumed present Murray Cod has the potential to occur within the project footprint in larger streams, particularly the	No

Scientific name	Common name	BC Act*	EPBC Act*	Source	Presence/absence	Further assessment required
					Murrumbidgee River, however these would not constitute any important populations identified in the recovery plan for the species (National Murray Cod Recovery Team 2010).	

* EPBC Act and BC Act conservation status: CE- Critically Endangered; E -Endangered; V- Vulnerable.

11.6 Migratory species

Species that migrate to Australia or pass through Australian waters during their annual migrations are listed as migratory under the EPBC Act. This includes species listed under the following international conventions: Bonn Convention, CAMBA, JAMBA, ROKAMBA and ACAP.

Three migratory species were recorded as a part of field surveys undertaken for the project: Fork-tailed Swift (*Apus pacificus*), Rufous Fantail (*Rhipidura rufifrons*) and Satin Flycatcher (*Myiagra cyanoleuca*) (Table 11-5).

Six additional listed migratory species have previously been recorded (BioNet, 2022) from the locality and are considered likely to fly over or forage within the project footprint:

- Sharp-tailed Sandpiper (*Calidris acuminata*)
- Red-necked Stint (*Calidris ruficollis*)
- Latham's Snipe (*Gallinago hardwickii*)
- White-throated Needletail (*Hirundapus caudacutus*).
- Common Greenshank (*Tringa nebularia*)
- Marsh Sandpiper (*Tringa stagnatilis*).

A total of ten EPBC Act listed migratory species are considered relevant to the assessment (Table 11-5). An assessment of project impacts to these listed migratory species is presented in Attachment 18 in accordance with the *Commonwealth Significant Impact Guidelines 1.1: Matters of National Environmental Significance* (DoE, 2013). A summary of the assessment results is presented in Section 13.8.5 of this BDAR.

Table 11-5: Migratory species recorded or with potential to occur within the project footprint

Scientific name	Common name	BC Act status*	EPBC Act status*	SAII	IBRA subregion	Assessment outcome
Apus pacificus	Fork-tailed Swift	P	M	-	Inland Slopes	Recorded- 1 individual within PCT 290
Calidris acuminata	Sharp-tailed Sandpiper	P	M	-	Inland Slopes	Not recorded during surveys. High likelihood.
Calidris ruficollis	Red-necked Stint	P	M	-	Inland Slopes	Not recorded during surveys. High likelihood.
Gallinago hardwickii	Latham's Snipe	f	M	-	Bungonia, Inland Slopes, Murrumbateman and Snowy Mountains	Not recorded during surveys. Moderate to high likelihood
Hirundapus caudacutus	White-throated Needletail	P	M	-	Bondo, Snowy Mountains and Inland Slopes	Not recorded during surveys. 23 historic records (BioNet, 2022) approximately 12 – 18 km from the

Scientific name	Common name	BC Act status*	EPBC Act status*	SAII	IBRA subregion	Assessment outcome
						project footprint. Moderate to high likelihood.
Monarcha melanopsis	Black-faced Monarch	P	M	-	All	Not recorded during surveys. Low likelihood but included based on SEARs requirements
Rhipidura rufifrons	Rufous Fantail	P	M	-	Bondo	Recorded Bondo -6 times at 1 location, on deployed camera trap within PCT 953. Cannot be determined if same or numerous individuals recorded.
Myiagra cyanoleuca	Satin Flycatcher	P	M	-	Murrumbateman	Recorded- 2 individuals within PCT 280.
Tringa nebularia	Common Greenshank	P	M	-	Inland Slopes	Not recorded during surveys. High likelihood
Tringa stagnatilis	Marsh Sandpiper	P	M	-	Inland Slopes	Not recorded during surveys. Moderate likelihood

* EPBC Act and BC Act conservation status: CE- Critically Endangered; E -Endangered; V- Vulnerable; Epop – Endangered population; M- Migratory; P - Protected.

11.7 Bogong Moth

In December 2021, the Bogong Moth (*Agrotis infusa*) was added to the IUCN Red List as an Endangered Species. In accordance with the project SEARs (issued March 2022), a detailed species assessment on potential impacts to the Bogong Moth (which is of cultural heritage value) is required.

The seasonal migration of Bogong Moth in Spring is typically greater than 1,000 kilometres and the species is known to travel at night – making their mechanism for navigation more complex as it uses the Earth's magnetic field (Dreyer et al. 2018).

Key summer aestivation sites are generally found in the caves, boulder fields and tors of the Australian Alps (Green 2010). These sites are scattered across the south-eastern Australian alpine areas (limited to areas of the project footprint occurring in the Snowy Mountains IBRA subregion) (Keaney 2016).

The Bogong Moth is of cultural significance and a central part of the Dreaming for many Indigenous peoples of south-eastern Australia. Significant cultural rituals are associated with the seasonal occupation of the Bogong high plains and other alpine areas of NSW to which Aboriginal people travelled to these summer aestivation cave sites to feast on Bogong Moth. The mountain caves where the adult moths aestivate were known to Aboriginal people. The Bogong Moth is also a critical food source to many native fauna species, including endemic alpine species such as the Mountain Pygmy-possum (Burramys parvus).

Given the species high cultural and ecological importance, potential impacts to the species are being considered in line with requirements for EPBC Act listed threatened species and communities (DPI 2022b). Further assessment of potential impacts is required in accordance with Section 17 of the project's Supplementary SEARs. The results of this assessment are documented in Section 13.8.6.

11.8 2019-20 bushfire impacts

On Monday 20 January 2020 the then Commonwealth Department of Agriculture, Water and the Environment (DAWE) released an initial list of listed threatened or migratory species which have more than 10 per cent of their known or predicted distribution in areas affected by bushfires in southern and eastern Australia (DAWE 2020). The assessment by DAWE (2020) states that for all priority species, protecting unburnt areas within or adjacent to recently burnt ground that provides refuge is essential.

EPBC Act listed species and communities and migratory species relevant to this assessment are documented in the preceding sections. Those that are known or considered likely to occur in the project footprint and are associated with severely burnt PCTs are detailed in Attachment 22. Assessments to clarify the importance of habitat within the project footprint in the context of the 2019-2020 bushfires, as per the requirements of the Supplementary SEARs, have been provided for these species. The assessments include the following information:

- The area (in hectares) of habitat for the MNES that are associated with severely burnt PCTs within the project footprint directly impacted by the fires (if any).
- Available information regarding the impacts of the fires on the population size (where relevant) for MNES within and surrounding the project footprint.
- The area (and per cent) of regional habitat for each species/ecological community that was burnt and remained unburnt in the fires. In this assessment regional habitat has been defined as an area of 100 kilometres surrounding the project footprint.
- A discussion regarding the importance and capacity of the remaining habitat within the project footprint to support remaining populations of each species.

The aim of these assessments was to clarify the importance of habitat within the project footprint in the context of the 2019-2020 bushfires. Table 11-6, Table 11-7 and Table 11-8 summarise the results of the assessments for the two TECs, 7 threatened flora and 13 threatened fauna species recorded or considered to have the potential to occur within the project footprint (see Attachment 22 for complete assessments).

Table 11-6: EPBC Act TEC bushfire impact assessment

TEC	EPBC Act status*	Associated PCTs severely burnt	Extent of TEC severely burnt (hectares)			% TEC severely burnt within project footprint	Relative importance of remaining unburnt habitats within the project footprint?
			BON	INL	SNO		
White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland)	CE	268	-	27.77	-	3%	No change
Alpine Sphagnum Bogs and Associated Fens (Bogs and Fens)	E	939	-	-	1.77	71%	Greater

Table 11-7: EPBC Act threatened flora bushfire impact assessment

Scientific Name	Common name	EPBC Act Status*	Associated PCTs severely burnt	Extent habitat severely burnt (hectares)			% habitat severely burnt	Population of the species within the project footprint considered an important population?	Relative importance of remaining unburnt habitats within the project footprint?
				BON	INL	SNO			
Ammobium craspedioides	Yass Daisy	V	268, 287, 290	-	52.69	-	2%	No	No change
Leucochrysum albicans var. tricolor	Hoary Sunray	E	268, 679, 953, 1196	87.01	9.71	87.40	9%	No	No change
Prasophyllum bagoense	Bago Leek Orchid	CE	1196	-	-	39.20	39%	Yes	Greater
Prasophyllum keltonii	Kelton's Leek Orchid	CE	1196	-	-	39.29	42%	Yes	Greater
Pterostylis oreophila	Blue-tongued Greenhood	CE	939	-	-	1.77	60%	Yes	Greater
Thesium australe	Austral Toadflax	V	679, 1196	-	-	45.82	4%	Yes	Greater
Xerochrysum palustre	Swamp Everlasting	V	679, 939	-	-	4.55	35%	No	No change

Table 11-8: EPBC Act threatened fauna bushfire impact assessment

Scientific Name	Common name	EPBC Act Status*	Associated PCTs severely burnt	Extent habitat severely burnt (ha)			% habitat severely burnt	Population of the species within the project footprint considered an important population?	Relative importance of remaining unburnt habitats within the project footprint?
				BON	INL	SNO			
Anthochaera phrygia	Regent Honeyeater	CE	268, 280, 287	-	66.27	-	5%	No	No change
Aprasia parapulchella	Pink-tailed Legless Lizard	V	278,280, 290	-	1.36	-	0.1%	No	No change
Callocephalon fimbriatum	Gang-gang Cockatoo	E	268, 290, 299, 300, 314, 638, 379, 953, 1196	108.86	241.89	167.94	20%	No	No change
Grantiella picta	Painted Honeyeater	V	268, 287, 290	-	67.86	-	9%	No	No change
Hirundapus caudacutus	White-throated Needletail	V; M	268, 277, 280, 285, 290, 297, 299, 300, 306, 314, 638, 639, 679, 939, 953, 1196	108.86	241.89	168.84	29%	No	No change
Lathamus discolor	Swift Parrot	CE	268, 277, 280, 287, 290, 297, 299, 301, 306, 314, 352	0.01	241.97	0	15%	No	No change
Litoria castanea	Yellow-spotted Tree Frog	E	939	-	-	1.77	5%	No	No change
Mastacomys fuscus	Broad-toothed Rat	E	679	-	-	5.85	54%	Yes	Greater
Petaurus australis	Yellow-bellied Glider		299, 300, 638, 953, 1196	109.87	1.82	162.36	36%	Yes	Greater
Petauroides volans	Greater Glider	V	299, 300, 638, 953, 1196	62.52	-	62.93	32%	No	No change
Phascolarctos cinereus	Koala	V	268, 280, 285, 287, 290, 297,	108.83	241.72	168.21	21%	No	No change

Scientific Name	Common name	EPBC Act Status*	Associated PCTs severely burnt	Extent habitat severely burnt (ha)			% habitat severely burnt	Population of the species within the project footprint considered an important population?	Relative importance of remaining unburnt habitats within the project footprint?
				BON	INL	SNO			
			299, 300, 301, 306, 314, 638, 679, 953, 1196						
Pseudomys fumeus	Smoky Mouse	E	638, 953, 1196	0.17	-	128.58	33%	No	No change
Pteropus poliocephalus	Grey-headed Flying-fox	V	287, 290	-	41.40	-	3%	No known population	No change

Stage 2: Impact assessment

12. Avoid and minimise impacts

This chapter addresses proposed measures to avoid and minimise impacts to biodiversity in accordance with Section 7 of the BAM (DPIE, 2020a).

A key part of management of biodiversity for this project is the application of the 'avoid, minimise, mitigate and offset' hierarchy as follows:

1. avoid and minimise impacts as the highest priority
2. mitigate impacts where avoidance is not feasible or practicable in the circumstance
3. offset where residual, significant unavoidable impacts would occur (if required).

Avoidance and minimisation measures relating to the project are detailed below, with mitigation detailed in Chapter 14.

12.1 Avoid and minimise direct impacts

An options report was prepared by Transgrid (2023b) to develop the project footprint, including the transmission line corridor and all associated infrastructure (substation, construction compounds, worker accommodation facility). The project footprint was developed by initially mapping constraints and identifying opportunities. Constraints were grouped as: Tier 1 constraints, which were no-go areas to be avoided and Tier 2 constraints, which were to be avoided if possible and impacts minimised.

Tier 1 constraints included:

- wilderness protection areas
- wetlands protected by international agreements
- areas of very high Indigenous significance and world heritage places
- Commonwealth Defence Land
- built-up areas (towns and dense residential areas)
- licensed airstrips
- areas of multiple transmission lines north of Lower Tumut Switching Substation.

Tier 2 constraints included:

- wetlands not listed as Tier 1 constraints
- ecological conservation areas (including national parks and nature reserves)
- endangered ecological communities (EECs) and, more broadly, plant community types (PCTs)
- heritage conservations areas and places
- Commonwealth land (non-Defence)
- areas subject to exclusive use Native Title determinations
- forested areas (due to elevated bushfire risk)
- intensive agricultural activities and horticultural use
- unlicensed airstrips
- active industry (mining, wind and solar farms, industrial use)
- residences

- water crossings greater than 800 metres.

Opportunities identified to minimise impacts from the project included:

- minimising overall transmission line length to reduce costs, impacts and construction time
- paralleling existing transmission lines to:
  - utilise existing access tracks
  - avoid introducing new areas of visual impact
  - avoid introducing new impacts to existing land uses
  - potentially overlap existing cleared easements to minimise environmental and property impacts
- targeting areas of existing disturbance, such as roads, tracks and property boundaries to reduce environmental and property impacts
- where network risks allow, constructing double circuit 500 kV structures to reduce the required easement width from 80 metres to 70 metres.

Further route refinement and options analysis was undertaken over many months, including the following refinements which specifically reduced impacts to biodiversity:

- avoidance of Kosciuszko National Park, to minimise biodiversity impacts and offset requirements
- the Tumut north option was selected over the Blowering option (which was previously considered), as it had a lower ecological impact.
- the Tumut north route was designed to avoid both Minjary National Park and Mudjarn Nature Reserve
- avoidance of Back Arm Nature reserve and Burrinjuck Nature Reserve
- in Bago State Forest, the route was selected to maximise the use of existing access tracks and minimise the extent of off-easement access track construction
- in the Bannaby area, the route selected minimised PCT impacts and avoided Tarlo River National Park
- north-east of Yass, a route avoiding Bango Nature Reserve and the Rye Park Wind Farm biodiversity offset area was selected.

It should be noted the potential for avoiding impacts by means of project siting is limited within some parts of the landscape such as heavily vegetated areas within Bago State Forest.

Table 12-1 outlines measures implemented as a part of project siting, project footprint selection and design development to avoid and minimise direct impacts to native vegetation, threatened species, TECs and their habitat.

Table 12-1: Measures implemented to avoid and minimise direct impacts

Avoidance principle (as per Section 7.1 of the BAM, DPIE, 2020a)	Measures implemented
Project siting	
Locating the project in areas where there are no biodiversity values	The options report prepared by Transgrid (2023b) details opportunities where corridor selection and route refinement reduced impact to biodiversity values, including avoidance of wilderness protection areas and wetlands protected by international agreements; and avoiding or minimising impacts to wetlands, ecological conservation areas (including national parks and nature
Locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition (ie areas that have a low VI score)	

Avoidance principle (as per Section 7.1 of the BAM, DPIE, 2020a)	Measures implemented
Locating the project in areas that avoid habitat for species with a high biodiversity risk weighting or land mapped on the important habitat map, or native vegetation that is a TEC or a highly cleared PCT	reserves), EECs and, more broadly, PCTs and waterway crossings greater than 800 metres. Micro-siting of infrastructure within the project footprint would continue to be undertaken as part of the detailed design stage of the project. This would aim to minimise impact on biodiversity values where practicable.
Locating the project outside of the buffer area of breeding habitat features such as nest trees or caves	
Project location considerations	
An analysis of alternative modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology	Alternative technologies were considered for the project. GHD (2022) investigated several transmission network options for HumeLink which use underground cables (undergrounding). Clearing methodologies would be tailored to reduce impacts where practicable. Opportunities for individually assessing hazard trees will be considered further during detailed design where required to minimise impacts.
An analysis of alternative routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route	As detailed above, the options report (Transgrid, 2023b) detailed further route refinement that included the following, which specifically reduced impacts to biodiversity (Transgrid, 2023b): • avoidance of Kosciuszko National Park, Minjary National Park and Tarlo River National Park • avoidance of Mudjarn Nature Reserve, Back Arm Nature Reserve and Burrinjuck Nature Reserve • narrowed corridor south-east of Bango Nature Reserve to avoid a biodiversity offset area.
An analysis of alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	
An analysis of alternative sites within a property on which the project is proposed that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site	Opportunities to minimise impacts will be identified through the detailed design process. Where possible, transmission line structures and access tracks would be located in areas with lower biodiversity value.
Project design	
Reducing the project clearing footprint by minimising the number and type of facilities	As part of the options report and route refinement (Transgrid, 2023b), the total length of the transmission line was reduced from over 500 km to under 360 km when the decision was made to choose a double-circuit option (Transgrid), decreasing impacts to biodiversity. Further, to minimise impacts on biodiversity, where practicable Transgrid have opted to include a partial clearing methodology, thereby retaining vegetation beneath the easement during the operational maintenance phase of the project, ie Transgrid are not adopting full continuous clearance of the easement (Transgrid, 2023a), which is the 'easier' maintenance option. See Chapter 13 for details regarding clearing impacts of the project.
Locating ancillary facilities in areas where there are no biodiversity values	The criteria for selection of substations, construction compound locations and other ancillary facilities included the following (Transgrid, 2023b): • avoid wilderness protection areas and wetlands protected by international agreements • minimise areas mapped as plant community types (especially endangered ecological communities) and threatened species habitat • minimise the need for vegetation clearing • maximise distance from waterbodies and waterways
Locating ancillary facilities where the native vegetation or threatened species habitat is in the poorest condition (ie areas that have a low VI score)	
Locating ancillary facilities in areas that avoid habitat for species and vegetation in high	

Avoidance principle (as per Section 7.1 of the BAM, DPIE, 2020a)	Measures implemented
threat status categories (ie an EEC, CEEC or an entity at risk of a SAII)	• target areas which have previously been disturbed, or would require disturbance as part of the construction of the project • use existing roads and farm tracks • avoid natural drainage lines and low wetland areas where possible. Or where unavoidable, waterway crossings would be designed to minimise impacts on KFH and riparian vegetation.
Implementing actions and activities that provide for rehabilitation, ecological restoration and/ or ongoing maintenance of retained areas of native vegetation, threatened species, threatened ecological communities and their habitat	Mitigation measures are detailed in Chapter 14 of this report and include revegetation of disturbed areas and preparation of rehabilitation plans and biodiversity management plans, which would guide the restoration, protection and maintenance of biodiversity values within the project footprint.

12.2 Avoid and minimise prescribed impacts

Table 12-2 outlines measures implemented as a part of project siting and design to avoid and minimise prescribed biodiversity impacts, as detailed in Section 7.2 of the BAM (DPIE, 2020a).

Table 12-2: Measures implemented to avoid and minimise prescribed impacts

Avoidance principle (as per Section 7.2 of the BAM, DPIE, 2020a)	Measures implemented
Project siting	
Locating the envelope of surface work to avoid direct impacts on the habitat features identified in Chapter 8.	Prescribed impacts identified as relevant to the project include: • karst, caves, crevices, cliffs, rocks, and other geological features of significance • human-made structures • non-native vegetation offering habitat for threatened species • habitat connectivity • waterbodies, water quality and hydrological processes • vehicle strikes. Micro-siting of infrastructure within the project footprint would be undertaken as part of the detailed design stage of the project and would aim to minimise impact on prescribed impact entities such as avoiding impact to rocky habitats or caves, waterways etc.
Locating the envelope of sub-surface work, both in the horizontal and vertical plane, to avoid and minimise operations beneath habitat features (ie locating longwall panels away from geological features of significance or water dependent plant communities and their supporting aquifers)	Subsurface work would be minimal. Micro-siting of infrastructure requiring sub surface work, such as transmission line structures, within the project footprint would be undertaken as part of the detailed design stage of the project, to minimise prescribed impacts where possible (ie selecting appropriate construction methodologies to minimise impacts to /interaction with GDEs and supporting aquifers during activities such as transmission line structure piling). Minimising deep drilling and excavation work and spanning of transmission lines over rocky habitat where practicable would mitigate any impacts to potential cave roosting habitat, and any residual impact to threatened species habitat will be appropriately offset.
Locating the project to avoid severing or interfering with corridors connecting different areas of habitat, migratory flight paths or important habitat or local movement pathways	Where possible, the project has been co-located with existing transmission lines/areas of disturbance to avoid/minimise additional fragmentation. Mitigation includes the implementation of a Connectivity Strategy, including connectivity corridors and fauna movement corridors, to maintain connectivity in areas identified as facilitating fauna movement.

Avoidance principle (as per Section 7.2 of the BAM, DPIE, 2020a)	Measures implemented
Optimising the project layout to minimise interactions with threatened entities	Detailed design will include elements to minimise interactions with threatened entities, including: • retention of connectivity corridors and fauna movement corridors, to maintain connectivity in areas identified as facilitating fauna movement • implementation of a Biodiversity Management Plan (BMP), including measures to reduce disturbance to sensitive flora and fauna and procedures for clearing of vegetation, including pre-clearing inspections, identification of clearing limits in relation to threatened species habitat, procedures for the relocation of flora and fauna • establishment of special biodiversity protection zones to protect threatened biodiversity • partial clearing along riparian zones, retaining shrub or ground stratum.
Locating the project to avoid direct impacts on water bodies or hydrological processes	To minimise impacts to surface water and groundwater, minimising direct impacts on waterways and higher risk erosion areas within the project footprint would continue to be considered when refining locations for construction activities and infrastructure. If impact to these areas cannot be avoided, appropriate environmental controls would be identified and implemented. Further information is provided in *Technical Report 12 – Surface Water and Groundwater Impact Assessment* (Aurecon, 2023c). Waterway crossings required for construction/maintenance would re-use existing crossings or upgrade informal crossing locations where possible or otherwise would be established in lower Strahler order waterways where possible. No permanent transmission line structure infrastructure is anticipated to be located within or underneath waterbodies.
Project location considerations	
An analysis of alternative modes or technologies that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed mode or technology	As detailed in Table 12-1 above, alternative technologies were considered for the project, such as the use of underground cables. Clearing methodologies would be tailored to reduce impacts where practicable. Opportunities for individually assessing hazard trees will be considered further during detailed design where required to minimise impacts.
An analysis of alternative routes that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed route.	As detailed above, the options report (Transgrid, 2023b) detailed further corridor refinement that included the following which specifically reduced prescribed impacts to biodiversity (Transgrid, 2023b): • avoidance of Kosciuszko National Park, Minjary National Park and Tarlo River National Park • avoidance of Mudjarn Nature Reserve, Back Arm Nature Reserve and Burrinjuck Nature Reserve • narrowed corridor south-east of Bango Nature Reserve to avoid a biodiversity offset area. The above avoidance and mitigation measures reduced the prescribed impacts to habitat connectivity from the project.

Avoidance principle (as per Section 7.2 of the BAM, DPIE, 2020a)	Measures implemented
An analysis of alternative locations that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed location	Further refinement of the location of the project would be undertaken at the detailed design stage of the project, with micro siting of infrastructure aiming to avoid and minimise prescribed impacts to caves and rocky habitat and minimise prescribed impacts to surface water and groundwater, thereby minimising impacts to GDEs.
An analysis of alternative sites within a property on which the project is proposed that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed site	The general process of refinement during the detailed design stage would include locating infrastructure within areas of lower biodiversity value, in an attempt to avoid and minimise impacts where possible, including prescribed impacts.
Locating the project in consideration of bushfire protection requirements and clearing for asset protection zones	Consideration of bushfire protection requirements and APZs has been built into vegetation clearance considerations (Transgrid, 2023a; Aurecon, 2023a). *Technical Report 13 – Bushfire Risk Assessment* was prepared for the project and considers a range of existing risk factors associated with the project, including fire weather and climate, ignition sources, vegetation, slope, and access, as well as construction and operation, and cumulative bushfire impacts. Management and mitigation measures that would be implemented for the project include APZs, transmission line clearances, construction requirements in accordance with the required Bushfire Attack Level (BAL) and emergency procedures (Aurecon, 2023a).
Locating the project in consideration of flood planning levels	The *Technical Report 11 – Hydrology and Flooding Impact Assessment* prepared by Aurecon (2023b) identified relevant flood mitigation and management measures for both construction and operational phases of the project at several locations. The resulting impacts from and on flooding is considered generally minor or low risk that can be managed through proper implementation of the recommended management measures. Consideration of flood hazard will continue in detailed design.
Locating the project in consideration of servicing constraints	Maintenance of the infrastructure would be required for the project, particularly vegetation inspection and management along Transgrid's easement to maintain separation distance requirements. The BMP would include monitoring of the biodiversity impacts of the construction and operational impacts of the project, including maintenance work, to ensure impacts on biodiversity are minimised and are in line with the current assessment.
Project design	
Adopting engineering solutions to minimise fracturing of bedrock underlying features of geological significance, or groundwater-dependent communities and their supporting aquifers	Geotechnical investigations for the project are ongoing. Appropriate construction methodologies will be selected to minimise interference with aquifers and to minimise groundwater extraction volumes (see project description in EIS for detailed construction methodologies). Some areas of limestone outcropping which may support caves and rocky areas were identified in the project footprint, however these are not likely to be impacted.
Adopting engineering solutions to restore connectivity and movement corridors	Mitigation includes the implementation of a Connectivity Strategy as part of the BMP, including connectivity corridors and fauna movement corridors, to maintain connectivity in areas identified as facilitating fauna movement.

Avoidance principle (as per Section 7.2 of the BAM, DPIE, 2020a)	Measures implemented
Adopting project design elements that minimise interactions with threatened entities such as designing fencing to prevent animal entry to transport corridor	Detailed design will consider use of elements to minimise interactions with threatened entities, including: • conductor line-marking techniques (increasing transmission line visibility by marking them to reduce collision-induced mortalities for birds) and use of bird diverters during design refinement to minimise bird strike • implementation of a Connectivity Strategy, which would include the identification of fauna corridors, safeguards, and recommendations for where measures are appropriate to maintain connectivity - e.g., design vegetation stepping-stones, fauna fencing, re-use of fallen debris to create ground refugia, pre-construction surveys and micro-siting, reduce vegetation clearance, spanning of infrastructure, artificial connectivity structures (eg Glider Poles), and establishment of special biodiversity protection zones.
Maintaining environmental processes that are critical to the formation and persistence of habitat features not associated with vegetation	Mitigations measures would include retention of habitat features such as rocky outcrops, surface rock, logs, wherever practicable and minimising impacts to waterways and karst/caves.
Maintaining hydrological processes that sustain threatened entities	The resulting impacts from and on flooding are considered generally minor or low risk and can be managed through proper implementation of the recommended management measures (Aurecon, 2023b). Overall, the impacts of construction and operation on groundwater would be minor to negligible (Aurecon, 2023c). The following impacts were identified for the project on surface water, particularly during construction: erosion risk and sedimentation, geomorphology, water quality, water supply and wastewater disposal (Aurecon, 2023c). Potential impacts would be mitigated through soil and water management measures including erosion and sedimentation control during construction and implementation of appropriate design guidelines. These would be detailed within and controlled through implementation of the CEMP. To minimise impacts to surface water and groundwater, a range of measures would be implemented during the detailed design, construction and operational phases of the project including (Aurecon, 2023c): • consideration of waterway locations within the project footprint and higher risk erosion areas • preparation of Soil and Water Management Plans as part of the CEMP to manage water quality impacts during construction of the project • preparation of Erosion and Sediment Control Plans (ESCPs) and Water Quality Monitoring Plan within the SWMP • consideration of appropriately designed scour protection at new stormwater management points. Overall, hydrological processes are not likely to be disrupted as a result of the project.

Avoidance principle (as per Section 7.2 of the BAM, DPIE, 2020a)	Measures implemented
Controlling the quality of water released from the site, to avoid or minimise downstream impacts on threatened entities	As detailed above, erosion and sedimentation risks to waterways during construction would be mitigated through soil and water management measures including erosion and sedimentation control. The largest source of wastewater during the construction phase would be from the worker accommodation facility and this would be connected to the existing Tumbarumba Sewerage Treatment Plant. Smaller volumes of wastewater from construction compounds would be collected and tankered to appropriate wastewater disposal facilities. Water use and wastewater disposal risks would be negligible during the operational phase as the volume of water required and the volume of wastewater generated would be low (Aurecon, 2023c).

13. Impact assessment

13.1 Approach to assessing impacts

The assessment of impacts to biodiversity values presented within this chapter has been carried out in accordance with Section 8 of the BAM (DPIE, 2020a).

This BDAR has assessed the biodiversity values within the project footprint so that the final transmission line easement and construction locations may be refined during detailed design (including to avoid and minimise biodiversity impacts) within the project footprint without the need to re-assess all biodiversity values.

An indicative disturbance area has been used to inform the extent of construction impacts, as defined in Table 13-1. The indicative disturbance area has been adopted to calculate a more accurate magnitude of impacts as use of the entire project footprint would result in a substantial overestimation of impact (due to its large width compared to the transmission line easement requirements) and the design and construction methodology is still being refined. The indicative disturbance area represents a likely worst-case impact scenario (noting it is designed to be relatively 'realistic' based on the current concept design that is still subject to refinement). Despite being indicative, the disturbance area would not move outside of the nominated project footprint and is reasonably certain in most areas particularly for example where the proposed easement is adjacent to existing transmission line easements. Final project impacts would be determined during the detailed design phase in accordance with the approach outlined in Section 14.1.1.

The indicative disturbance area used for calculation of direct impacts associated with the project is shown in Figure 13-1. Within the indicative disturbance area there are three vegetation clearance scenarios:

- TCZ where all vegetation/habitat would be removed
- ECZ which would be subject to partial loss of vegetation associated with clearing taller vegetation within the easement
- HTZ which would be subject to partial loss of vegetation associated with removal of hazardous trees.

Details regarding the impacts associated with each of these vegetation removal scenarios is provided in Table 13-1.

A small overlap between the indicative disturbance area and the Snowy 2.0 Transmission Connection construction footprint (approximately 10 hectares) occurs at Maragle (Figure 13-1). The extent of this overlap has been excluded from any impact calculations herein.

Table 13-1: Clearing impacts within indicative disturbance area and relevant zones

Terminology	Definition
Indicative disturbance area (NB: disturbance area has the same meaning as 'Development footprint' as defined	The indicative area that would be temporarily or permanently cleared during project construction and operation. The final disturbance area would be within the project footprint. This includes 1,115.43 ha of land shown in Figure 13-1 subject to varying levels of physical disturbance, as follows: • TCZ with full clearing • ECZ and HTZ with partial clearing.

Terminology	Definition
by the BAM, DPIE, 2020a)	Clearing, maintenance and control protocols relevant to the disturbance areas are described below and documented within: • *Transmission Line Construction Manual – Major New Build (*Transgrid, 2020a) • Maintenance Plan Easement and Access Tracks (Transgrid, 2020b).
Total Clearing Zone (TCZ)	TCZ lands subject to total clearing and ground disturbance (including earthworks). Permanent structures including transmission line structures, access tracks and substations would be situated within these lands as well as temporary brake and winch sites and construction compounds. Certain access tracks referred to as un-improved tracks (Transgrid, 2020a), particularly those within non-wooded native pasture would not require clearing or ground disturbance however it is assumed this would occur for the purpose of impact quantification. In areas subject to civil work (such as construction benches, structure footings, access track surfaces, substation benches), complete removal of the root balls would be required. As such, a tree pusher would typically be used in these areas. Removed trees would be passed through a tub grinder with the material then re-used for erosion and sediment control and stabilisation of disturbed areas during construction and in post construction rehabilitation. Mulched material would only be stored within the cleared footprint. In the areas where civil work is not required, a forest harvester or excavator-mulcher would be used. Mulched material will be evenly spread on bare, disturbed or exposed areas within the full clearing area to assist in protection of the soil. Where low growing vegetation, grasses or ground cover exists, care will be taken to avoid excess debris build up/smothering as to promote regeneration of the grass layer. All areas that are part of the TCZ have been considered as full and permanent loss of vegetation (refer to Section 13.2).
Easement Clearing Zone (ECZ)	ECZ: includes land within the proposed transmission line easement where clearing and ongoing maintenance of tall growing vegetation would be undertaken. Tall growing vegetation includes any vegetation which may intrude on the Vegetation Clearance Requirements at Maximum Line Operating Conditions (maximum conductor sag and maximum conductor blowout) at that location now or at any time in the future. The assessment of tall growing vegetation would be by a qualified arborist. Earthworks and grubbing are not required within this zone except in limited circumstances. In areas safely accessible to a machine, smaller trees (or other tall growing vegetation) <200 mm DBH would be removed using an excavator-mulcher. As such, ground cover species and low growth shrubs would be affected (particularly by trampling) during the mechanical clearing process as part of the movement of the machinery throughout the ECZ. Vegetation > 200 mm DBH would be removed using a forest harvester, noting that tree branches/canopy may be mulched in-situ. The tree barrels would either be: • tub ground to provide material for erosion/sediment control and rehabilitation for use outside of the ECZ • relocated to the edge of the easement and retained as habitat where applicable • the mulching of vegetation debris would also be dispersed as much as possible throughout the zone during clearing and designed to minimise heaped mulch that would limit the rehabilitation/emergence of ground cover species following construction.

Terminology	Definition
	Removal of scrub and undergrowth is only to be carried out to the extent necessary to meet the safety requirements for separation between infrastructure and vegetation. Vegetation clearance heights are set by Transgrid for operational and safety requirements, including bushfire risk management (Transgrid, 2020a). All areas that are part of the ECZ have been considered as partial loss of vegetation (refer to Section 13.2).
Hazard Tree Zone (HTZ)	Includes land located within and adjacent to the transmission line easement where selective tree removal, trimming or lopping would be undertaken to manage any risk of damage to transmission lines and structures in the event of tree fall. LiDAR analysis was performed to identify hazard trees around the indicative disturbance area. The outer boundary of the mapped trees was then buffered to allow for a consolidated potential impact area. All hazard trees outside the easement corridor would be assessed by a qualified Level 4 or Level 5 arborist with Tree Risk Assessment Qualification. Any hazard tree showing risk of failure due to health, structure or defect shall be removed. All areas that are part of the HTZ have been considered as partial loss of vegetation (refer to Section 13.2).

13.2 Determining future vegetation integrity scores

The HumeLink project has adopted measures to avoid and minimise impacts to biodiversity values in line with the guiding principle of the BAM (DPIE, 2020a), including through the management of the transmission line easement. The maintenance zone underneath the transmission line (ie ECZ) would be managed through the removal of trees and shrubs that can grow to within 3.9 metres of the overhead conductors plus a safety allowance of 1.5 metres leaving the ground layer largely intact. This partial clearing of the easement is part of the measures taken to minimise impacts to biodiversity. To facilitate these partial vegetation clearing scenarios the BAM (DPIE, 2020a) allows for future VI scores to be determined following the procedure in Section 6.4 of the BAM Calculator User Guide (OEH, 2017a).

In assessing direct impacts on native vegetation, future VI scores were calculated in the BAM-C for each disturbance area subset and associated vegetation zone. For the TCZ, the future vegetation integrity score used was zero as it assumes total loss of native vegetation. For the ECZ, total loss was assumed for all tree and shrub attributes as outlined in Table 13-2. Future VI scores for other growth forms and function attributes have been determined using reference data from an existing transmission easement and where relevant, modifying the future VI attributes. Thirty plots were completed within existing transmission easements across five of the six IBRA subregions intersecting the project footprint. This comprised survey within five different vegetation formations. The mean attribute scores of these plots were calculated according to vegetation formation and compared to that obtained for BAM plots collected within the project footprint. The percentage change for each attribute collected was then calculated. This reflected the average loss or gain for each attribute as the result of being within an easement clearing zone. These percentage changes are shown in Table 13-3 and Table 13-4.

This analysis using the reference existing easement data showed that in most cases, clearing of the canopy resulted in an increase in the structure and composition of grasses and forbs in the understorey (Table 13-3). This is supported by studies which have found that transmission line clearings develop into novel habitats over time (Eldridge *et al.*, 2017) and species and functional composition have been shown to be different between sites with control and thinned canopy treatments with proportionally more individuals of grasses and forbs in thinned plots (Tsai *et al.*, 2018). Therefore, the current composition and structure scores for grasses and forbs were retained for the future scores within the ECZ. Future scores for the other attributes for vegetation zones within the ECZ was reduced as informed by the reference data analysis and outlined in Table 13-2.

For areas within the HTZ, future attribute scores were applied as per Table 13-2. This included setting the stem class for 50-79 centimetre DBH trees and number of large trees (greater than 50 centimetre DBH) to zero based on the precautionary assumption that all large trees would be deemed hazard trees and require removal. The structure attribute of the tree growth form would also be reduced according to mean number of large trees per vegetation zone, with one large tree resulting in a 60 square metre reduction in tree cover. This 60 square metres is equivalent to 15 per cent of the 20 metre by 20 metre floristic plot. Fifteen per cent was calculated based on a conservative estimate of canopy cover of large trees using the mean tree cover data in plots where only one large tree was recorded within the floristic plot, and no other trees were recorded. To calculate the estimated per cent cover of large trees per vegetation zone, this tree cover area of 60 square metres was multiplied by the average number of large trees recorded within each 50 metre by 20 metre plot, and then converted to per cent cover across the plot as outlined in the equation below. This estimate of per cent cover was then subtracted from the current tree structure score to generate the future tree structure score for the vegetation zone.

$$Estimated\ percent\ cover\ large\ trees\ per\ vegetation\ zone = \frac{(large\ tree\ area\ \times average\ number\ large\ trees)}{area\ of\ function\ plot} \times 100$$

where:

large tree area = 60m2

area of function plot = 1000m2

Due to limitations within the BAM-C, the regeneration scores within the HTZ areas could not be accurately inputted. For the HTZ areas, regeneration is expected to not be impacted and therefore the score within the BAM-C related to presence of regeneration would ideally not be changed from the current to future score. However, the BAM-C does not allow for this in most cases as the current score is calculated from an average of all plots, while when entering a future score, an average cannot be inputted. Instead, the score for regeneration must be either present (1) or absent (0). As a result, the future VI score can be either artificially higher or lower than the true score. In some instances, this affects the future VI score by up to 15 points. In order to overcome this, where the average of regeneration was 0.5 or less, regeneration was entered as absent and hence a score of 0 given. Where the regeneration average was above 0.5, it was entered as present and a score of 1 was given. This reduces the extreme artificial increases and decreases.

Table 13-2 provides a summary of the assumptions applied in determining future VI scores for the indicative disturbance area. A more detailed breakdown with future VI score is provided in Table 13-6 to Table 13-11.

Table 13-2: Summary of approach to determining future vegetation integrity for full and partial clearing scenarios

Clearing activity/ management zone	Attributes with total loss	Attributes with partial or no loss
TCZ	Total clearing of trees, shrubs and groundcovers, BAM-C values set to zero for all attributes related to composition, structure and function	None
ECZ	Composition and structure attributes: • Trees and shrubs continually removed as part of long-term easement maintenance – tree and shrub growth forms set to zero. • Fern and 'Other' growth forms would remain in situ but are likely to be reduced as a result of changed environmental conditions and therefore reduced to zero as a conservative measure and based on relative change data as shown in Table 13-3. Function attributes: • Tree stem classes, large trees and hollow trees have been reduced to zero	Composition and structure attributes: • Grass and forb growth forms remain in-situ and would retain current VI condition based on relative change from reference data as shown in Table 13-3. Function attributes: • Leaf litter is expected to reduce over time with the absence of a tree canopy and therefore has been reduced by 50%.

Clearing activity/ management zone	Attributes with total loss	Attributes with partial or no loss
	• The length of fallen logs is expected to reduce significantly over time with the absence of a tree canopy and therefore has been set to zero as a conservative measure.	
HTZ	Function attributes: • The Stem class for 50-79 cm and number of large trees (>50 cm DBH) has been reduced to zero	Composition and structure attributes: • Structure of tree growth form to be reduced according to mean number of large trees per vegetation zone, with one large tree having an estimated cover of 60 m^2. • All other growth-forms remain in-situ, including shrubs and ground growth forms which would retain current VI condition

Table 13-3 Percentage change in composition and structure attributes between plots undertaken in the project footprint and the existing easement

Vegetation formation	Composition (% change)						Structure (% change)					
	Tree	Shrub	Grass	Forbs	Ferns	Other	Tree	Shrub	Grass	Forbs	Ferns	Other
Dry Sclerophyll Forests (Shrub/grass sub-formation)	-43%	-5%	31%	-4%	0%	-100%	-76%	675%	103%	-18%	-50%	-100%
Dry Sclerophyll Forests (Shrubby sub-formation)	-10%	-30%	25%	34%	146%	-14%	-93%	-64%	81%	21%	360%	-92%
Freshwater Wetlands	-67%	-33%	87%	19%	-100%	N/A	-17%	163%	52%	-79%	-100%	N/A
Grassy Woodlands	-30%	22%	0%	14%	-1%	-4%	-49%	-39%	41%	36%	211%	-72%
Wet Sclerophyll Forests (Grassy sub-formation)	-91%	-70%	19%	62%	-30%	-75%	-49%	-89%	11%	37%	-99%	-88%

Table 13-4 Percentage change in function attributes between plots undertaken in the project footprint and the existing easement

Vegetation formation	Function (% change)										
	Large Trees	Hollow trees	Litter Cover	Length Fallen Logs	Tree Regeneration	High Threat Exotic weeds	Tree Stem 5 to 10cm DBH	Tree Stem 10 to 20cm DBH	Tree Stem 20 to 30cm DBH	Tree Stem 30 to 50cm DBH	Tree Stem 50 to 80cm DBH
Dry Sclerophyll Forests (Shrub/grass sub-formation)	-75%	-88%	-46%	-92%	50%	N/A	0%	-75%	-75%	-75%	-75%
Dry Sclerophyll Forests (Shrubby sub-formation)	-100%	-100%	-88%	-88%	30%	-35%	-41%	-81%	-100%	-100%	-100%
Freshwater Wetlands	N/A	N/A	-38%	-96	-100	N/A	N/A	N/A	N/A	N/A	N/A
Grassy Woodlands	-100%	-100%	-33%	-43%	60%	-66%	7%	-28%	-49%	-47%	-71%
Wet Sclerophyll Forests (Grassy sub-formation)	-100%	-100%	-90%	-100%	-42%	345%	-100%	-100%	-100%	-100%	-100%

13.3 Direct impacts

13.3.1 Impacts to native vegetation

As detailed in Section 12.1, this BDAR has assessed the biodiversity values within the project footprint so that the final transmission line easement and construction locations may be refined during detailed design within the project footprint without the need to re-assess biodiversity values. However, the calculation of impact areas has been restricted to the indicative disturbance area for this stage of the development assessment. Project impacts and offset obligations would be revised prior to the commencement of construction once the detailed design has been finalised.

Direct impacts to native vegetation as a result of the project are summarised in Table 13-5, relative to other clearing impacts (including non-native vegetation and Category 1 exempt lands). Vegetation zone impacts and loss in VI is presented in Table 13-6 to Table 13-9 for each IBRA subregion.

Direct impacts have been calculated using the indicative disturbance area for the Bungonia, Crookwell, Murrumbateman, Bondo and Snowy Mountains IBRA subregions and excluding Category 1 exempt lands. This represents the maximum clearing area required for the project, however the exact location of the final transmission line easement and associated disturbance area within the project footprint would not be known until the completion of detailed design.

Vegetation and habitat clearing would be avoided along sections of the project footprint, including waterways and gullies (approximately eight hectares). However, the project would result in the direct removal of native vegetation and habitat for construction of the transmission line and associated infrastructure, including access tracks, transmission line structure locations and the substation sites.

Approximately 670.21 hectares of native vegetation would be directly impacted by the project consisting of the PCTs listed in Table 13-6, Table 13-7, Table 13-8, Table 13-9, Table 13-10 and Table 13-11.

Table 13-5: Summary of direct impacts to native vegetation

IBRA subregion	Native vegetation subject to assessment (ha)	Native vegetation within Category 1 exempt lands (ha)	Planted native vegetation subject to streamlined assessment (ha)	Non-native vegetation, roads and waterbodies (ha)	Total (ha)
Bungonia	34.17	1.75	0.15	19.04	55.11
Crookwell	76.83	8.98	1.31	31.50	118.63
Murrumbateman	98.11	9.95	0.75	35.65	144.42
Inland Slopes	245.29	21.86	3.35	149.47	419.96
Bondo	38.84	3.94	0.53	147.62	190.92
Snowy Mountains	176.97	0	0	9.44	186.38
All IBRA subregions	**670.21**	**46.48**	**6.09**	**392.73**	**1115.43**
% total	**60%**	**4%**	**1%**	**35%**	**100%**

Impacts to native vegetation within Bungonia

Table 13-6: Vegetation impacts within the Bungonia IBRA subregion

PCT ID	PCT Name	Condition	TEC	Patch size (ha)	Clearing zones (hectares)	Current VI Scores	Future VI Scores	VI Loss (%)
283	Apple Box - Blakelys Red Gum moist valley and footslopes grass-forb open forest	Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 0.14	26	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.23	39.6	TCZ - 0	100.0
					ECZ - 0.03		ECZ - 11.2	71.7
					HTZ - nil		N/A	N/A
870	Grey Gum - Thin-leaved Stringybark grassy woodland	Very High	No associated TEC	>100	TCZ - 0.81	81.3	TCZ - 0	100.0
					ECZ - 0.65		ECZ - 23.6	71.0
					HTZ - 0.23		HTZ - 66.9	17.7
1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest	Low	No associated TEC	>100	TCZ - 0.22	37.4	TCZ - 0	100.0
					ECZ - 0.08		ECZ - 4.5	88.0
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.57	53.2	TCZ - 0	100.0
					ECZ - 0.01		ECZ - 11.1	79.1
					HTZ - nil		N/A	N/A
		High		>100	TCZ - 0.22	73.3	TCZ - 0	100.0
					ECZ - 0.06		ECZ - 21.4	70.8
					HTZ - 0.1		HTZ - 67.5	7.9
		Very High		>100	TCZ - 1.93	83.6	TCZ - 0	100.0
					ECZ - 0.01		ECZ - 13.6	83.7
					HTZ - 0.02		HTZ - 58.9	29.5
1097	Ribbon Gum - Narrow-leaved Peppermint grassy open forest on basalt plateaux	Very Low	Tableland Basalt Forest	>100	TCZ - 0.3	13.4	TCZ - 0	100.0
					ECZ - 0.02		ECZ - 0	100.0
					HTZ - nil		N/A	N/A
				>5	TCZ - nil		N/A	N/A
					ECZ - 0.02		ECZ - 0	100.0
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.01	52.5	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
1107	River Peppermint - Narrow-leaved Peppermint open forest on sheltered escarpment slopes	High	Tableland Basalt Forest	>100	TCZ - 0.3	65	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - 0.01		HTZ - 57.2	12.0
1150	Silvertop Ash - Blue-leaved Stringybark	Very Low	No associated TEC	>100	TCZ - 0.22	4.8	TCZ - 0	100.0
					ECZ - 0.06		ECZ - 2.6	45.8

PCT ID	PCT Name	Condition	TEC	Patch size (ha)	Clearing zones (hectares)	Current VI Scores	Future VI Scores	VI Loss (%)
	shrubby open forest on ridges				HTZ - nil		N/A	N/A
		Low		>100	TCZ - 0.09	26.5	TCZ - 0	100.0
					ECZ - 0.14		ECZ - 2.3	91.3
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.32	37.7	TCZ - 0	100.0
					ECZ - 0.3		ECZ - 10.4	72.4
					HTZ - 0.05		HTZ - 34.5	8.5
		High		>100	TCZ - 6.25	45.2	TCZ - 0	100.0
					ECZ - 3.64		ECZ - 10.4	77.0
					HTZ - 1.12		HTZ - 45.2	0.0
1330	Yellow Box - Blakely's Red Gum grassy woodland on the tablelands	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	>5	TCZ - nil	1.1	N/A	N/A
					ECZ - 0.02		ECZ - 0.6	45.5
					HTZ - nil		N/A	N/A
		Low		>100	TCZ - 14.39	34.2	TCZ - 0	100.0
					ECZ - 0.29		ECZ - 29.5	13.7
					HTZ - 0.02		HTZ - 33.3	2.6
		Very High		>100	TCZ - 1.2	81.2	TCZ - 0	100.0
					ECZ - 0.05		ECZ - 23.7	70.8
					HTZ - 0.04		HTZ - 64.3	20.8
Total					**34.17**	-	-	-

Impacts to native vegetation within Crookwell

Table 13-7: Vegetation impacts within the Crookwell IBRA subregion

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Scores	Future VI Scores	VI Loss (%)
280	Red Stringybark - Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland	Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 0.11	10.4	TCZ - 0	100.0
					ECZ - 0.09		ECZ - 5.5	47.1
					HTZ - 0.02		HTZ - 10.4	0.0
		Moderate		>100	TCZ - 0.65	42	TCZ - 0	100.0
					ECZ - 0.67		ECZ - 14.3	66.0
					HTZ - 0.22		HTZ - 30.4	27.6
283	Apple Box - Blakely's Red Gum moist valley and footslopes grass-forb open forest	Very low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 1.83	2.2	TCZ - 0	100.0
					ECZ - 0.02		ECZ - 1.2	45.5
					HTZ - nil		N/A	N/A
		Low		>100	TCZ - 0.01	75.7	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.16	61.7	TCZ - 0	100.0
					ECZ - 0.24		ECZ - 27.5	55.4
					HTZ - 0.05		HTZ - 43.5	29.5
		High		>100	TCZ - 0.42	79.8	TCZ - 0	100.0
					ECZ - 0.31		ECZ - 33.9	57.5
					HTZ - 0.12		HTZ - 72.6	9.0
335	Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South-Western Slopes Bioregion	High	No associated TEC	>100	TCZ - 0.61	84.4	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
679	Black Sallee - Snow Gum low woodland of montane valleys, South-Eastern Highlands Bioregion and Australian Alps Bioregion	Low	Monaro Tableland Cool Temperate Grassy Woodland	>100	TCZ - 0.33	54.4	TCZ - 0	100.0
					ECZ - 0.05		ECZ - 33.2	39.0
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - nil	41.8	N/A	N/A
					ECZ - 0.1		ECZ - 25	40.2
					HTZ - 0.01		HTZ - 41.8	0.0
		High		>100	TCZ - nil	65.5	N/A	N/A
					ECZ - 0.05		ECZ - 3.4	94.8
					HTZ - 0.01		HTZ - 48	26.7
727	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest	Very Low	No associated TEC	>100	TCZ - 1.25	10.4	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Scores	Future VI Scores	VI Loss (%)
		Moderate		>100	TCZ - 0.53	50.3	TCZ - 0	100.0
					ECZ - 0.16		ECZ - 8	84.1
					HTZ - nil		N/A	N/A
				<5	TCZ -0.09		TCZ - 0	100.0
					ECZ - 0.16		ECZ - 8	84.1
					HTZ - 0.04		HTZ - 46.4	7.8
		Very High		>100	TCZ - 0.82	86	TCZ - 0	100.0
					ECZ - 0.2		ECZ - 20.5	76.2
					HTZ - 0.07		HTZ - 65.8	23.5
731	Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills	Low	No associated TEC	>100	TCZ - 2.39	18.7	TCZ - 0	100.0
					ECZ - 0.01		ECZ - 7.7	58.8
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 1.53	68.3	TCZ - 0	100.0
					ECZ - 1.78		ECZ - 19.9	70.9
					HTZ - 0.27		HTZ - 67.7	0.9
		High		>100	TCZ - 0.52	81.8	TCZ - 0	100.0
					ECZ - 0.06		ECZ - 15.6	80.9
					HTZ - 0.07		HTZ - 59	27.9
952	Mountain Gum - Narrow-leaved Peppermint - Snow Gum dry shrubby open forest on undulating tablelands	Very Low	Tableland Basalt Forest	>100	TCZ - 2.28	5.7	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Low		>100	TCZ - 0.31	40.8	TCZ - 0	100.0
					ECZ - 0.08		ECZ - 5.9	85.5
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.33	45.2	TCZ - 0	100.0
					ECZ - 0.08		ECZ - 7.5	83.4
					HTZ - nil		N/A	N/A
1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands	Very Low	No associated TEC	>100	TCZ - 2.19	5.2	TCZ - 0	100.0
					ECZ - 0.1		ECZ - 2.9	44.2
					HTZ - 0.01		HTZ - 5.2	0.0
		Low		>100	TCZ - 1.95	33.4	TCZ - 0	100.0
					ECZ - 0.1		ECZ - 5.4	83.8
					HTZ - 0.09		HTZ - 32.1	3.9
				<5	TCZ - nil		N/A	N/A
					ECZ - 0.01		ECZ - 5.4	83.8
					HTZ - nil		N/A	N/A

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Scores	Future VI Scores	VI Loss (%)
		Moderate		>100	TCZ - 0.26	53.2	TCZ - 0	100.0
					ECZ - 0.24		ECZ - 11	79.3
					HTZ - 0.02		HTZ - 50.7	4.7
				<5	TCZ -0.03		TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		High		>100	TCZ - 2.99	73.3	TCZ - 0	100.0
					ECZ - 3.1		ECZ - 21.4	70.8
					HTZ - 0.98		HTZ - 67.9	7.4
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	Very Low	No associated TEC	>100	TCZ - 0.02	4.6	TCZ - 0	100.0
					ECZ - 0.08		ECZ - 2.5	45.7
					HTZ - nil		N/A	N/A
		Low		>100	TCZ - 0.28	25.6	TCZ - 0	100.0
					ECZ - 0.09		ECZ - 2.2	91.4
					HTZ - 0.09		HTZ - 27.1	-5.9
		Moderate		>100	TCZ - 0.23	48.4	TCZ - 0	100.0
					ECZ - 0.54		ECZ - 4.9	89.9
					HTZ - 0.13		HTZ - 11.2	76.9
		High		>100	TCZ - 1.24	77.1	TCZ - 0	100.0
					ECZ - 2.57		ECZ - 18.7	75.7
					HTZ - 0.66		HTZ - 53.5	30.6
		Very High		>100	TCZ - 1.18	81.4	TCZ - 0	100.0
					ECZ - 2.75		ECZ - 20.8	74.4
					HTZ - 0.95		HTZ - 54.9	32.6
1191	Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes	Low	Monaro Tableland Cool Temperate Grassy Woodland	>100	TCZ - 1.14	5.6	TCZ - 0	100.0
					ECZ - 0.01		ECZ - 0.4	92.9
					HTZ - nil		N/A	N/A
1256	Tableland swamp meadow on impeded drainage sites	Low	Montane Peatlands and Swamps	>100	TCZ - 0.16	27.8	TCZ - 0	100.0
					ECZ - 0.03		ECZ - 27.8	0.0
					HTZ - nil		N/A	N/A
1330	Yellow Box - Blakely's Red Gum grassy woodland on the tablelands	Very low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 15.26	1.1	TCZ - 0	100.0
					ECZ - 0.3		ECZ - 0.6	45.5
					HTZ - 0.04		HTZ - 1.1	0.0
				25-100	TCZ - 2.15		TCZ - 0	100.0
					ECZ -0.02		ECZ - 0.6	45.5
					HTZ - 0.02		HTZ - 1.1	0.0

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Scores	Future VI Scores	VI Loss (%)
		Low		>100	TCZ - 7.79	53.4	TCZ - 0	100.0
					ECZ - 1.91		ECZ - 13.2	75.3
					HTZ - 0.18		HTZ - 28.1	47.4
				<5	TCZ - 0.01		TCZ - 0	100.0
					ECZ - 0.13		ECZ - 13.2	75.3
					HTZ - 0.01		HTZ - 28.1	47.4
		High		>100	TCZ - 2.18	81.1	TCZ - 0	100.0
					ECZ - 2.81		ECZ - 20.2	75.1
					HTZ - 0.69		HTZ - 71.8	11.5
Total					**76.83**	-	-	-

Impacts to native vegetation within Murrumbateman

Table 13-8: Vegetation impacts within the Murrumbateman IBRA subregion

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Score	Future VI Scores	VI Loss (%)
266	White Box grassy woodland	Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 2.59	4.3	TCZ - 0	100.0
					ECZ - 0.09		ECZ - 2.4	44.2
					HTZ - nil		N/A	N/A
				<5	TCZ - 0.04		TCZ - 0	100.0
					ECZ - 0.03		ECZ - 2.4	44.2
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.25	47.8	TCZ - 0	100.0
					ECZ - 0.01		ECZ - 21.6	54.8
					HTZ - nil		N/A	N/A
278	White Box grassy woodland	Very low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 0.05	2.2	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
280	Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 0.34	5.2	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Low		>100	TCZ - 9.6	7.9	TCZ - 0	100.0
					ECZ - 0.1		ECZ - 4.2	46.8
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 1.34	32.7	TCZ - 0	100.0
					ECZ - 0.11		ECZ - 3.4	89.6
					HTZ - 0.04		HTZ - 7	78.6
				<5	TCZ - 0.19		TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		High		>100	TCZ - 1.03	62.1	TCZ - 0	100.0
					ECZ - 0.72		ECZ - 19.6	68.4
					HTZ - 0.15		HTZ - 45.6	26.6
283	Apple Box - Blakely's Red Gum moist valley and footslopes grass-forb open forest	Moderate	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 0.07	61.7	TCZ - 0	100.0
					ECZ - 0.05		ECZ - 27.5	55.4
					HTZ - nil		N/A	N/A
		High		>100	TCZ - 0.11	48.2	TCZ - 0	100.0

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Score	Future VI Scores	VI Loss (%)
					ECZ - 0.1		ECZ - 21.3	55.8
					HTZ - 0.02		HTZ - 31	35.7
		Very High		>100	TCZ - 0.28	78.9	TCZ - 0	100.0
					ECZ - 0.74		ECZ - 28.6	63.8
					HTZ - 0.21		HTZ - 67	15.1
287	Long-leaved Box - Red Box - Red Stringybark mixed open forest	Very Low	No associated TEC	>100	TCZ - 0.14	14.3	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Low		>100	TCZ - 0.64	26.9	TCZ - 0	100.0
					ECZ - 0.02		ECZ - 3.8	85.9
					HTZ - nil		N/A	N/A
				<5	TCZ - 0.01		TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		High		>100	TCZ - 0.42	56.5	TCZ - 0	100.0
					ECZ - 0.01		ECZ - 11.2	80.2
					HTZ - nil		N/A	N/A
322	Inland Scribbly Gum - Red Stringybark - Black Cypress Pine hillslope shrub-tussock grass open forest	Very Low	No associated TEC	>100	TCZ - 0.01	3.3	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		High		>100	TCZ - 0.39	75.7	TCZ - 0	100.0
					ECZ - 0.09		ECZ - 23.4	69.1
					HTZ - 0.03		HTZ - 52.2	31.0
349	Inland Scribbly Gum - Red Stringybark open forest on hills composed of silicous substrates	Low	No associated TEC	>100	TCZ - 0.83	10.4	TCZ - 0	100.0
					ECZ - 0.01		ECZ - 1.8	82.7
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.75	46.3	TCZ - 0	100.0
					ECZ - 0.03		ECZ - 9.7	79.0
					HTZ - nil		N/A	N/A
				5 - 25	TCZ - 0.69		TCZ - 0	100.0
					ECZ - 0.16		ECZ - 9.7	79.0
					HTZ - 0.07		HTZ - 46.1	0.4
		High		>100	TCZ - 0.19	77.6	TCZ - 0	100.0
					ECZ - 0.19		ECZ - 18.5	76.2
					HTZ - 0.03		HTZ - 61.3	21.0

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Score	Future VI Scores	VI Loss (%)
351	Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest	Very Low	No associated TEC	>100	TCZ - 0.33	10.8	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Low		>100	TCZ - 0.41	33.6	TCZ - 0	100.0
					ECZ - 0.04		ECZ - 2.6	75.9
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 2.27	56.7	TCZ - 0	100.0
					ECZ - 0.31		ECZ - 8.2	85.5
					HTZ - 0.14		HTZ - 39.4	30.5
352	Red Stringybark - Blakely's Red Gum hillslope open forest on meta-sediments in the Yass - Boorowa - Crookwell region	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 1.6	8.2	TCZ - 0	100.0
					ECZ - 0.03		ECZ - 1.1	86.6
					HTZ - 0.03		HTZ - 8.2	0.0
		Low		>100	TCZ - 0.24	18.2	TCZ - 0	100.0
					ECZ - 0.14		ECZ - 8.3	54.4
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.72	38.3	TCZ - 0	100.0
					ECZ - 0.65		ECZ - 5.5	85.6
					HTZ - 0.06		HTZ - 22.3	41.8
731	Broad-leaved Peppermint - Red Stringybark grassy open forest	High	No associated TEC	>100	TCZ - 0.35	69.5	TCZ -0	100.0
					ECZ - 0.1		ECZ - 27.6	60.3
					HTZ - 0.02		HTZ - 65	6.5
1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest	Very Low	No associated TEC	>100	TCZ - 0.05	5.2	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Low		>100	TCZ - 0.67	26.4	TCZ - 0	100.0
					ECZ - 0.07		ECZ - 5.4	79.5
					HTZ - 0.06		HTZ - 23.4	11.4
		Moderate		>100	TCZ - 1.64	66.8	TCZ - 0	100.0
					ECZ - 1.07		ECZ - 22.9	65.7
					HTZ - 0.22		HTZ - 56.2	15.9
		High		>100	TCZ - 2.21	83.6	TCZ - 0	100.0
					ECZ - 3.06		ECZ - 17.6	78.9
					HTZ - 0.68		HTZ - 57.4	31.3
		Very High		>100	TCZ - 1.5	76.5	TCZ - 0	100.0

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Score	Future VI Scores	VI Loss (%)
					ECZ - 1.05		ECZ - 16.5	78.4
					HTZ - 0.59		HTZ - 62.3	18.6
1330	Yellow Box - Blakely's Red Gum grassy woodland on the tablelands	Very low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 32.31	18.2	TCZ - 0	100.0
					ECZ - 0.68		ECZ - 3.7	79.7
					HTZ - 0.29		HTZ - 18.2	0.0
		Low		>100	TCZ - 8.28	35.2	TCZ - 0	100.0
					ECZ - 3.16		ECZ - 2.4	93.2
					HTZ - 0.84		HTZ - 30	14.8
				<5	TCZ - 0.03		TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 2.41	57.5	TCZ - 0	100.0
					ECZ - 2.22		ECZ - 13.9	75.8
					HTZ - 0.6		HTZ - 36.9	35.8
				<5	TCZ - 0.22		TCZ - 0	100.0
					ECZ - 0.14		ECZ - 13.9	75.8
					HTZ - 0.06		HTZ - 36.9	35.8
		High		>100	TCZ - 0.36	79	TCZ - 0	100.0
					ECZ - 0.76		ECZ - 24.1	69.5
					HTZ - 0.33		HTZ - 56.7	28.2
		Very high		>100	TCZ - 0.81	72.9	TCZ - 0	100.0
					ECZ - 1.03		ECZ - 24.3	66.7
					HTZ - 0.3		HTZ - 45.6	25.1
Total					**98.11**	-	-	-

Impacts to native vegetation within Inland Slopes

Table 13-9: Vegetation impacts in the Inland Slopes IBRA subregion

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Estimated clearing extent*(ha)	Current VI Scores	Future VI Scores	VI Loss (%)
5	River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains	Low	No associated TEC	>100	TCZ -0.69	22.1	TCZ-0	100.0
					ECZ -0.08		ECZ-5.4	75.6
					HTZ - nil		N/A	N/A
		High		>100	TCZ -0.29	47	TCZ-0	100.0
					ECZ - 0.99		ECZ-13.8	70.6
					HTZ - 0.54		HTZ-33.5	28.7
266	White Box grassy woodland in the upper slopes sub-region of the NSW South-Western Slopes Bioregion	Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ -21.2	3	TCZ-0	100.0
					ECZ -1.12		ECZ-1.6	46.7
					HTZ -0.61		HTZ-3	0.0
		Moderate		>100	TCZ -1.6	31.7	TCZ-0	100.0
					ECZ -0.16		ECZ-6.4	79.8
					HTZ -0.4		HTZ-31.7	0.0
		High		>100	TCZ -4.93	66.9	TCZ-0	100.0
					ECZ -1.99		ECZ-16.3	75.6
					HTZ -0.72		HTZ-52.6	21.4
268	White Box - Blakely's Red Gum - Long-leaved Box - Nortons Box - Red Stringybark grass-shrub woodland on shallow soils on hills	Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ -9.25	35.2	TCZ-0	100.0
					ECZ -1.17		ECZ-12.9	63.4
					HTZ -0.19		HTZ-30.3	13.9
				<5	TCZ -nil		N/A	N/A
					ECZ -0.03		ECZ-12.9	63.4
					HTZ -0.01		HTZ-30.3	13.9
		Moderate		>100	TCZ -0.01	32.3	TCZ-0	100.0
					ECZ -0.11		ECZ-4.7	85.4
					HTZ -0.03		HTZ-24.6	23.8
		High		>100	TCZ -5.03	80.8	TCZ-0	100.0
					ECZ -0.74		ECZ-19.3	76.1
					HTZ -0.31		HTZ-73.6	8.9
277	Blakely's Red Gum - Yellow Box grassy tall woodland	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ -51.39	22.5	TCZ-0	100.0
					ECZ -1.35		ECZ-4.5	80.0
					HTZ -0.41		HTZ-18.4	18.2
				5 - 25	TCZ -0.1		TCZ-0	100.0
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
				<5	TCZ -0.03		TCZ-0	100.0
					ECZ -0.04		ECZ-4.5	80.0

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Estimated clearing extent*(ha)	Current VI Scores	Future VI Scores	VI Loss (%)
					HTZ -0.02		HTZ-18.4	18.2
		Low		>100	TCZ -4.36	38.7	TCZ-0	100.0
					ECZ -3.02		ECZ-17.6	54.5
					HTZ -1.74		HTZ-32.8	15.2
				<5	TCZ -0.75		TCZ-0	100.0
					ECZ -0.44		ECZ-17.6	54.5
					HTZ -0.02		HTZ-32.8	15.2
		Moderate		>100	TCZ -1.23	70.6	TCZ-0	100.0
					ECZ -0.65		ECZ-30.4	56.9
					HTZ -0.41		HTZ-56	20.7
		High		>100	TCZ -2.11	69.7	TCZ-0	100.0
					ECZ -1.38		ECZ-28.2	59.5
					HTZ -0.61		HTZ-45.6	34.6
278	Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ -6.65	6.2	TCZ-0	100.0
					ECZ -0.22		ECZ-0.9	85.5
					HTZ -0.12		HTZ-1.5	75.8
		Moderate		>100	TCZ -1.16	25.6	TCZ- 0	100.0
					ECZ -2.12		ECZ-5.2	79.7
					HTZ -0.94		HTZ-9.3	63.7
				<5	TCZ -0.18		TCZ-0	100.0
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
		High		>100	TCZ -0.68	68.2	TCZ-0	100.0
					ECZ -1.05		ECZ- 18.7	72.6
					HTZ -0.47		HTZ-41.3	39.4
280	Red Stringybark - Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ -17.65	4.2	TCZ-0	100.0
					ECZ -0.89		ECZ-2.3	45.2
					HTZ -0.20		HTZ-4.2	0.0
				<5	TCZ -0.24		TCZ-0	100.0
					ECZ -0.28		ECZ-2.3	45.2
					HTZ -0.14		HTZ-4.2	0.0
		Low		>100	TCZ -0.02	7.4	TCZ-0	100.0
					ECZ -0.02		ECZ-3.7	50.0
					HTZ -nil		N/A	N/A
		Moderate		>100	TCZ -5.55	45.1	TCZ-0	100.0
					ECZ -1.41		ECZ-12.3	72.7
					HTZ -0.65		HTZ-32.8	27.3

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Estimated clearing extent*(ha)	Current VI Scores	Future VI Scores	VI Loss (%)
				25-100	TCZ -0.74		TCZ-0	100.0
					ECZ -0.43		ECZ-12.3	72.7
					HTZ -0.16		HTZ-32.8	27.3
		High		>100	TCZ -8.05	67.1	TCZ-0	100.0
					ECZ -4.18		ECZ-20.7	69.2
					HTZ -1.58		HTZ-53.6	20.1
				25-100	TCZ -0.61		TCZ-0	100.0
					ECZ -0.11		ECZ-20.7	69.2
					HTZ -0.03		HTZ-53.6	20.1
287	Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes	Very Low	No associated TEC	>100	TCZ -0.25	12.3	TCZ-0	100.0
					ECZ -0.02		ECZ-0	100.0
					HTZ -nil		N/A	N/A
		Low		>100	TCZ -0.06	26	TCZ-0	100.0
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
		Moderate		>100	TCZ -0.49	42.1	TCZ-0	100.0
					ECZ -0.32		ECZ-8.2	80.5
					HTZ -0.02		HTZ-17.7	58.0
290	Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills	Very Low	No associated TEC	>100	TCZ -1.86	18	TCZ-0	100.0
					ECZ -0.23		ECZ-1	94.4
					HTZ -0.01		HTZ-1.9	89.4
		Low		>100	TCZ -1.18	18.4	TCZ-0	100.0
					ECZ -0.58		ECZ-4.1	77.7
					HTZ -0.15		HTZ-15.1	17.9
				<5	TCZ -0.15		TCZ-0	100.0
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
		High		>100	TCZ -0.65	76.5	TCZ-0	100.0
					ECZ -0.48		ECZ-28.6	62.6
					HTZ -0.18		HTZ-69.5	9.2
294	Nortons Box - Red Box - White Box tussock grass open forest	Moderate	No associated TEC	>100	TCZ -NIL	27.1	N/A	N/A
					ECZ -0.04		ECZ-2	92.6
					HTZ -nil		N/A	N/A
297	Broad-leaved Peppermint - Nortons Box - Red Stringybark tall open forest on red clay on hills	Low	No associated TEC	>100	TCZ -0.46	11.5	TCZ-0	100.0
					ECZ -0.02		ECZ-5.5	100.0
					HTZ -nil		N/A	N/A
		Moderate		>100	TCZ -0.42	52.7	TCZ-0	100.0

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Estimated clearing extent*(ha)	Current VI Scores	Future VI Scores	VI Loss (%)
					ECZ -0.16		ECZ-20.6	60.9
					HTZ -0.02		HTZ-49.5	6.1
299	Riparian Ribbon Gum - Robertsons Peppermint - Apple Box riverine very tall open forest	Very Low	No associated TEC	>100	TCZ -0.24	5.2	TCZ-0	100.0
					ECZ -0.64		ECZ-5.2	0.0
					HTZ -0.21		HTZ-5.2	0.0
		Low		>100	TCZ -0.24	40.8	TCZ-0	100.0
					ECZ -0.09		ECZ-7.6	81.4
					HTZ -nil		N/A	N/A
301	Drooping Sheoke - Ricinocarpus bowmannii - grasstree tall open shrubland of the Coolac - Tumut Serpentinite Belt	Low	Coolac-Tumut Serpentinite Shrubby Woodland	>100	TCZ -0.63	24.3	TCZ-0	100.0
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
		Moderate		>100	TCZ -0.42	37.1	TCZ-0	100.0
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
		High		>100	TCZ -0.37	66.2	TCZ-0	100.0
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
306	Red Box - Red Stringybark - Nortons Box hill heath shrub - tussock grass open forest of the Tumut region	Very Low	No associated TEC	>100	TCZ -3.08	18	TCZ-0	100.0
					ECZ -0.03		ECZ-1	94.4
					HTZ -0.07		HTZ-1.9	89.4
				<5	TCZ -0.03		TCZ-0	100.0
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
		Low		>100	TCZ -1.92	21.6	TCZ-0	100.0
					ECZ -0.48		ECZ-8.4	61.1
					HTZ -0.44		HTZ-20.4	5.6
		High		>100	TCZ -0.64	63.6	TCZ-0	100.0
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
314	Apple Box - Red Stringybark basalt scree open forest in the upper Murray River region	Very Low	No associated TEC	>100	TCZ -3.98	3.6	TCZ-0	100.0
					ECZ -0.45		ECZ-2	44.4
					HTZ -0.1		HTZ-3.6	0.0
		Low		>100	TCZ -1.16	11.5	TCZ-0	100.0
					ECZ -0.43		ECZ-5.5	52.2
					HTZ -0.19		HTZ-9.6	16.5
		Moderate		>100	TCZ -5.17	43.5	TCZ-0	100.0
					ECZ -4.07		ECZ-6.5	85.1

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Estimated clearing extent*(ha)	Current VI Scores	Future VI Scores	VI Loss (%)
					HTZ -2.08		HTZ-41.2	5.3
		Very high		>100	TCZ -4.4	100	TCZ-0	100.0
					ECZ -0.9		ECZ-23.6	76.4
					HTZ -0.57		HTZ-85.3	14.7
316	Nortons Box - Red Box - Red Stringybark +/- Nodding Flax Lily forb-grass open forest	Low	No associated TEC	>100	TCZ -2.54	19.2	TCZ-0	100.0
					ECZ -0.08		ECZ-2	89.6
					HTZ -0.07		HTZ-17.4	9.4
		Moderate		>100	TCZ -0.98	21.5	TCZ-0	100.0
					ECZ -0.14		ECZ-2.1	90.2
					HTZ -0.05		HTZ-21.5	0.0
		High		>100	TCZ -0.8	66.2	TCZ-0	100.0
					ECZ -0.13		ECZ-18.3	72.4
					HTZ -0.19		HTZ-58.9	11.0
		Very high		>100	TCZ -3.27	90.4	TCZ-0	100.0
					ECZ -3.64		ECZ-28.7	68.3
					HTZ -1.04		HTZ-81.4	10.0
319	Tumbledown Red Gum - White Cypress Pine hill woodland	Low	No associated TEC	>100	TCZ -0.58	21.3	TCZ-0	100.0
					ECZ -0.05		ECZ-3.4	100.0
					HTZ -nil		N/A	N/A
		High		>100	TCZ -0.6	54.1	TCZ-0	100.0
					ECZ -0.07		ECZ-16.2	100.0
					HTZ -0.02		HTZ-53.8	0.6
343	Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates	Very Low	No associated TEC	>100	TCZ -3.21	11.9	TCZ-0	100.0
					ECZ -0.05		ECZ-6.7	43.7
					HTZ -0.01		HTZ-11.9	0.00
		Low		>100	TCZ -nil	26	N/A	N/A
					ECZ -0.04		ECZ-8.3	68.1
					HTZ -nil		N/A	N/A
		Moderate		>100	TCZ -1.65	44.8	TCZ-0	100.0
					ECZ -0.71		ECZ-10.2	77.2
					HTZ -0.03		HTZ-21.2	52.7
352	Red Stringybark - Blakely's Red Gum hillslope open forest on meta-sediments	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ -3.25	7.4	TCZ-0	100.0
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
		Low		>100	TCZ -0.78	17.4	TCZ-0	100.0
					ECZ -0.05		ECZ-8	54.0
					HTZ -0.06		HTZ-8.1	53.4

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Estimated clearing extent*(ha)	Current VI Scores	Future VI Scores	VI Loss (%)
				<25	TCZ -0.05		TCZ-0	100.0
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
731	Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills	Very Low	No associated TEC	>100	TCZ -1.1	18.3	TCZ-0	100.0
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
		Low			TCZ -0.28	17.7	TCZ-0	100.0
					ECZ -0.01		ECZ-7.2	59.3
					HTZ -0.05		HTZ-13.2	25.4
1191	Snow Gum - Candle Bark woodland on broad valley flats	Low	No associated TEC	>100	TCZ -0.14	38.1	TCZ-0	100.0
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
Total					**245.29**			-

Impacts to native vegetation within Bondo

Table 13-10: Vegetation zones within the Bondo IBRA subregion

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Score	Future VI Scores	VI Loss (%)
285	Broad-leaved Sally grass - sedge woodland on valley flats and swamps	Low	No associated TEC	>100	TCZ - 0.01	21.5	TCZ - 0	100.0
					ECZ - 0.66		ECZ - 0.7	96.7
					HTZ - 0.07		HTZ - 8.3	61.4
295	Robertsons Peppermint - Broad-leaved Peppermint - Nortons Box - stringybark shrub-fern open forest	Low	No associated TEC	>100	TCZ - 0.08	28	TCZ - 0	100.0
					ECZ - 0.04		ECZ - 2.8	90.0
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.69	53.7	TCZ - 0	100.0
					ECZ - 0.77		ECZ - 11.5	78.6
					HTZ - 0.2		HTZ - 34	36.7
296	Brittle Gum - peppermint open forest of the Woomargama to Tumut region	Low	No associated TEC	>100	TCZ - 0.02	25.1	TCZ - 0	100.0
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
299	Riparian Ribbon Gum - Robertsons Peppermint - Apple Box riverine very tall open forest	Very Low	No associated TEC	>100	TCZ - 0.19	5.4	TCZ - 0	100.0
					ECZ - 0.42		ECZ - 5.4	0.0
					HTZ - 0.63		HTZ - 5.4	0.0
		Moderate		>100	TCZ - 0.77	57.6	TCZ - 0	100.0
					ECZ - 0.36		ECZ - 13.7	76.2
					HTZ - 0.25		HTZ - 56.1	2.6
953	Mountain Gum - Snow Gum - Broad-leaved Peppermint shrubby open forest of montane ranges	Very Low	Tableland Basalt Forest	>100	TCZ - 2.56	5.4	TCZ - 0	100.0
					ECZ - 0.23		ECZ - 5.4	0.0
					HTZ - 0.19		HTZ - 5.4	0.0
		Low		>100	TCZ - 2.1	27.9	TCZ - 0	100.0
					ECZ - 0.16		ECZ - 2.8	90.0
					HTZ - 0.07		HTZ - 31.2	+11.8
		High		>100	TCZ - 9.63	69.6	TCZ - 0	100.0
					ECZ - 10.72		ECZ - 7.3	89.5
					HTZ - 7.76		HTZ - 53.8	22.7
		Very High		>100	TCZ - 0.16	90.7	TCZ - 0	100.0

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Score	Future VI Scores	VI Loss (%)
					ECZ - 0.03		ECZ - 17.3	80.9
					HTZ - 0.07		HTZ - 65.3	28.0
Total					**38.84**	-	-	-

Impacts to native vegetation within Snowy Mountains

Table 13-11: Vegetation impacts within Snowy Mountains IBRA subregion

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Score	Future VI Scores	VI Loss (%)
300	Ribbon Gum - Narrow-leaved (Robertsons) Peppermint montane fern - grass tall open forest on deep clay loam soils	Low	No associated TEC	>100	TCZ - 0.23	27.6	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - 0.29		HTZ - 5.3	80.8
		Moderate		>100	TCZ - 0.01	45.9	TCZ - 0	100.0
					ECZ - 0.11		ECZ - 2.4	94.8
					HTZ - 0.26		HTZ - 45.9	0.0
		High		>100	TCZ - 5.08	76.7	TCZ - 0	100.0
					ECZ - 6.54		ECZ - 17.6	77.1
					HTZ - 11.31		HTZ - 59.3	22.7
638	Alpine Ash - Mountain Gum moist shrubby tall open forest of montane areas	High	No associated TEC	>100	TCZ - 5.63	65.3	TCZ - 0	100.0
					ECZ - 8.29		ECZ - 17.2	73.7
					HTZ - 16.63		HTZ - 50.8	22.2
679	Black Sallee - Snow Gum low woodland of montane valleys	Low	No associated TEC	>100	TCZ - 0.16	32.9	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - 0.06		HTZ - 32.9	0.0
		High		>100	TCZ - 0.95	69.8	TCZ - 0	100.0
					ECZ - 1.11		ECZ - 23.3	66.6
					HTZ - 1.32		HTZ - 51.6	26.1
939	Montane wet heath and bog of the eastern tablelands	Very High	Montane Peatlands and Swamps	>100	TCZ - 0.32	71	TCZ - 0	100.0
					ECZ - 0.02		ECZ - 56.5	20.4
					HTZ - 0.22		HTZ - 71.1	+0.14
953	Mountain Gum - Snow Gum - Broad-leaved Peppermint shrubby open forest of montane ranges	Low	No associated TEC	>100	TCZ - 3	24.7	TCZ - 0	100.0
					ECZ - 0.31		ECZ - 2.5	89.9
					HTZ - 1.12		HTZ - 27.7	+12.15
		Moderate		>100	TCZ - 0.02	48.8	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		High		>100	TCZ - 0.06	45.7	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Very High		>100	TCZ - 19.44	76	TCZ - 0	100.0
					ECZ - 28.35		ECZ - 16	78.9
					HTZ - 34.2		HTZ - 56.1	26.2

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Score	Future VI Scores	VI Loss (%)
1196	Snow Gum - Mountain Gum shrubby open forest of montane areas	Low	No associated TEC	>100	TCZ - 0.38	35	TCZ - 0	100.0
					ECZ - 0.03		ECZ - 2.1	94.0
					HTZ - 0.27		HTZ - 35	0.0
		High		>100	TCZ - 6.38	73.4	TCZ - 0	100.0
					ECZ - 12.28		ECZ - 20.9	71.5
					HTZ - 12.34		HTZ - 62.9	14.3
1224	Sub-alpine dry grasslands and heathlands of valley slopes	High	No associated TEC	>100	TCZ - 0.25	87.2	TCZ - 0	100.0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
Total					**176.97**	-	-	-

13.3.2 Impacts to threatened ecological communities

Table 13-12 and Figure 13-2 document potential direct impacts to TECs as a result of the project relative to each IBRA subregion. A total of five BC Act and two EPBC Act TECs could be impacted intersecting the indicative disturbance area. Each impact area provided is the sum of all clearing within each of the three clearing zones (TCZ/ECZ and HTZ). Total clearing areas for each TEC are as follows:

- 311.78 hectares of BC Act and 111.47 hectares of EBPC Act listed *White Box – Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South-Eastern Highlands, NSW South-Western Slopes, South-East Corner and Riverina Bioregion*
- 1.42 hectares of BC Act listed *Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South-Western Slopes and South-Eastern Highlands Bioregions*
- 37.42 hectares of BC Act listed *Tableland Basalt Forest in the Sydney Basin and South-Eastern Highlands Bioregions*
- 0.75 hectares of BC Act and 0.56 hectares of EPBC Act listed *Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South-East Corner, South-Eastern Highlands and Australian Alps bioregion / Alpine Sphagnum Bogs and Associated Fens*
- 1.7 hectares of BC Act listed *Monaro Tableland Cool Temperate Grassy Woodland in the South-Eastern Highlands Bioregion.*

Table 13-12: Direct impacts to threatened ecological communities

Threatened ecological community	BC Act	EPBC Act	SAII	Impacts (ha)						
				BUN	CRO	MUR	INL	BON	SNO	All IBRA subregions
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South-Eastern Highlands, NSW South-Western Slopes, South-East Corner and Riverina Bioregion	CE	CE	Y	16.41	38.42	76.56	180.39	-	-	311.78
				16.39 (EPBC)	18.56 (EPBC)	28.4 (EPBC)	48.12 (EPBC)	-	-	111.47 (EPBC)
Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South-Western Slopes and South-Eastern Highlands Bioregions	E	-	Y	-	-	-	1.42	-	-	1.42
Tableland Basalt Forest in the Sydney Basin and South-Eastern Highlands Bioregions	E	-	Y	0.66	3.08	-	-	33.68	-	37.42
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South-East Corner, South-Eastern Highlands and Australian Alps bioregion / Alpine Sphagnum Bogs and Associated Fens	E	E	N	-	0.19	-	-	-	0.56	0.75
				-	-	-	-	-	0.56 (EPBC)	0.56 (EPBC)
Monaro Tableland Cool Temperate Grassy Woodland in the South-Eastern Highlands Bioregion	CE	-	Y	-	1.7	-	-	-	-	1.7

Note: BC Act = *Biodiversity Conservation Act 2016*, EPBC Act = *Environment Protection Biodiversity Conservation Act 1999*, BUN = Bungonia IBRA subregion, CRO = Crookwell IBRA subregion, MUR = Murrumbateman IBRA subregion, INL = Inland Slopes IBRA subregion, BON= Bondo IBRA subregion, SNO = Snowy Mountains IBRA subregion.

13.3.3 Impacts to threatened species and their habitat

Direct impacts to species credit species

A total of 58 threatened flora species, 33 threatened fauna species (including five frogs, two insects, three reptiles, 12 birds and 11 mammals) and two endangered fauna populations listed under the BC Act have the potential to be impacted by the project.

A summary of potential direct impacts on threatened species credit species as a result of the project, including recorded and assumed habitat, is shown in Figure 13-3 to Figure 13-12 and documented in Table 13-13. These calculations exclude any Category 1 exempt lands. Threatened fauna habitat subject to clearing within Category 1 exempt lands is documented in Attachment 21.

Potential impacts presented below are higher than impacts that will occur from the project due to the required BAM method employed, survey limitations and a reduction in impacts due to avoidance and mitigation measures detailed within Chapter 14 of this report. Table 15-8 and Table 15-9 of this report further classifies impacts for the below species into species likely to be impacted versus species with limited potential to be impacted.

Table 13-13: Summary of direct impacts to threatened species credit species

Scientific name	Common name	BC Act	EPBC Act	SAII	IBRA subregion	Direct impact potential (ha)	Species habitat status within IBRA subregion (BioNet, 2022)
Acacia ausfeldii	Ausfeld's Wattle	V	-	False	Inland Slopes	14.6	Known
Acacia bynoeana	Bynoe's Wattle	E	V	False	Bungonia	1.2	Predicted
					Crookwell	1.8	Known
Acacia flocktoniae	Flockton Wattle	V	V	False	Bungonia	14.3	Known
Acacia phasmoides	Phantom Wattle	V	V	True	Inland Slopes	0.8	Known
Ammobium craspedioides	Yass Daisy	V	V	False	Bondo	1.6	Known
					Crookwell	32.8	Known
					Inland Slopes	101.4	Known
					Murrumbateman	40.4	Known
Aprasia parapulchella	Pink-tailed Legless Lizard	V	V	False	Bungonia	6.0	Known
					Crookwell	11.4	Known
					Inland Slopes	86.3	Known
					Murrumbateman	37.1	Known
Baloskion longipes	Dense Cord-rush	V	V	False	Bungonia	1.2	Predicted
Bossiaea fragrans	Bossiaea fragrans	CE	CE	True	Inland Slopes	6.1	Known
Bossiaea oligosperma	Few-seeded Bossiaea	V	V	False	Bungonia	1.2	Known
Burhinus grallarius	Bush Stone-curlew	E	-	False	Inland Slopes	60.5	Known
Caesia parviflora var. minor	Small Pale Grass-lily	E	-	False	Inland Slopes	0.2	Known
Caladenia concolor	Crimson Spider Orchid	E	V	True	Inland Slopes	30.5	Known
					Murrumbateman	3.6	Predicted

Scientific name	Common name	BC Act	EPBC Act	SAII	IBRA subregion	Direct impact potential (ha)	Species habitat status within IBRA subregion (BioNet, 2022)
Caladenia tessellata	Thick Lip Spider Orchid	E	V	True	Bungonia	16.0	Known
Callocephalon fimbriatum	Gang-gang Cockatoo	V	E	N/A	Bondo	22.1	Known
					Bungonia	14.8	Known
					Crookwell	29.7	Known
					Inland Slopes	45.4	Known
					Murrumbateman	28.6	Known
					Snowy Mountains	165.8	Known
Calotis glandulosa	Mauve Burr-daisy	V	V	True	Snowy Mountains	16.0	Known
Calotis pubescens	Max Mueller's Burr-daisy	E	-	False	Snowy Mountains	0.3	Known
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	V	N/A	Bungonia	12.2	Known
					Crookwell	23.6	Known
					Inland Slopes	11.5	Known
					Murrumbateman	18.8	Known
Cercartetus nanus	Eastern Pygmy-possum	V	-	False	Bondo	21.7	Known
					Bungonia	5.2	Known
					Crookwell	22.7	Known
					Inland Slopes	16.3	Known
					Murrumbateman	6.0	Known
					Snowy Mountains	121.9	Known
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	True	Bungonia	7.7	Known
Commersonia prostrata	Dwarf Kerrawang	E	E	False	Crookwell	0.8	Predicted
Crinia sloanei	Sloane's Froglet	E	E	False	Inland Slopes	2.6	Known
Cullen parvum	Small Scurf-pea	E	-	False	Inland Slopes	71.7	Known
Cyclodomorphus praealtus	Alpine She-oak Skink	E	E	False	Snowy Mountains	12.2	Known
Delma impar	Striped Legless Lizard	V	V	False	Bungonia	16.0	Predicted
					Crookwell	33.5	Predicted
					Inland Slopes	70.1	Known
					Murrumbateman	54.8	Known
Dillwynia glaucula	Michelago Parrot-pea	E	-	False	Bungonia	1.7	Known
Diuris aequalis	Buttercup Doubletail	E	V	False	Bungonia	3.6	Known
					Crookwell	24.7	Known
Diuris ochroma	Pale Golden Moths	E	V	True	Snowy Mountains	0.3	Known
Diuris tricolor	Pine Donkey Orchid	V	-	False	Inland Slopes	1.4	Known
Eucalyptus aggregata	Black Gum	V	V	False	Crookwell	1.1	Known
					Inland Slopes	0.1	Predicted

Scientific name	Common name	BC Act	EPBC Act	SAII	IBRA subregion	Direct impact potential (ha)	Species habitat status within IBRA subregion (BioNet, 2022)
Eucalyptus alligatrix subsp. alligatrix	Eucalyptus alligatrix subsp. alligatrix	V	V	True	Inland Slopes	1.1	Known
Eucalyptus cannonii	Capertee Stringybark	V	-	False	Inland Slopes	4.4	Known
Eucalyptus macarthurii	Paddys River Box, Camden Woollybutt	E	E	False	Bungonia	10.2	Known
Eucalyptus robertsonii subsp. hemisphaerica	Robertson's Peppermint	V	V	True	Crookwell	0.3	Predicted
Euphrasia arguta	Euphrasia arguta	CE	CE	True	Inland Slopes	92.9	Predicted
Euphrasia scabra	Rough Eyebright	E	-	True	Snowy Mountains	1.9	Predicted
Genoplesium superbum	Superb Midge Orchid	E	-	True	Bungonia	8.8	Known
Glycine latrobeana	Clover Glycine	CE	V	True	Snowy Mountains	0.3	Known
Grevillea iaspicula	Wee Jasper Grevillea	CE	E	True	Murrumbateman	3.9	Known
Grevillea wilkinsonii	Tumut Grevillea	CE	E	True	Inland Slopes	34.7	Known
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-	N/A	Bondo	0.4	Known
					Crookwell	0.01	Known
					Inland Slopes	14.9	Known
					Murrumbateman	3.3	Known
Hieraaetus morphnoides	Little Eagle	V	-	N/A	Bondo	32.9	Known
					Bungonia	19.2	Known
					Crookwell	28.3	Known
					Inland Slopes	108.9	Known
					Murrumbateman	38.0	Known
					Snowy Mountains	170.5	Known
Irenepharsus magicus	Elusive Cress	E	-	True	Snowy Mountains	26.5	Predicted
Keyacris scurra	Key's Matchstick Grasshopper	E	-	False	Bungonia	16.4	Known
					Crookwell	36.7	Predicted
					Inland Slopes	116.4	Known
					Murrumbateman	59.5	Known
Kunzea cambagei	Cambage Kunzea	V	V	False	Bungonia	12.2	Known
Lepidium hyssopifolium	Aromatic Peppercress	E	E	False	Crookwell	36.4	Predicted
Leucochrysum albicans var. tricolor	Hoary Sunray	E	E	False	Bondo	30.8	Predicted
					Bungonia	11.4	Known
					Crookwell	31.8	Known
					Inland Slopes	12.2	Known
					Murrumbateman	32.4	Known
					Snowy Mountains	64.0	Known

Scientific name	Common name	BC Act	EPBC Act	SAII	IBRA subregion	Direct impact potential (ha)	Species habitat status within IBRA subregion (BioNet, 2022)
Litoria booroolongensis	Litoria booroolongensis	E	E	False	Bondo	0.1	Known
Litoria castanea	Yellow-spotted Tree Frog	CE	CE	True	Crookwell	0.8	Predicted
					Snowy Mountains	0.6	Predicted
Lophoictinia isura	Square-tailed Kite	V	-	N/A	Bondo	29.2	Known
					Inland Slopes	75.1	Known
					Murrumbateman	19.6	Known
Mastacomys fuscus	Broad-toothed Rat	V	V	False	Snowy Mountains	2.2	Known
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	N/A	Murrumbateman	0.1	Known
Mixophyes balbus	Stuttering Frog	E	V	True	Bungonia	13.8	Known
Myotis macropus	Southern Myotis	V	-	False	Bondo	1.0	Known
					Bungonia	2.1	Known
					Inland Slopes	2.4	Known
					Murrumbateman	8.1	Known
Ninox connivens	Barking Owl	V	-	N/A	Bondo	21.4	Known
					Bungonia	14.8	Known
					Inland Slopes	41.3	Known
					Snowy Mountains	99.5	Known
Ninox strenua	Powerful Owl	V	-	N/A	Bondo	21.4	Known
					Bungonia	14.8	Known
					Crookwell	27.6	Known
					Inland Slopes	4.9	Known
					Murrumbateman	26.4	Known
					Snowy Mountains	121.9	Known
Persoonia marginata	Clandulla Geebung	V	V	False	Inland Slopes	1.2	Predicted
Persoonia mollis subsp. revoluta	Persoonia mollis subsp. revoluta	V	-	False	Bungonia	8.0	Known
Petauroides volans	Greater Glider	E	E	False	Bondo	20.5	Known
					Bungonia	14.1	Known
					Crookwell	4.0	Known
					Murrumbateman	1.7	Known
					Inland Slopes	3.1	Known
					Snowy Mountains	74.6	Known
Petaurus australis - endangered population	Yellow-bellied Glider population on the Bago Plateau	EP	-	N/A	Snowy Mountains	19.4	Known
Petaurus norfolcensis	Squirrel Glider	V	-	False	Bondo	21.1	Known
					Bungonia	14.6	Known

Scientific name	Common name	BC Act	EPBC Act	SAII	IBRA subregion	Direct impact potential (ha)	Species habitat status within IBRA subregion (BioNet, 2022)
					Crookwell	14.4	Known
					Inland Slopes	46.7	Known
					Murrumbateman	12.5	Known
					Snowy Mountains	61.2	Known
Petaurus norfolcensis - endangered population	Squirrel Glider	EP	-	N/A	Inland Slopes	46.7	Known
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	True	Bungonia	1.1	Known
Petroica rodinogaster	Pink Robin	V	-	False	Bondo	30.6	Known
					Bungonia	12.2	Known
					Inland Slopes	0.3	Known
					Snowy Mountains	169.9	Known
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	False	Bondo	21.1	Predicted
					Snowy Mountains	108.8	Known
Phascolarctos cinereus	Koala	E	E	False	Bondo	32.9	Known
					Bungonia	19.4	Known
					Crookwell	39.2	Known
					Inland Slopes	114.7	Known
					Murrumbateman	41.7	Known
					Snowy Mountains	170.5	Known
Phyllota humifusa	Dwarf Phyllota	V	V	False	Bungonia	11.4	Predicted
Polytelis swainsonii	Superb Parrot	V	V	N/A	Crookwell	7.2	Known
					Inland Slopes	34.6	Known
					Murrumbateman	18.0	Known
Pomaderris cotoneaster	Cotoneaster Pomaderris	E	E	False	Bungonia	11.7	Known
Pomaderris delicata	Delicate Pomaderris	CE	CE	True	Bungonia	8.0	Known
Pomaderris pallida	Pale Pomaderris	V	V	True	Murrumbateman	0.8	Known
Prasophyllum bagoense	Bago Leek-orchid	CE	CE	True	Snowy Mountains	31.9	Known
Prasophyllum innubum	Brandy Marys Leek-orchid	CE	CE	True	Snowy Mountains	0.3	Known
Prasophyllum keltonii	Kelton's Leek Orchid	CE	CE	True	Snowy Mountains	31.7	Known
Prasophyllum petilum	Tarengo Leek Orchid	E	E	False	Inland Slopes	13.3	Known
					Murrumbateman	11.2	Predicted
Prasophyllum sp. Wybong	Prasophyllum sp. Wybong	-	CE	True	Inland Slopes	87.8	Predicted
Pseudomys fumeus	Smoky Mouse	CE	E	True	Bondo	0.1	Known
					Snowy Mountains	132.6	Known

Scientific name	Common name	BC Act	EPBC Act	SAII	IBRA subregion	Direct impact potential (ha)	Species habitat status within IBRA subregion (BioNet, 2022)
Pseudophryne corroboree	Southern Corroboree Frog	CE	CE	True	Snowy Mountains	22.2	Known
Pterostylis alpina	Alpine Greenhood	V	-	False	Snowy Mountains	24.4	Known
Pterostylis foliata	Slender Greenhood	V	-	False	Snowy Mountains	36.5	Known
Pterostylis oreophila	Blue-tongued Greenhood	CE	CE	True	Snowy Mountains	0.6	Known
Pultenaea humilis	Dwarf Bush-pea	V	-	False	Inland Slopes	4.2	Known
Rutidosis leiolepis	Monaro Golden Daisy	V	V	False	Snowy Mountains	0.3	Known
Senecio garlandii	Woolly Ragwort	V	-	False	Inland Slopes	1.2	Known
Solanum armourense	Solanum armourense	E	-	True	Bungonia	0.5	Known
Swainsona recta	Small Purple-pea	E	E	False	Inland Slopes	91.2	Known
					Murrumbateman	35.8	Known
Swainsona sericea	Silky Swainson-pea	V	-	False	Bungonia	11.2	Predicted
					Inland Slopes	129.3	Known
					Murrumbateman	46.6	Known
Synemon plana	Golden Sun Moth	V	V	False	Inland Slopes	19.8	Known
					Murrumbateman	16.1	Known
Thelymitra alpicola	Alpine Sun-orchid	V	-	False	Snowy Mountains	0.6	Known
Thesium australe	Austral Toadflax	V	V	False	Bungonia	15.0	Predicted
					Crookwell	30.3	Predicted
					Murrumbateman	41.3	Predicted
					Snowy Mountains	23.7	Known
Tyto novaehollandiae	Masked Owl	V	-	N/A	Bondo	20.5	Known
					Bungonia	14.7	Known
					Inland Slopes	27.8	Known
					Snowy Mountains	99.5	Known
Tyto tenebricosa	Sooty Owl	V	-	N/A	Snowy Mountains	21.2	Known
Xerochrysum palustre	Swamp Everlasting	-	V	False	Snowy Mountains	1.5	Known
Zieria obcordata	Granite Zieria	E	E	True	Inland Slopes	43.4	Known

13.3.4 Impacts to Groundwater Dependent Ecosystems

Proposed construction and operational activities associated with the project are unlikely to pose a significant risk to groundwater dependent ecosystems given impacts to ground water quality and flow would be negligible (*Technical Report 12 – Surface Water and Groundwater Impact Assessment*).

Project construction would not involve deep excavations or tunnelling activities likely to result in groundwater drawdown. Excavation up to five metres depth and piling up to 27 metres depth is proposed for transmission line structure foundations. These which would generally be located within elevated parts of the landscape outside of riparian areas and associated alluvials where ground-surface water interaction is most likely. Whilst some ground surface compaction is likely due to proposed earthworks and access track construction this would not involve significant grouting or introduction of hardstand and would not pose any significant barrier to ongoing groundwater recharge.

The storage and use of chemicals during construction and ongoing infrastructure maintenance may pose an increased risk to groundwater quality (such as from hydrocarbon spill). However, this risk is considered negligible where effective controls are implemented to guide the storage and management of chemicals and other substances posing a potential hazard to sensitive receiving environments.

13.4 Indirect impacts

Table 13-14 provides an assessment of potential indirect impacts on native vegetation, threatened entities and their habitat as a result of the project. The nature, extent, frequency, duration, and timing of indirect impacts has been identified including proposed mitigation measures to be implemented during construction and operation of the project. The general extent of indirect impacts is shown in Figure 13-1 (Attachment 1), except where Table 13-14 indicates these are limited to the final disturbance area.

Table 13-14: Assessment of indirect impacts associated with the project

Indirect impact	Timing	Nature / impacted entities	Consequence	Extent	Duration	Mitigation
Inadvertent impacts on adjacent habitat or vegetation	Construction and operation	PCTs, TECs and threatened flora and fauna and aquatic habitats situated at the construction interface	There is a risk of disturbance and/ or destruction of adjacent habitats and vegetation through soil disturbance and construction activities and unauthorised vehicle movements potentially resulting in accidental clearing, sedimentation and erosion and mobilisation of contaminants within the disturbance area and into adjoining native vegetation and aquatic habitats. However, the consequence of the impacts is expected to be minor following the implementation of further design refinement and mitigation measures to protect these areas.	Adjacent (ie within 100 m) of the final disturbance area	Short-term	At a minimum, the BMP would include the following measures for the protection and management of adjacent areas: • Development of a Connectivity Strategy to mitigate impacts to connectivity. • Adjacent habitats and vegetation would be identified as a no-go zone within approved plans and on-site demarcation. • High visibility protection fencing would be erected on site including signage clearly identifying these areas as no-go zones. • Requirements for the protection and management of no-go zones to be addressed as a part of the site induction. • Work within proximity of aquatic ecosystems would require stringent erosion and sediment controls to avoid increased run-off and pollutant loads. Further detail on the above mitigation options is outlined in Chapter 14, and Appendix 21.
Reduced viability of adjacent habitat due to noise,	Construction	Nocturnal fauna	Areas within the project footprint (substations, workers accommodation facility etc), would likely require artificial lighting. Adjacent habitats are likely to be subject to disturbance during the	Adjacent (ie within 100 m) to the final disturbance area.	Short-term	Light spill would be managed as follows: • Directional lighting would be used for any permanent lighting required (i.e.,

Indirect impact	Timing	Nature / impacted entities	Consequence	Extent	Duration	Mitigation
dust, or light spill			construction phase as a result of increased noise, dust, and light spill. Light is a natural stimulus, which impacts on the physiology, behaviour, and movement of all organisms. Artificial lighting alters the length of the natural photoperiod, disrupting the natural circadian rhythm and sensory ecology of organisms. This change in photoperiod can affect the foraging, breeding, and dispersal behaviours of fauna. In addition, fauna also use lighting cues as a means for predator detection and habitat selection, both of which are impacted by the introduction of artificial light (Blackwell *et al.*, 2015). Based on available research, other impacts resulting from increased light pollution include (Altringham & Kerth, 2016; Haddock *et al.,* 2019): • potential decrease in species abundance and diversity • resource partitioning and shifts in foraging niches • increased predation • alterations to trophic interactions • physiological influences on species • potential behavioural adaptions. Increased light, noise and dust spill appears to have some level of influence on all trophic levels within urban terrestrial ecosystems, which in turn may result in both positive and negative feedback effects and impact overall ecosystem health. Although these impacts would be short-term and are unlikely to have long-term adverse effects on the viability of adjacent habitats.			substation) to minimise light spill as much as possible. • Wherever possible, artificial lighting required during construction will be directed away from remnant vegetation. • Temporary artificial light impacts during construction (ie worker accommodation facility and work sites) would be managed through shielding/directing light spill away from sensitive areas. All feasible and reasonable measures would be applied to reduce the potential noise and vibration impacts from the project. Specific mitigation measures have been recommended based on the predicted impacts (SLR, 2023). Exact mitigation strategies would be determined as the project progresses. The principal contractor would be required to prepare a Noise and Vibration Management Plan (NVMP), detailing the implemented mitigation measures and strategies (SLR, 2023). Further detail is provided in *Technical Report 9 – Noise and Vibration Impact Assessment.* Dust suppression would be addressed as per below: • Reduced vehicle speeds during the construction phase. • No dust generating work would be conducted during high winds.

Indirect impact	Timing	Nature / impacted entities	Consequence	Extent	Duration	Mitigation
			Operational impacts would mostly be limited to vehicle movements for maintenance activities and security lighting for substations. These activities would be periodic and of an extent and duration that is unlikely to impact the viability of adjacent habitats. Any residual impacts are considered minor and are likely to be adequately managed with mitigation measures.			• Stockpiles will be kept covered with material to prevent the generation of dust. • Application of water as dust suppression during dust generating activities where practicable. • Dust suppression through wetting of exposed surfaces including access tracks.
Transport of weeds and pathogens from the site to adjacent vegetation	Construction and operation	TECs and threatened flora habitats situated at the interface to the proposed easement	There is the potential for the introduction or spread of weeds and pathogens by means of imported materials, machinery movements and increased foot traffic during construction and operation. Weeds recorded as a part of field survey activities are detailed in Section 6.4 of this BDAR relative to each vegetation zone and IBRA subregion. No evidence of pathogens such as Root Rot (*Phytophthora cinnamomi*), Myrtle Rust (*Austropuccinia psidii)* and Chytrid Fungus (*Batrachochytrium dendrobatidis)* was recorded within the project footprint. However, these have the potential to occur.	Adjacent (ie within 100 m) to the final disturbance area.	Long-term	Mitigation measures to control the spread of weeds, pathogens and pest animals are identified in Table 14-1. These would include the implementation of hygiene protocols such as vehicle washdown facilities and ensuring supplier provides certification that imported soils and materials for construction work are clean and free from contaminants. Weed and pathogen management during operation would occur in accordance with Transgrid operational procedures.
Increased risk of starvation or exposure, and loss of shade or shelter	Construction	Fauna species situated at the construction interface	Displacement of resident fauna species during vegetation clearing is considered relatively low in some areas due to the modified vegetation structure resulting from long-term agricultural stock grazing. However, the risk is likely to increase in areas with larger intact remnants. Given the linear nature of the project, proposed mitigation options and the highly mobile nature of most potential resident fauna species, the	Within the final disturbance area, and adjacent (ie within 100 m).	Short-term	The displacement of fauna during clearing work would be managed through the following mitigation measures (Table 14-1): • Pre-clearing surveys and procedures for avoidance of habitat features, ecological supervision, and the relocation of fauna (if required). • Preparation of a fauna handling and rescue procedure to be implemented for

Indirect impact	Timing	Nature / impacted entities	Consequence	Extent	Duration	Mitigation
			increased risk of starvation, exposure and loss of shade or shelter due to the project is considered low.			the ethical handling of injured or displaced fauna. • Habitat supplementation measures such as nest boxes, hollow re-use / creation, and re-use of timber/logs as habitat in broader easement area if practicable. • Unexpected threatened species finds protocol to be implemented if TECs, flora and fauna species, not assessed in the BDAR, are encountered.
Loss of breeding habitat	Construction	Fauna species situated within the disturbance area	The loss of breeding habitat such as large old growth trees, hollows, stick nests, drays and fallen timber has the potential to affect native animals such as: • hollow-dependent bats • hollow-nesting and canopy-nesting birds • arboreal mammals • reptiles. The loss of breeding habitats is unlikely to extend beyond the disturbance area. Impacts beyond this area would be avoided through mitigation and management measures.	Within the final disturbance area	Long-term	In line with the mitigation measures (Table 14-1), a BMP would be developed with a supplementary hollow and nest strategy, including measures such as nest boxes, hollow re-use / creation and re-use of timber/logs as habitat in broader easement area if practicable. Pre-clearing surveys and ecological supervision would be required to mitigate any direct or indirect impacts to displaced fauna within the disturbance areas (Table 14-1)
Trampling of threatened flora species	Construction/ operation	Threatened flora species situated at the construction interface, or within the disturbance area	Reduction in population extent and available habitat of threatened flora species that occur in the ground stratum could occur due to trampling, unauthorised material storage and/or vehicle and plant equipment movement during the construction and operation of the project.	Within the final disturbance area, and adjacent (ie within 100 m).	Long-term	Prior to any clearing or construction, features of high biodiversity conservation significance within the easement, including biodiversity exclusions zones (Table 14-1) would be identified during construction, and retained habitat for threatened species, would be recorded in Transgrid's GIS. The GIS information will be reviewed during the planning of all maintenance or other future activities that could cause disturbance.

Indirect impact	Timing	Nature / impacted entities	Consequence	Extent	Duration	Mitigation
Removal and disturbance of rocks, including bush rock	Construction/ operation	Threatened fauna species situated at the construction interface, or within the disturbance area	Reduction in population extent and available habitat of small terrestrial fauna (small mammals, and reptiles) that occur in the ground stratum could occur due to the direct removal of habitat during the construction and operation of the project.	Within the final disturbance area, and adjacent (ie within 100 m).	Long-term	Existing tracks and clearings would be used, where possible, to limit the construction of new tracks (Table 14-1),. Where this is not possible, the design would seek to minimise impacts to native vegetation, including cut and fill, as a priority. Design and micro-siting of new access tracks would avoid and minimise impacts to rock outcrops, large boulders, piled rock, and rock features that provide potential sheltering and breeding habitat for fauna, including threatened species, and avoid mapped habitat trees where practicable.
Increase in pest animal populations and predation of native fauna	Construction/ operation	Threatened fauna species situated at the construction interface, or within the disturbance area	Section 13.9 identifies pest animals known or likely to occur within the project footprint. It is unlikely that work associated with the project would result in the introduction or spread of pest species within the project footprint. It should be considered that the project footprint consists of large areas of agricultural lands. Therefore, it is highly likely that those areas are already subjected to varying degrees of feral animal encroachment. Despite this, it is possible that native fauna may be more susceptible to predation as a result of vegetation clearing and increased levels of fragmentation within the locality.	Within the disturbance area, and adjacent (ie within 100 m)	Long-term	Transgrid would consult with relevant agencies and groups involved with pest management in order to contribute to existing or future monitoring and management programs. Consideration of potential contributions would be targeted towards areas where greatest impacts occur, particularly through relatively intact landscapes where easement introduction increases the risk of native fauna predation. If isolated threatened species populations which are prone to pest animal incursion are detected during pre-construction and/ or construction works, then specific measures will be developed and undertaken to address threats in these areas after consultation with the BCD and/or NSW NPWS as appropriate. Development of a pest species monitoring program may be required if there is a

Indirect impact	Timing	Nature / impacted entities	Consequence	Extent	Duration	Mitigation
						substantial occurrence of large intact remnants and threatened species habitat within or adjacent to the disturbance areas (Table 14-1).
Reduced viability of adjacent habitat due to edge effects	Operation	PCTs, TECs and threatened flora and fauna situated at the construction interface	Much of the landscape surrounding the project footprint has been historically cleared and is subject to high levels of fragmentation. Clearing as a result of the project is likely to have a negligible impact on existing cleared lands due to the high levels of disturbance already associated with these areas. Vegetated fragments remaining within the landscape are generally small, isolated, and already likely to be subject to considerable edge effects such as weed invasion and altered floristic composition and structure. Previous research has identified that new forest edges created by transmission line easements can promote resource partitioning, shifts in species composition, and create a barrier effect (individuals exhibit avoidance behaviours), particularly in microbats and avifauna (Baker *et al.*, 1998; Threlfall *et al*., 2011; Hopkins, 2015; Altringham & Kerth, 2016). In Baker *et al*.'s 1998 research, they observed a barrier effect for four cryptic bird species. These were small to medium-sized terrestrial birds associated with dense ground and/or understorey cover. Further, overall bird abundance, mean species richness and total species richness were significantly higher in the forest interior, when compared to the forest outer margins.	Adjacent (ie within 100 m) to the final disturbance area	Long-term	Development of a Connectivity Strategy to mitigate impacts to threatened species susceptible to edge effects. Refer to mitigation measures (Table 14-1), and Appendix 21.

Indirect impact	Timing	Nature / impacted entities	Consequence	Extent	Duration	Mitigation
			The response of bats to edge effects can vary among species. Roosting ecology and edge-affinity have been identified as good predictors of the sensitivity of individual bat species to habitat fragmentation; 'forest interior' species (often tree-roosting bats such as *Chalinolobus* spp., *Vespadelus* spp., Yellow-bellied Sheathtail Bat, Greater Broad-nosed Bat, Large-eared Pied Bat etc) are negatively affected by fragmentation. There is enough evidence to suggest that new edges and increased fragmentation would see some bat species avoid crossing the large gaps in vegetation (Law & Law, 2011) and would influence the assemblages of species which occupy these new forest edges to some extent (Threlfall *et al.*, 2011; Hopkins, 2015; Altringham & Kerth, 2016). Increased clearing and fragmentation as a result of the project may further intensify these pressures within remaining fragments and has the potential to impact habitat viability for some threatened flora and fauna species generally reliant on the availability of larger contiguous habitats (ie clutter-adapted microbats, cryptic forest birds, gliders, Koala and small terrestrial mammals).			
Changed fire regimes	Operation	All entities	Fire regimes within the locality are already subject to considerable alteration as a result of the agricultural and forestry land uses which dominate the landscape. There is an increased risk of bushfire where the transmission lines become damaged from storm activity or fallen vegetation. However, these risks would be low with appropriate maintenance.	Within the final disturbance area, and surrounding vegetation	Ongoing	During construction and operation, the project would implement the required bushfire management measures to manage any increased risk of bushfire. Design specifications would be adopted to ensure conductor clearance heights adhere to recommended levels to minimise any risk of arcing or potential fire events. Vegetation

Indirect impact	Timing	Nature / impacted entities	Consequence	Extent	Duration	Mitigation
						maintenance would occur in accordance with HumeLink operational procedures (to be developed as per Chapter 14). Impact calculations presented within this document incorporate this maintenance provision. The proposed new and upgraded access tracks and roads would provide additional opportunity for fire breaks across the regional landscape to enable better management of fire and reduce the potential for inappropriate fire intervals.
Electric and magnetic field exposure	Operation	Some increased risk to avifauna where nesting on transmission towers, and foraging microbats	**Birds** Based an analysis of predicted electric and magnetic field (EMF) levels as a result of the HumeLink project, EMFs would remain well below reference levels for maintaining public safety under all operational scenarios (refer to *Technical Report 15- Electric and Magnetic Field Study*). Native fauna interaction with the proposed transmission lines is likely to be transient and as such, risk of exposure to EMF is considered low. However, there is an increased risk of EMF exposure for some birds (i.e., White-bellied Sea-eagle) where nesting for prolonged periods on transmission line structures in close proximity to transmission lines. Fernie & Reynolds (2005) indicate EMF impacts in birds are largely unknown, although changes in bird behaviour, physiology, endocrine system, and immune function have been noted with potential to compromise reproduction success and fitness in some species. These risks remain largely uncertain	In proximity to the transmission line	Ongoing	Deterrent strategies (including bird flappers and perching deterrents to deter raptors effectively and safely away from perching on energized infrastructure), and the development of a diverter model would be finalised during design refinement and would be developed as part of the Connectivity Strategy (Figure 13-13) (Table 14-1). The proposed locations where deterrent devices are considered appropriate is outlined in Appendix 21, Section 4.

Indirect impact	Timing	Nature / impacted entities	Consequence	Extent	Duration	Mitigation
			at this time. Design measures should be considered to discourage birds from nesting at transmission line structures where these intersect significant habitats. Based on the review of available scientific literature, the risk of EMF exposure on nesting birds is considered low. **Bats** Echolocation is microbats' navigation system and are high frequency sound waves made by the bat forcing air through its vocal cords. Bat vocal calls vibrate very rapidly, creating sound impulses that are either through their mouth or nostrils. The call bounces back from surrounding objects and the bat then converts this to information about the size, texture, and distance of the surrounding objects (Moss & Surlykke, 2001; Churchill, 2009). It has been suggested that EMF associated with this type of infrastructure could potentially exert an aversive behavioural response in foraging bats (impacting echolocation capabilities, which provokes avoidance behaviour) (Moss & Surlykke, 2001). However, based on the information provided in the EMF Technical Report (2022), the EMF emittance from the proposed transmission lines is highly unlikely to adversely affect foraging bats or their insect prey in the vicinity.			
Fauna collision, electrocution with transmission lines	Operations	Mobile species such as Grey-headed Flying-fox, and avifauna may become entangled/	Whilst several threatened fauna species are likely to occur in proximity to the proposed power lines, very few are likely to fly at elevations which would	In proximity to the transmission line	Ongoing	Mitigation measures for fauna collision, electrocution with transmission lines is addressed in further detail in Table 13-20 and Table 14-1 of the BDAR, as well as Attachment 21.

Indirect impact	Timing	Nature / impacted entities	Consequence	Extent	Duration	Mitigation
		collide with powerlines (DAWE, 2021). Similarly, to electrocution, the risk of entanglement is higher in more urbanised areas (Tidemann, 1999; Tidemann & Nelson, 2011).	put them at risk from transmission line strike, entanglement or electrocution. Therefore, terrestrial fauna, mammals, reptiles, and amphibians are not at risk of transmission line strike. Flying and gliding mammals have the potential to make aerial movements at elevations where transmission lines are located, although many of those species are either not present locally, they do not fly at elevations where transmission lines are positioned (many microchiropteran bats and gliders) and they are unlikely to accidentally strike transmission lines, because they navigate by radar clicks and not sight (ie larger microchiropteran bats). The general fauna group most likely to have potential for transmission line strike are the birds, but only small subsets of birds are likely to fly at elevations that would place them at risk of transmission line strike (eg migratory birds, and raptors). The consequences of fauna collision, and electrocution with transmission lines is addressed in further detail in Table 13-20.			

13.5 Prescribed biodiversity impacts

13.5.1 Prescribed impact entities

As per the BAM (DPIE, 2020a), the assessor must assess the prescribed impacts that the project would, or is likely to have, on threatened entities and their habitat, taking into account:

- TECs, threatened species and their habitat
- ongoing or future impacts that the project will have on biodiversity values, considering the measures taken to avoid or minimise impacts
- the spatial and temporal extent of the impacts likely to result from changes in land use arising from the project, in accordance with Subsections 8.3.1–8.3.6 of the BAM (DPIE, 2020a).

The BDAR must include an assessment of any prescribed impacts of the project on threatened entities and their habitat, and describe:

- the nature, extent, frequency, duration and timing of prescribed impacts that may occur:
  - during construction
  - during operation
  - that are uncertain (predictions should be made).
- the consequences of prescribed impacts on biodiversity values
- any limitations to data, assumptions, and predictions about impacts on biodiversity.

An assessment for each of the relevant prescribed biodiversity impacts has been completed and is presented in the following sections below.

13.5.2 Impacts to karst, caves, crevices, cliffs, rocks and other geological features of significance

The assessment of impacts to karst, caves, crevices, cliffs, rocks as a result of the project is detailed below in Table 13-15. Further detailed discussion on habitat associated with karsts, cliffs and gorges is presented in Table 13-6, and Attachment 21. Figure 7-2 shows the potential extent of prescribed impacts associated with mapped karst, caves, crevices, cliffs, rocks and other geological features of significance.

Table 13-15 Assessment of Prescribed Impacts (karst, caves, crevices, cliffs, rocks and other geological features of significance)

Prescribed biodiversity impacts	Nature (relevance to the project)	Extent	Duration	Consequences
(a) impacts of development on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs and other geological features of significance, or rocks.	The project has the potential to impact on caves, crevices, cliffs, rock habitats that are considered important to the lifecycle of threatened fauna. An important element of geodiversity is karst landforms. 'Karst' is a type of landscape formed by water dissolving carbonate rock, such as limestone, to make features like gorges and caves. Across the project footprint, there are numerous limestone deposits displaying features we expect to see in karst environments. Further, some of those limestone deposits are of the same formation group and epoch as karst environments in the broader region (eg Bungonia Caves and Careys Cave). No cave environments were identified within the project footprint during field campaigns. However, there is important cave roosting habitat beyond the project footprint, including Large Bent-winged Bat roosts at: • Black Andrew Mine (within 14 km) • Dip Cave, Wee Jasper (within 28 km) • Punchbowl Cave (within 27 km, known roosting site and staging site for gravid females enroute to Church Cave maternity site) • Pylon 58 Cave (within 20 km) • Church Cave (within 27 km) (maternity roost site) • Drum Cave (within 37 km) (maternity roost site). Areas of typical rocky hillslope and rock overhangs occur throughout the project footprint, in areas with moderate to high topographic relief. This provides a different type of terrestrial habitat to other parts of the project footprint.	Impacts would be negligible; the rocky environment described would be minimally impacted, and these habitats would remain post-construction.	The minor impacts to the rocky woodlands would be permanent.	The consequence of the impacts would be minor and non-significant following further design refinement (avoidance) and the residual impact would be appropriately offset. Further detailed discussion of impacts on habitat associated with karsts, cliffs and gorges is presented in Table 13-6.

Table 13-16 Impacts of the project on habitat associated with karsts, cliffs and gorges

Cave/cliff-dependant species	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
Large Bent-winged Bat	The project intersects 14.81 ha of potential karstic (cave-forming) geologies (consisting of 3.44 ha of high potential, 2.19 ha of moderate, 9.18 ha of low potential karstic geologies), within the project footprint that may be considered important as staging, migration, and breeding habitat for Large Bent-winged Bat. Not all areas of karstic geology were able to be inspected to rule out the presence of potentially important habitat for this species (eg caves). Should important breeding habitat occur within or near to construction areas there is the potential for direct impacts. Post-construction there is potential for microbat interactions with towers or other infrastructure. The area of Large Bent-winged Bat habitat mapped is outlined in Attachment 21, Table 3.	Lattice transmission towers proposed as a part of the development are highly permeable and are unlikely to impede species movement. Earthworks would be limited to general subsurface work in the locality of the transmission line structures, ancillary infrastructure, and access roads. No deep excavation or drilling is proposed within karstic geologies that intersect the project footprint. Further, the project footprint is greater than 30 km from any known maternity sites for the species.	Any direct construction impacts would be relatively short-term in nature. Once constructed, impacts from towers would potentially be long-term, however some level of accustomisation is expected.	Direct impacts to features such as caves are potentially significant, however likely highly avoidable through, for example, avoidance of deep excavations in areas identified as potential bat habitat (post-survey). Spanning of transmission lines over rocky habitats is another relevant avoidance measure. The consequence of the potential indirect impacts such as collision would be minor and non-significant given appropriate distance from breeding areas (e.g. caves).	For areas mapped as high karst potential within the project footprint, mitigation measures will include: • Pre-construction survey to confirm roosting habitat in the locality. • If present, develop adaptive safeguards to mitigate indirect impacts to roosting individuals (including avoidance of deep drilling, or design changes in the locality to avoid this habitat). Any residual impact to threatened species habitat will be appropriately offset.

Cave/cliff-dependant species	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
Large-eared Pied Bat	The project intersects approximately 6.23 ha of steep cliffline habitat within the Bungonia and Inland Slopes IBRA subregions of the project footprint. These areas may provide potential roosting habitat for Large-eared Pied Bat. The area of Large-eared Pied Bat habitat mapped is outlined in Attachment 21, Table 4.	Lattice transmission line structures proposed as a part of the development are highly permeable, and are unlikely to impede species movement. Earthworks would be limited to general subsurface work in the locality of the transmission line structures, ancillary infrastructure, and access roads.	No deep excavation or drilling is required within high potential cave roosting habitat intersecting the project footprint. Transmission lines would span across steep gullies and outcrops. This would be permanent.	The project is unlikely to impact any potential rocky habitat for this species.	Suitable rocky habitat for Large-eared Pied Bat would be avoided. Therefore, no further mitigation is required.
Masked Owl and Sooty Owl	The project intersects 6.23 ha of steep cliffline habitat within the project footprint that may be considered potential cave - nesting habitat for Sooty Owl or Masked Owl. The area of Sooty Owl and Masked Owl habitat mapped is outlined in Attachment 21, Table 4.	Lattice transmission line structures proposed as a part of the development are highly permeable and are unlikely to impede species movement. Earthworks would be limited to general subsurface work in the locality of the transmission line structures, ancillary infrastructure, and access roads.	No deep excavation or drilling is required within rocky areas or steep slopes that intersect the project footprint. Transmission lines would span across steep gullies and outcrops. This would be permanent.	The project is unlikely to impact any potential rocky habitat for this species.	Suitable rocky habitat for Masked Owl and Sooty Owl would be avoided. Further, pre-clearing surveys to determine the presence of nest trees and rock habitat would be undertaken (Chapter 14). Therefore, no further mitigation or offset is required for prescribed impacts to Masked Owl habitat.

13.5.3 Impacts to habitat connectivity and fauna movement

The assessment of prescribed impacts to habitat connectivity and fauna movement as a result of the project is detailed below in Table 13-17. Further detailed discussion on associated impacts of reduced connectivity on threatened species likely to be affected is presented in Table 13-18. Figure 13-14 and Figure 13-15 show the location of existing habitat corridors in relation to the indicative disturbance areas, potential prescribed impacts and associated mitigation options.

Table 13-17 Assessment of Prescribed Impacts (habitat connectivity and fauna movement)

Prescribed biodiversity impacts	Nature (ie relevance to the project)	Extent	Duration	Consequences
(c) impacts of development on habitat connectivity	Installation of line structures and transmission lines may impact on aerial species while clearance of vegetation within the easement may create an open-space barrier for terrestrial species. The nature of the potential impacts to connectivity primarily relate to impacts to aerial species such as birds or bats through interaction with the proposed line structures or associated lines.	Lattice transmission line structures proposed as a part of the development are highly permeable structures and are unlikely to impede species movement. Transgrid would retain connectivity corridors near transmission line structure locations that occur in woodland vegetation at strategic locations that would be developed as part of a Connectivity Strategy. However, an unknown level of interaction such as bird strike (and fatality) may occur. Mitigating would include development of a Connectivity Strategy following design refinement.	The impacts to connectivity related to the installation of transmission line structures and lines would be permanent. However, they are likely to reduce over time as biodiversity acclimatises to the presence of the transmission line structures and lines. Further a Connectivity Strategy is to be developed after the design refinement stage to minimise the extent of connectivity impacts, which includes retaining of corridors adjacent to easement to facilitate fauna movement.	The consequence of the impacts are considered to be minor: aerial species have the ability to fly under/over/around the structures/lines. Impacts to terrestrial species that may be subject to open-space barriers would be addressed within the Connectivity Strategy where they occur or are considered likely to occur within proximity to the project. The project has also been co-located within existing transmission lines / areas of disturbance to avoid/minimise additional fragmentation. Further detailed discussion of project impacts on habitat connectivity is presented in Table 13-18 and Figure 13-14.

Table 13-18 Impacts of the project on connectivity and fauna movement

Connectivity feature entities	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
Threatened microbat species that require cluttered or edge environments for foraging and may be affected by reduced connectivity: • Large-eared Pied Bat • Southern Myotis • Eastern False Pipistrelle.	Reduced connectivity can modify bat species assemblages. Specifically, it has been found that bat diversity, abundance, and foraging activity decrease as cover of remnant vegetation diminishes, although such effects are dependent upon functional identity of bat species (specifically, foraging guilds, morphology, and behavioural adaptions) (Hopkins, 2015; Threlfall *et al.*, 2011; Jung & Threlfall, 2016; Haddock *et al.*, 2019). Avoidance behaviour (such as avoiding nesting or foraging resources) and habitat utilisation (such as diverging around the broader area where easements, substations and transmission lines are located) may be affected. The project may create a barrier effect which causes microchiropteran bats to alter their flight pathways to avoid certain areas eg cleared areas where	The project footprint consists of a mosaic of large areas of intact remnant vegetation, smaller remnants, and agricultural lands. The loss and fragmentation of remnant vegetation are accompanied by an increase in the ratio of forest edge to interior forest, and as a result, the response of bats to this can vary among species (change species assemblages). The morphology of a species (body size, wing form and size ratio, echolocation call structure, feeding and roosting ecology) all determine how bats fly and use the landscape. Thus, the effects of fragmentation on bats are to a significant extent species-specific (Hopkins, 2015; Altringham & Kerth, 2016).	Reduced connectivity would be permanent, however, the impacts associated with reduced connectivity are likely to reduce over time as the animals acclimatise to the presence of the structures/gaps in the landscape, and connectivity is retained in other sections (implementation of a Connectivity Strategy)	The risk of isolating threatened microbats due to increased fragmentation is considered low across the project footprint. Further, microbats are considered highly mobile, and some remnants would be retained to maintain connectivity.	Development of a Connectivity Strategy to mitigate impacts to microbat species assemblages. A Connectivity Strategy would be developed to maintain fauna connectivity (Table 14-1, and Attachment 21, Table 6). As such, additional offsets for impacts to connectivity are not proposed.

Connectivity feature entities	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
	easements are located (Threlfall *et al*., 2011).				
Terrestrial and arboreal mammals affected by reduced landscape connectivity: • Broad-toothed Rat • Koala • Eastern Pygmy-possum • Long-nosed Potoroo • Greater Glider • Yellow-bellied Glider • Yellow-bellied Glider population on the Bago Plateau (endangered population) • Squirrel Glider • Squirrel Glider in the Wagga Wagga Local Government Area (endangered population).	The ability of arboreal and gliding fauna to safely traverse across the easement to retained patches of vegetation would become constrained, and it may represent a barrier for gliding species and increased predation risk to species such as the Koala that may be required to traverse open ground. During the field surveys, Greater Glider (Snowy Mountain IBRA region), Squirrel Glider (Inland Slopes IBRA subregion), and Yellow-bellied Glider (Snowy Mountain IBRA region), were recorded in several locations throughout the project footprint (refer to Section 7.3.3, and Figure 13-14).	The increased fragmentation resulting from the project, may hinder the ability for some arboreal species to traverse the landscape, hence, reducing the species overall home range and may indirectly increase predation risk for many species. Specifically, reduced connectivity in areas of the Inland Slopes and Snowy Mountains IBRA subregions may reduce the extent and habitat extent and connectivity with the broader landscape of listed endangered glider populations.	Reduced connectivity would be permanent as the easement will be maintained free of trees/canopy vegetation, however, the impacts associated with reduced connectivity are likely to reduce over time as biodiversity acclimatises, and connectivity is retained in other sections (implementation of a Connectivity Strategy).	The impacts on connectivity in some areas are likely to be permanent, and moderate in nature. However, those impacts may include increased risk of predation, reduce species dispersal, and reduced genetic exchange, and viability of a local population.	Development of a Connectivity Strategy to mitigate impacts to terrestrial and arboreal fauna species and use fauna sensitive design to facilitate fauna movement throughout the project footprint, and broader landscape (e.g. use of glider poles and other artificial connectivity structures in areas of high activity and where clearing is unavoidable) (refer to Figure 13-13, and 13-14). In line with the mitigation measures (refer to Table 14-1, and, Attachment 21; Table 6), fauna sensitive structures such as under transmission glider poles, vegetation steppingstones, or reduced clearing requirements would be recommended in at least three locations within the project footprint, where gliders have been observed using the area.

Connectivity feature entities	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
					Recommended locations are provided in Figure 13-13 and Figure 13-14, and Attachment 21.
Small, sedentary (short dispersal distances) woodland birds which may be affected by reduced connectivity: • Flame Robin • Scarlet Robin • Varied Sitella.	For the woodland bird species like the Varied Sitella (species recorded in Murrumbateman and Inland Slopes), reduced landscape connectivity may create movement barriers (the sedentary nature of the species makes cleared land a potential barrier). Species such as Flame Robin (species recorded in Snowy Mountains, Bungonia, Inland Slopes and Bondo), Scarlet Robin (species recorded in Bungonia, Crookwell, Bondo, Inland Slopes, Crookwell, and Murrumbateman), they require connected corridors of vegetation for movement. Isolation of patches of habitat, particularly where these patches are smaller than 10 ha, may result in isolated individuals.	The project would result in varied types (hazard tree removal, partial and full removal) of vegetation clearance for the transmission line easements within the project footprint (Figure 13-13, and Figure 13-14). As such, the project may reduce some landscape connectivity where it passes through remnant patches of native vegetation, however, the retention of some native vegetation within lower canopy and mid stratum layers would allow for some connectivity between patches of vegetation either side of the easement.	Canopy vegetation would be removed from the easement permanently; ground-layer and shrubs would be retained.	Reduced connectivity of the canopy vegetation would be permanent, however, the impacts associated with reduced connectivity are likely to reduce over time as the animals acclimatise, and connectivity is retained in other sections (implementation of a Connectivity Strategy). The retention of the ground and shrub-layers would also facilitate movement for these small woodland species.	The magnitude of vegetation clearing required for the transmission line easement is unlikely to impede species movement, particularly since landscape connectivity was considered during the conceptual design stage of the project and ground and shrub layer vegetation would be retained. As such, impacts to woodland bird species are likely to be negligible impact. As such, it is considered that additional offsets for impacts to connectivity of habitat for these species is not required. A Connectivity Strategy would be developed, and the use of fauna deterrent devices such as “bird flappers” would be considered to deter aerial species from transmission line strike.
Reptiles which may be affected by reduced connectivity: • Pink-tailed Legless Lizard	For reptile species with restricted dispersal ability, such as Pink-tailed Legless and Striped Legless Lizard;	The increased fragmentation resulting from the project, may reduce landscape connectivity and create	The impacts on connectivity in some areas are likely to be permanent, ranging from minor to moderate in degree.	Reduced connectivity would be permanent, however, the impacts associated with reduced connectivity are	Development of a Connectivity Strategy to mitigate impacts to reptile species using fauna sensitive

Connectivity feature entities	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
• Striped Legless Lizard	the reductions in habitat connectivity may effectively isolate individuals, leading to a decline in the species population.	movement barriers for the species to traverse the landscape, effectively isolating individuals.		likely to reduce over time as biodiversity acclimatises, and connectivity is retained in other sections (implementation of a Connectivity Strategy).	design (such as considering placement of salvaged logs and rocks within cleared habitats) to facilitate fauna movement throughout the project footprint, and broader landscape (refer to Figure 13-13).
Amphibians which may be affected by reduced riparian/stream flow connectivity: • Sloane's Froglet • Booroolong Frog • Yellow-spotted Tree Frog.	For amphibian species like Sloane's Froglet, Booroolong Frog, Yellow-spotted Tree Frog, the installation of maintenance access tracks across waterways (formal or informal) may reduce connectivity along the length of the stream.	Localised reduced riparian/stream connectivity in areas where access track crossings are proposed. A total of 280 streams were identified as occurring within the project footprint and intersecting with indicative access track locations across waterways. Of these, 194 are first order and 60 are second order streams, combining to total 91% of streams intersecting with indicative access track locations. This reflects the dominance of smaller streams within the project footprint. A description and assessment of potential impacts to stream ecology as a result of waterway crossings is presented in Sections 10.3 and 13.7 respectively.	Waterway crossings have been assessed as being permanent, maintained, structures. However, some of these waterway crossings may be removed where they are not required for easement access or asset maintenance.	Reduced stream connectivity may be permanent, in some areas (depending on whether the crossing is permanent structure or a temporary). However, most amphibian species are highly mobile and will disperse to find con-specific species and foraging resources. Therefore, the reduce stream connectivity is unlikely to reduce connectivity for this fauna group. Impacts to stream connectivity are likely to be minor, as the proposed design methods align with those included in Fisheries NSW guidelines (Fairfull, 2013), as detailed in Section 13.7.1. In instances where existing informal waterway crossings	Mitigation options to be considered during the detailed design and micro siting process for access track waterway crossings to minimise potential impacts to stream connectivity include: Where waterway crossings are required, any existing crossings should be re-used or upgraded in preference to establishing new crossings where practicable. To the fullest extent practical, the crossing design and work sites should minimise disturbance to any native vegetation, including native instream, fringing, and riparian vegetation within the access track alignment. Crossing structures should be designed so that the existing nominal flow velocity, low

Connectivity feature entities	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
		Potential impacts to riparian corridors are discussed in Section 13.7.4.		are to be upgraded, the constructed crossing is likely to achieve a more sensitive overall design in terms of preventing or minimising erosion and sedimentation impacts.	flow conditions and fish passage are maintained wherever possible. The complete suite of mitigation measures in relation to managing risk to riparian corridors and stream connectivity throughout the design refinement, construction and operational stages of the project are presented in Section 14.2 (Table 14-1, Figure 13-13 and Figure 13-14).
TECs affected by reduced connectivity: • *Coolac-Tumut Serpentinite Shrubby Woodland TEC* • *Monaro Tableland Cool Temperate Grassy Woodland TEC* • *Tableland Basalt Forest TEC*	The proposed clearing work would result in further loss and fragmentation of TEC remnants within the project footprint.	These TECs have been extensively cleared and the communities are already severely fragmented. Many of these remaining patches occur on road reserves, the edges of house paddocks, or beside steep slopes on the edges of cleared land. Proposed clearing would predominantly impact more degraded TEC patches and edge environments.	The impacts on connectivity in some areas are likely to be permanent, ranging from minor to moderate in degree.	Increased fragmentation may result in loss of community composition, structure, and function and reduced viability of resulting smaller remnants. The integrity and survival of small, isolated stands of these TECs, may become impaired by reduced species assemblages, enhanced risks from environmental stochasticity, disruption to pollination and dispersal of fruits or seeds, and likely reductions in the genetic diversity. Fragmentation may also result in reduced fire frequencies within some	Design opportunities to minimise impacts to TEC connectivity should be explored during the detailed design phase. This would include: • Consolidating clearing work and prioritising impacts within more degraded TEC remnants where possible. • Minimising total clearing work and identifying opportunities to retain understorey vegetation and connectivity.

Connectivity feature entities	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
				patches, impacting the viability of some native plant populations. Fragmentation of habitats and disruption of these ecological processes can contribute to reduced ecological function of the communities.	

13.5.4 Fauna injury and/ or mortality from transmission line collision, entanglement or electrocution

The assessment of prescribed impacts associated with transmission line collision, entanglement, or electrocution is detailed below in Table 13-19. Further detailed discussion on associated impacts on threatened species is presented in Table 13-20. Figure 13-16 identifies areas within the project footprint with elevated risk of collision, entanglement or electrocution and proposed mitigation options. These are detailed further in Attachment 21.

Table 13-19 Assessment of Prescribed Impacts (Injury or mortality from transmission line collision, entanglement, or electrocution)

Prescribed biodiversity impacts	Relevant threatened entities	Nature (ie relevance to the project)	Extent	Duration	Consequences
Injury or mortality from transmission line collision, entanglement, or electrocution	Highly mobile species are likely to be more at risk of collision. The species considered most at risk, include: **Aves**: <u>Forest Owls and Cockatoos</u> • Barking Owl • Masked Owl • Powerful Owl • Sooty Owl • Gang-gang Cockatoo • Glossy Black Cockatoo. <u>Migratory birds:</u> • Fork-tailed Swift • Sharp-tailed Sandpiper • Red-necked Stint • Latham's Snipe • Common Greenshank • Marsh Sandpiper. <u>Raptors:</u> • Square-tailed Kite • Little Eagle • White-bellied Sea-Eagle	Interaction with the proposed transmission line structures or associated lines being altered flight patterns/behaviour or collision/injury/death.	Entire length of the project but potentially more likely in areas supporting remnant vegetation.	The structures would be permanent, but the risk of collision is likely to reduce over time as animals acclimatise to the presence of the transmission line structures and lines. Fauna deterrent devices would also be installed in higher risk area to deter species from nesting in the structures.	The consequences of the impacts are considered to be moderate in nature in, some areas of the project footprint. Based on review of avifauna records (aves and mammals), some fauna species that occur within proximity of the proposed transmission lines, may be at higher risk of collision, entanglement, or electrocution (Attachment 21, Figure 13-15). Other less mobile fauna species are likely to habituate to the structures overtime, and therefore at lower risk of collision/electrocution. Deterrent strategies (including bird flappers and perching deterrents to deter avifauna effectively and safely away from

Prescribed biodiversity impacts	Relevant threatened entities	Nature (ie relevance to the project)	Extent	Duration	Consequences
	Bats: • Grey-headed Flying-fox. <u>Microbats</u> • Large Bent-winged Bat • Large-eared Pied Bat • Little Bent-winged Bat • Southern Myotis.				energized infrastructure), and the development of a diverter model would be finalised during design refinement and would be developed as part of the Connectivity Strategy (Table 14 1, Figure 13-14 and 13-15).

Table 13-20 Impacts to biodiversity from transmission line collision, entanglement, or electrocution

Threatened species at risk of collision/entanglement	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
Threatened microbat species that may be at risk of collision: • Large Bent-winged Bat • Large-eared Pied Bat • Little Bent-winged Bat • Southern Myotis • Eastern False Pipistrelle	There is an abundance of emerging research on the impacts associated with windfarm developments on insectivorous bats (Smales, 2014; Bennett *et al.*, 2022; Good *et al*., 2022). However, information is currently very limited in relation to associated transmission line developments. Despite the limited research on the effects of transmission lines on microbats, it can be assumed that there is a degree of collision risk. The	It is assumed that collision risk would be higher near forest edges, during nightly foraging. Large Bent-winged Bat (and other above canopy foraging species) may exhibit this foraging behaviour in relation to tall transmission structures. However, at this stage there is no research to support this conclusion. The morphology of a species (body size, wing form and size ratio, echolocation call structure, feeding and roosting ecology) all	The structures would be permanent; however, the risk of collision would likely reduce over time as animals acclimatise to the presence of the transmission line structures and transmission lines. Fauna deterrent devices would be installed in higher risk areas.	Collision may result in altered flight patterns/behaviour or collision/injury/death.	Development of a Connectivity Strategy to mitigate impacts to microbat species assemblages. The risk of collision is likely species specific for microbat species across the project footprint. Therefore, an Adaptive Management approach should be implemented to mitigate collision risks to microbats in locations where the relevant species were recorded/considered highly likely to occur.

Threatened species at risk of collision/entanglement	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
	movement between territories for Large Bent-winged Bat is unusual compared to other species, some migration movements have been tracked up to 1,300 km. Large Bent-winged Bat and Little Bent-winged Bat are known to forage above the canopy and in open spaces (Churchill, 2009), and therefore more susceptible to collision strike. Other species, such as Large-eared Pied Bat, Eastern False Pipistrelle and Southern Myotis and show strong roost fidelity and will occupy those multiple roosts sites within their range, year after year. These species tend to be low to mid-canopy flyers, and therefore, are less likely to be susceptible to transmission line collision.	determine how bats fly and use the landscape. Thus, the risk of collision is likely species specific.			
Grey-headed Flying-fox	In Mo et al. (2020), a broad range of factors were involved in flying-fox mortality or injury, the main ones being entanglements and electrocutions.	The overall risk of collision, entanglement, and electrocution of Grey-headed Flying-fox individuals as a result of the project are considered low due to the proposed spacing and height	The risk of collision is considered low due to the proposed spacing of transmission lines.	This risk of collision is considered low and unlikely to pose any long-term impacts.	Minimum spacing of transmission lines to exceed potential wingspan of the species. HumeLink high voltage lines would be spaced more than 6 m apart, minimising the risk of electrocution.

Threatened species at risk of collision/entanglement	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
	Upon review of BioNet records (2022), there have been numerous Grey-headed Flying-fox individuals that have experienced electrocution (resulting in injury or mortality from existing transmission lines), particularly within proximity to the Tumut River Island and Wagga Wagga flying-fox camps (more urbanised areas). However, based on knowledge of species behaviour and body size, it is likely that these electrocutions were associated with low voltage transmission lines which generally support line spacing of around 600 mm. There is a risk of electrocution from short circuit associated with these lines where the species has potential to contact more than one line with their feet or wings. In contrast to this, the HumeLink project would involve high voltage lines spaced more than 6 m apart	of transmission lines. However, electrocution from powerlines is a well-documented risk for this species, and there are several established Grey-headed flying-fox camps in less than 10 km from the project footprint: • Wagga Wagga (9 km from the project footprint) • Tarcutta (5 km from the project footprint) • Yass (6 km from the project footprint) • Tumut River Island (6 km).			The proposed mitigation measures in these higher risk locations (Attachment 21, Table 7, and refer to Figure 13-15), include: • A review of wildlife rehabilitation records to determine the areas within the project footprint that are of higher risk of collision, and prioritise mitigation measures in these locations. • An investigation into appropriate deterrent devices is recommended (as identified on Figure 13-15).

Threatened species at risk of collision/entanglement	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
	thus minimising any risk of electrocution.				
Birds <u>Raptors:</u> • Square-tailed Kite • Little Eagle • White-bellied Sea Eagle <u>Migratory birds:</u> • Fork-tailed Swift • Sharp-tailed Sandpiper • Red-necked Stint • Latham's Snipe • Common Greenshank • Marsh Sandpiper <u>Forest Owls and Cockatoos:</u> • Barking Owl • Masked Owl • Powerful Owl • Sooty Owl • Gang-gang Cockatoo • Glossy Black Cockatoo	It is well documented that transmission lines, especially close to wetlands, forests or over floodplains, are a significant cause of mortality of many bird species (Baker *et al.*, 1998; Clancy, 2010; Loss *et al.*, 2014). Many birds which are strongly tied to terrestrial habitats, like understorey strata or other strata below the top of canopy height (particularly in open, shrubby or mallee woodland habitats) will rarely fly to the height of transmission lines and when they do, it is to perch and there is no risk of transmission line strike, since flights are made at relatively slow speeds and transmission lines represent part of the habitat within their known territories. Generally, it is those groups of birds which are likely to fly at heights where transmission lines are located, and are not familiar with local habitat	The overall risk of bird collision may increase as a result of the project. This risk is likely to be higher in areas adjacent to intact vegetation, wetlands, and riverine habitats.	The risk of collision would likely reduce over time as animals acclimatise to the presence of the transmission line structures and transmission lines.	Collision, entanglement, and electrocution by transmission lines. The consequence of the impacts is likely to be more severe directly adjacent to wetlands, forests or over floodplains (without appropriate mitigation).	Conductor line-marking techniques would be implemented during design refinement to minimise bird strike. Use of fauna deterrent devices, most likely consisting of the "flapper" variety, would be implemented. Positioning and exact diverter model would be finalised during design refinement and would be developed as part of impact mitigation. At minimum these would be used within 1 km of wetland/riverine habitats to reduce impacts on aerial fauna species from collision and allow safer passage within these areas (Chapter 14, Figure 13-15, and Attachment 21).

Threatened species at risk of collision/entanglement	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
	attributes, which have the most potential to encounter transmission line infrastructure. Such birds include, raptors, owls, cockatoos, and waterbirds, many of which move in response to changing distributions of resources. While there is always likely to be a subset of resident birds of prey, many of those species which are at risk, particularly waterbirds (eg egrets, herons) are unlikely to occur in habitats associated with most of the project footprint, because within the inland areas in the vicinity of the project those habitats remain dry for long periods of time. Many species within the waterbird groups are unlikely to fly at elevations of transmission lines, unless making local movements. Furthermore, much of the habitats through which the project traverses are devoid of the shallow aquatic habitats that are most likely to attract such species.				

13.5.5 Impacts to water quality, waterbodies, and hydrological processes

The assessment of prescribed impacts associated with water quality, waterways, and hydrological processes as a result of the project is detailed in Table 13-21. Further detailed discussion on associated impacts on threatened species is presented in Table 13-22. The location of streams, waterbodies and other relevant hydrological features is shown in Figure 5-1.

Table 13-21 Assessment of Prescribed Impacts (water quality, waterbodies, and hydrological processes)

Prescribed biodiversity impacts	Nature (ie relevance to the project)	Extent	Duration	Consequences
(d) impacts of development on water bodies, water quality and hydrological processes that sustain threatened species and threatened ecological communities.	A total of 1,139 streams are located within the project footprint (of various types and condition). There are several major waterways that intersect the project footprint, such as: • Goobarragandra River • Gocup Creek • Tumut River • Murrumbidgee River • Adjungbilly Creek • Lachlan River. These waterways are considered important in their bioregions for several species.	The extent of impact related to this issue is expected to be minor. The work would mostly be limited to transmission line structure construction and transmission line installation, which would avoid direct impacts to waterways, especially major waterways, with appropriate water management measures to be implemented. No direct impacts are expected to occur to these aquatic values of reliant terrestrial threatened species. Indirect impacts would include trimming and clearing of riparian vegetation to facilitate access track construction and maintain transmission line easements. Direct impacts to smaller waterways through the construction and operation of access track crossings would occur, however these are unlikely to impact upon any threatened aquatic biota (Section 13.7)	The highest potential for these impacts is during construction. During operation these impacts are considered negligible on an ongoing basis. Waterway crossings have been assessed as being permanent, maintained, structures. However, some of these crossings may be removed where work is no longer required.	Localised and generally short-term impact. It is considered that the project would not result in substantial environmental impacts to aquatic systems within the project footprint (Section 13.7) and as such no offsets for FM Act listed biota or KFH would be required (Section 15.3). Further detailed discussion of project impacts on threatened terrestrial biota is presented below, in Table 13-22. Implementation of the CEMP and the required construction and waterway crossing controls would mitigate potential impacts (see Chapter 14). Co-locating required waterway crossings to existing crossings (where feasible) would further minimise impacts.

Table 13-22 Impacts on water quality, waterways, and hydrological processes

Aquatic dependent entities	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
Threatened microbats that use waterbodies as part of their foraging strategy or a primary source of food: • Southern Myotis (confirmed present) • Greater Broad-nosed Bat (confirmed present).	**Southern Myotis** The selection of day roosts by microbats influences energetics, social interactions, and breeding success. Southern Myotis (*Myotis macropus*) relies on waterways for all stages of their lifecycle (such as breeding, roosting, and foraging). The species require waterways for foraging, and proximity and condition of suitable aquatic habitats are the primary force driving roost selection by this species (Campbell, 2009; Gonsalves & Law, 2015). Given the species' affinity with waterways, the species can, directly and indirectly, be exposed to pollutants associated with run-off (heavy metals, inorganic compounds etc).	The extent of impact related to this issue is expected to be minor (no direct impacts likely with sediment and erosion controls to mitigate potential impacts to the aquatic environment (see Section 13.7).	Construction would mostly be limited to transmission line structure construction and transmission line installation, which would avoid direct impacts to waterways, especially major waterways, with appropriate water management measures to be implemented. No direct impacts are expected to occur to these aquatic values that would in turn impact reliant terrestrial threatened species.	The highest potential for these impacts is during construction. During operation these impacts are considered negligible on an ongoing basis.	Localised and generally short-term impact. The project is unlikely to result in significant environmental impacts to aquatic systems within the project footprint. Work within proximity of aquatic ecosystems would require stringent erosion and sediment controls to avoid increased run-off and pollutant loads (see Chapter 14).

Aquatic dependent entities	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
	Aquatic impacts are a key threat to the conservation of the species in some areas. **Greater Broad-nosed Bat** The species often uses creeklines for foraging (attracts insects), flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m.				
Threatened frogs: • Sloane's Froglet • Booroolong Frog • Yellow-spotted Tree Frog. Amphibians which may be affected by erosion or sedimentation: • Sloane's Froglet • Booroolong Frog • Yellow-spotted Tree Frog.	The candidate threatened frog species and amphibians spend most of their life cycle in water, and therefore may be susceptible to risks associated with reduced water quality. the installation of maintenance access tracks across waterways (formal or informal) have the potential to result in erosion or sedimentation, which may impact key habitats and breeding success of individuals.	Localised erosion or sedimentation impacts could occur at locations where access track crossings are proposed across waterways. A description and assessment of potential impacts to stream ecology as a result of access track crossings is presented in Sections 10.3 and 13.7 respectively. The extent of impact related to this issue is expected to be minor (no direct impacts likely and sediment and erosion controls to mitigate potential indirect impacts will be implemented as detailed above). <u>Booroolong Frog</u> Booroolong Frog habitat mapping provided by the BCD has been reviewed against the indicative access track mapping to identify any areas of	The work would mostly be limited to transmission line structure construction and transmission line installation, which would avoid direct impacts to waterways, especially major waterways, with appropriate water management measures to be implemented. Waterway crossings have been assessed as being permanent, maintained, structures. However, some of these waterway crossings may be removed where work is no longer required. Impacts associated with erosion or sedimentation are considered likely to be temporary pulse events.	Potential erosion and sedimentation events would be anticipated to be localised and temporary but have the potential to reduce stream habitats and breeding success of individuals.	Localised and generally short-term impact. The project is unlikely to result in significant environmental impacts to aquatic systems within the project footprint. Work within proximity of aquatic ecosystems would require stringent erosion and sediment controls to manage erosion and sedimentation risk to stream environments throughout the design refinement, construction, operation and rehabilitation stages of the project. See aquatic impact assessment (Section 13.7) and mitigation measures (Chapter 14) for details. Specific erosion and sediment control measures relevant to waterway crossings and work

Aquatic dependent entities	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
		habitat at risk of direct or indirect impacts on the basis of proximity and location (upstream/downstream) to any potential waterway crossing works. Stream habitats identified as being potentially at risk include: • Leech Gully (and associated first and second order tributaries) is potentially subject to indirect impacts from an indicative access track crossing approximately 280 m upstream of mapped habitats. • Gilmore Creek is potentially subject to direct and indirect impacts from indicative access track waterway crossings within mapped occupied habitat. • Adjungbilly Creek is potentially subject to indirect impacts from disturbance associated with an indicative access track which extends into the 50-metre habitat buffer.	Nevertheless, these events have the potential to result in a loss of habitat in the short term.		around waterways are specified in Table 14-1. Additional site-specific mitigation measures relevant to Booroolong Frog habitats (Figure 13-3) identified as potentially at risk include: • Opportunities to avoid installing a waterway crossing should be considered during detailed design. • The crossing design should preference installing a single bridge structure spanning the waterway (no instream structures) to minimise the potential for hydrological change, erosion and sedimentation impacts of downstream environments. • Where possible, re-alignment of the access track to avoid disturbance within 50 m of the top of bank of the waterway including riparian vegetation and waterway banks. • A suitably qualified Ecologist should be engaged to complete a site inspection to guide micro-siting of the waterway crossing to avoid impacts to potential habitats or ecological features. • Develop site specific erosion and sedimentation control plans to ensure the potential

Aquatic dependent entities	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
					for erosion and sedimentation impacts are minimized as far as practicable, including monitoring the success of erosion and sediment control measures. • A suitably qualified Ecologist should be engaged to monitoring surveys for the species at the crossing site and in downstream receiving environments. A monitoring plan would be developed as part of the BMP in consultation with the BCD.
TECs affected by altered hydrological regimes: • *Monaro Tableland Cool Temperate Grassy Woodland in the South-Eastern Highlands Bioregion* • *White Box Yellow Box Blakely's Red Gum Woodland* • *Tableland Basalt Forest* • *Montane Peatlands and Swamps*	These communities are vulnerable to altered hydrological regimes which may impede quality or flow of subsurface water.	Location of infrastructure that may intersect with groundwater, sub-surface flows or surface water would be developed at the detailed design phase of the project. However, impacts to groundwater have been determined to be minimal during construction and negligible during operation of the project (Aurecon, 2023c). Micro-siting of infrastructure requiring sub-surface work would be undertaken as part of the detailed design stage of the project, to minimise impacts where possible (ie selecting appropriate construction methodologies to minimise impacts/interaction to GDEs and supporting aquifers during	The work would mostly be limited to transmission line structures and line stringing, which would avoid direct impacts to waterways, especially major waterways, with appropriate water management measures to be implemented. No direct impacts are expected to occur to these aquatic values of reliant terrestrial threatened species.	The highest potential for these impacts is during construction, although these are subject to detailed management measures. Once operational, such impacts are considered to be negligible on an ongoing basis.	It is not considered that the project would result in significant environmental impacts to aquatic systems within the project footprint. Work within proximity of aquatic ecosystems would require stringent erosion and sediment controls to avoid increased run-off and pollutant loads. Subsurface work would be minimal. Micro-siting of infrastructure requiring sub surface work, such as transmission line structures, within the project footprint would be undertaken as part of the detailed design stage of the project, to minimise prescribed impacts where

Aquatic dependent entities	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offsets
• *Alpine Sphagnum Bogs and Associated Fens.*		activities such as transmission line structure piling) The extent of impact related to this issue is expected to be minor (minor direct impacts likely and sediment and erosion controls to mitigate potential indirect impacts).			possible (ie minimising impact to GDEs and supporting aquifers). Given impacts on water quality, waterways, and hydrological processes are unlikely, no indirect offsets are required for associated TECs.

13.5.6 Impacts to non-native vegetation and human made structures for threatened species

It was determined in Chapter 8 that of the two types of features that may constitute prescribed impacts (human made structures or non-native vegetation) only non-native vegetation was identified as relevant to the project. The assessment of prescribed impacts to non-native vegetation and human made structures as a result of the project is detailed in Table 13-23. Further detailed discussion on associated impacts to potentially affected threatened species is presented in Table 13-24. Non-native vegetation mapped within the project footprint is shown in Figure 6-1.

Table 13-23 Assessment of prescribed Impacts (human made structures or non-native habitat)

Prescribed biodiversity impacts	Nature (ie relevance to the project)	Extent	Duration	Consequences
(b) impacts of development on the habitat of threatened species or ecological communities associated with: (i) human made structures, or (ii) non-native vegetation.	**Human-made structures:** As detailed in Chapter 8 and Table 5 in Attachment 21, no impacts to human-made structures (ie culvert/ bridge demolition) are to occur as a result of the project. Therefore, impacts to human-made structure are not relevant to the project and have not been discussed further. **Non-native vegetation:** Some candidate threatened fauna recorded or assumed present are known to utilise non-native vegetation: Golden Sun Moth, Grey-headed Flying-fox, Striped Legless Lizard and, Pink-tailed Legless Lizard. Impacts to non-native vegetation on which they may depend is discussed in Table 13-24. Some areas of exotic-dominated vegetation would be impacted by the project. However, this is of low ecological value and has not been identified as supporting threatened species.	Impacts would be negligible in most areas of non-native vegetation. The extent of impacts is variable – depending on the species (refer to Table 13-24).	**Non-native vegetation:** Variable – depending on the species (see below)	Loss of potential low-quality/ marginal habitat for threatened species.

Table 13-24 Impacts of the project on threatened species that utilise non-native habitat

Candidate species	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offset
Grey-headed Flying-fox	Resident populations of Grey-headed Flying-fox in human-modified landscapes (urban, peri-urban, and agricultural), have been documented utilising exotic vegetation, as an alternate food source throughout the year, as well as vegetation suitable for roosting (Parry-Jones & Augee, 2001; Timmiss *et al.*, 2020; Yabsley *et al.*, 2021). No known Grey-headed flying-fox camps occur within the project footprint. However, recent data received from the BCD (dated 19/12/2022) indicate eight camps have been recorded within 37 km of the project footprint. Some areas of exotic-dominated vegetation impacted by the project may offer supplementary foraging resources for these populations.	Impacts would be negligible in most areas of exotic vegetation. Exotic vegetation to be removed is considered supplementary foraging habitat for the species and not considered important for the species survival.	The impacts to the exotic foraging habitats would be permanent, ranging from minor to moderate.	The species is highly adaptable and typically forages on a mosaic of urban food resources and natural foraging resources throughout its range. In peri-urban, and rural areas the species primarily forages on wet and dry sclerophyll forest, forested wetlands, and preferentially utilises high-quality foraging habitat (Yabsley *et al.*, 2021).	No known Grey-headed flying-fox camps occur within the project footprint, and any exotic vegetation would likely be supplementary foraging resources for the species. Given the impacts to non-native foraging resources for Grey-headed Flying-fox are considered relatively minor, no offsets or further mitigation measures are considered necessary.

Candidate species	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offset
Golden Sun Moth	Primary habitat is native grasslands (including derived grasslands) or grassy woodlands within the species geographical distribution. However, the species is also known to colonise exotic grasslands dominated by the exotic weed Chilean Needle Grass (*Nassella neesiana*) (DAWE, 2009). Chilean Needle Grass habitats haven't been identified in areas surveyed within the project footprint. However, there is potential for these low-quality habitats to occur within inaccessible lands.	Impacts would be negligible and localised in most areas of suitable exotic vegetation.	The impacts to the exotic vegetation foraging habitats would be permanent, ranging from minor to moderate.	The consequence of the impacts would be minor and non-significant to areas of known habitat where suitable avoidance measures can be adopted during detailed design and as a part of micro-siting of infrastructure.	Avoidance measures would be prioritised during the detailed design phase including infrastructure micro-siting within Golden Sun Moth habitat including non-native vegetation.

Candidate species	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation/offset
Striped Legless Lizard and Pink-tailed Legless Lizard	Striped Legless Lizard has been previously identified in sites dominated by exotic grasses such as *Phalaris aquatica*, *Nasella trichotoma* and *Hypochaeris radicata* (Robertson & Smith, 2010). Occasionally, Pink-tailed Legless Lizard has been found in disturbed areas dominated by exotic species such as *Avena barbata, Vulpia bromoides, Hypocheirus radicata, Bromus hordaceous, Aira elegantissima,* and *Trifolium arvense* (Jones, 1999). Approximately 197.91 ha of exotic grassland occurring within the Bungonia (17.45 ha), Crookwell (28.99 ha), Murrumbateman (33.28 ha) and Inland Slopes (118.19 ha) IBRA subregions may offer potential habitat opportunities for these species.	Where relevant, impacts are likely to be limited and localised.	The impacts to exotic grassland habitats would be permanent, ranging from minor to moderate.	The consequence of the impacts would be minor and non-significant to areas of known habitat where suitable avoidance measures can be adopted during detailed design and as a part of micro-siting of infrastructure.	Avoidance measures would be prioritised during the detailed design phase and as a part of infrastructure micro-siting within Striped Legless Lizards and Pink-tailed Legless Lizard habitat including non-native vegetation. (Figure 13-14).

13.5.7 Vehicle strike impacts

The assessment of vehicle strike as a result of the project is detailed in Table 13-5. Further detailed discussion on associated impacts to threatened species in relation to vehicle strike is presented in Table 13-26.

Table 13-25 Assessment of Prescribed Impacts (vehicle strike)

Prescribed biodiversity impacts	Nature (ie relevance to the project)	Extent	Duration	Consequences
(f) the impact of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community	The project has the potential to impact on fauna through interactions with vehicles/machinery.	The extent of vehicular strike may occur throughout the project footprint where vehicles and machinery move through the landscape for construction and operation (maintenance).	The risk of vehicle strike risk is likely to be greatest during the construction phase of the project.	Injury/death.

Table 13-26 Impacts of the project associated with vehicle strike on threatened species

Candidate species potentially subject to vehicle strike	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation
The following candidate fauna species with vehicle strike listed as a Key Threatened Process to their conservation (under the BC Act), include: • Koala • Eastern Pygmy-possum • Squirrel Glider • Superb Parrot • Powerful Owl • Masked Owl.	Collision with passenger vehicles and construction machinery	Throughout the project footprint where vehicles and machinery move through the landscape for construction and operation (maintenance). The risk of mortality or injury from vehicle strike is likely to be higher at certain times of the year for terrestrial/ arboreal mammals when their mobility and home range sizes increase, particularly during the breeding season. The clearing of vegetation in some areas within the project	The risk of vehicle strike is likely to be greatest during the construction phase of the project where the number of vehicles and machinery would be greatest.	Injury/death.	The BMP would include the requirement for: education of construction teams regarding the presence of native fauna and risks of collision, particularly early in the morning and late in the afternoon/at night; implementation of speed limits on sealed and unsealed tracks and roads; and awareness of biodiversity “hotspot” areas along the project footprint during construction.

Candidate species potentially subject to vehicle strike	Nature (relevance to the project)	Extent	Duration	Consequences	Mitigation
		footprint may increase the risk of harm/death to local fauna through increased exposure to vehicle strike as they attempt to move to nearby habitats. Some bird species feed on carrion or seeds along road corridors, or easements, which may result in them being struck by or trampled by vehicles/machinery.			

13.6 Serious and irreversible impacts

The BC Act and the LLS Act imposes various obligations on decision-makers in relation to impacts on biodiversity values that are at risk of Serious and Irreversible Impacts (SAII). These obligations require a decision-maker to determine whether the residual impacts of a proposed development on biodiversity values (that is, the impacts that would remain after any proposed avoid or mitigate measures have been taken) are serious and irreversible.

The BC Act and the BC Regulation provide a framework to guide the approval authority in making this determination. The framework consists of a series of principles defined in Section 6.7 of the BC Regulation and supporting guidance, provided for under section 6.5 of the BC Act, to interpret these principles. Criteria to interpret the principles is included in Table 1 of *Guidance to assist a decision-maker to determine a serious and irreversible impact* (DPIE, 2019).

Table 13-27 identifies candidate species regarded as SAII entities. The potential for SAII was determined by a conservative assessment of the likelihood of occurrence of potential entities, based on the results of the field survey and candidate species assessment (refer to Threatened flora: Section 7.1; Threatened fauna: Section 7.3 and analysis against direct, prescribed and indirect impacts, Section 13.3, 13.4 and 13.5). Five of the SAII entities were recorded in the project footprint including four TECs and one fauna species (Table 13-27):

- *White Box-Yellow Box-Blakely's Red Gum Grassy Box Woodland and Derived Native Grassland*
- *Tableland Basalt Forest in the Sydney Basin and South-Eastern Highlands Bioregions*
- *Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South-Western Slopes and South-Eastern Highlands Bioregions*
- *Monaro Tableland Cool Temperate Grassy Woodland in the South-Eastern Highlands Bioregion*
- Large Bent-winged Bat (*Miniopterus orianae oceanensis).*

A further 28 SAII entities were assumed present or have been previously found within or adjacent to the project footprint, as detailed in Table 13-27.

Twelve SAII entities (including four TECs, five flora and three fauna species) are considered likely to be impacted by the project. However, based on the assessment against relevant principles (Attachment 13), there is a risk the project would result in a potential SAII for two TECs (Box Gum Woodland and Tableland Basalt Forest TECs), two threatened flora species (*Prasophyllum bagoense* and *Prasophyllum keltonii*) and one threatened fauna species (Smoky Mouse).

There is a low risk of potential SAII for the following entities:

- Two of the four TECs: Coolac-Tumut Serpentinite Shrubby Woodland and Monaro Tableland Cool Temperate Grassy Woodland, due to the limited or sporadic extent of potential impacts
- Two of the five threatened flora species: *Prasophyllum innubum* and *Pterostylis oreophila,* likely to be avoided through further route refinement and micro-siting of transmission line structures
- One flora species (*Solanum armourense*), likely to be excluded from the assessment through additional targeted surveys scheduled for completion in spring 2023
- Yellow-spotted Tree Frog due to low likelihood of breeding habitats occurring within the project footprint and proposed mitigation measures within proximity to streams and waterbodies
- Sooty Owl, due to limited occurrence of suitable breeding habitats and opportunities to avoid impacts to hollow-bearing trees as a part of the detailed design, where breeding is recorded.

Another 23 SAII entities (18 flora and five fauna species) have been assessed as a conservative measure but are considered unlikely to be impacted due to limited potential impacts and/ or occurrence within the project footprint.

Provision of additional information for the candidate SAII entities detailed in Table 13-27 are contained in Attachment 13 to assist the determining authority with evaluating the extent and severity of project impacts to each SAII entity. Avoidance and mitigation measures relevant to each SAII entity are outlined in Attachment 13 and further detailed in Chapters 12 and 14 of this report.

Table 13-27: Candidate and predicted 'Candidate SAII' TECs and threatened species

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
Threatened biodiversity SAII candidates likely to be impacted Species have been included in this table where some level of impact for the species is considered at least moderately likely.					
Threatened ecological communities					
White Box-Yellow Box-Blakely's Red Gum Grassy Box Woodland and Derived Native Grassland	-	True	-	Yes. This TEC was recorded in the project footprint and would be impacted by the project. SAII assessment required.	Approximately 3,137 ha of *White Box-Yellow Box-Blakely's Red Gum Grassy Box Woodland and Derived Native Grassland* TEC occurs in the project footprint (Figure 6-1). The majority (80%) of this TEC in the project footprint is in a low to very low condition, 8% is in moderate condition and 11% is in high to very high condition. A total of up to 311.78 ha would be directly impacted by the project. Of the area that would be directly impacted, only 16% (49.35 ha) is in high to very high condition, and the majority is in low to very low condition. The project would add to the reduction in ecological function experienced by this community historically given the extent of proposed clearing. The project would contribute to a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline. However, there are extensive areas of this community that remain and if impacts were substantially limited to lower condition remnants this might result in a 'non-significant risk' of extinction determination. This would be due to the relatively large expanses of the community which remain and restriction of most impacts to lower condition areas.
Tableland Basalt Forest in the Sydney Basin and	-	True	-	Yes. This TEC was recorded in the project footprint and would be impacted by the project. SAII assessment required.	Approximately 176.85 ha of Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions TEC occurs in the project footprint (Figure 6-1 The majority (60%) of this TEC in the

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
South-Eastern Highlands Bioregions					project footprint is in high to very high condition, 5% is in moderate condition and 35% is in a low to very low condition. Of that, a total of 37.42 ha would be directly impacted by the project. It is noted that 8.1 ha of impacts for this community would occur within the HTZ zone where a limited VI loss is predicted. If TCZ and ECZ clearing within higher condition areas can be further limited, it should significantly reduce the risk of an SAII conclusion. However, without additional mitigation, the project is likely to be deemed a significant risk to the ecological community becoming extinct because it will cause a further decline of the ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline. In addition, primarily for better condition areas of the community subject to ECZ clearing, the project would add to the reduction in ecological function experienced by this community historically.
Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South-Western Slopes and South-Eastern Highlands Bioregions	-	True	-	Yes. This TEC was recorded in the project footprint and would be impacted by the project. SAII assessment required.	Approximately 33.10 ha of Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes and South Eastern Highlands Bioregions TEC occurs in the project footprint (Figure 6-1). The majority (40%) of this TEC in the project footprint is in a low condition, 23% is in a moderate condition and 37% is in high condition. No other condition classes were recorded. Of that, a total of 1.42 ha would be directly impacted by the project. Given the limited and sporadic extent of impacts it is considered very unlikely that the project would be considered as contributing significantly towards the risk of extinction to the community. The project is not expected to reduce the extent of occurrence or area of occupation of this community (the relevant SAII principle for assessment) under scales used for their calculation.

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
Monaro Tableland Cool Temperate Grassy Woodland in the South-Eastern Highlands Bioregion	-	True	-	Yes. This TEC was recorded in the project footprint and would be impacted by the project. SAII assessment required.	Approximately 23.32 ha of *Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion* CEEC occurs in the project footprint (Figure 6-1). The majority (58%) of this CEEC in the project footprint is in Low condition, 10% is in moderate condition and 32% is in High to Very high condition. Of that, a total of 1.7 ha would be directly impacted by the project. Given the limited extent of impacts and the retention of some values in areas to be cleared (no areas expected to be totally cleared) it is considered unlikely that the project would be considered as contributing significantly towards the risk of extinction to the community. Additional avoidance of better condition areas would reduce the likelihood of an SAII even further.
Threatened flora					
Prasophyllum bagoense	Bago Leek Orchid	True	-	*Prasophyllum bagoense* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. A population has been previously recorded 130 m to the west of the project footprint in Bago State Forest. Potential habitat for the species would be impacted by the project at this location. SAII assessment required.	Suitable habitat for *Prasophyllum bagoense* occurs within the project footprint within the Snowy Mountains IBRA subregion. The species was recorded during field surveys adjacent to (ie within 130 m) the project footprint. A total of 39 individuals were recorded. Another 20 individuals were historically recorded by NSW Forestry Corporation in 2016 within the project footprint in the Snowy Mountains IBRA subregion. Review of BioNet data approximately 397 historic records occur within 10km of the project footprint. The species is considered likely to occur within within the project footprint given the presence of historic records and suitable habitats. The species has been assumed present within these habitats. Confirmation of habitat status through survey and/or further expert advice may remove the likelihood of an SAII finding. Presently, given the project will impact on 31.9 ha of potential habitat, which may equate with up to 8% of the species known range, the project is likely to be deemed a significant risk to the species becoming extinct because it is an impact on the habitat of a

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
					species that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.
Prasophyllum innubum	Brandy Marys Leek-orchid	True	-	*Prasophyllum innubum* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. Potential habitat for the species would be impacted by the project. SAII assessment required.	Suitable habitat for Brandy Marys Leek-orchid occurs within the project footprint within the Snowy Mountains IBRA subregion. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within potential habitat. As such a percentage present in the subpopulation of the total population cannot be attained. However, it is assumed to have a high likelihood of occurrence due to presence of suitable habitat and there are four nearby records of the Brandy Marys Leek-orchid, with the closest record only 600 m outside the project footprint (DPE, 2022). All records are located in proximity to the southern extent of the project footprint in PCT 1124 paddocks (DPE, 2022). Given the project impact would be limited to 0.25 ha of high condition habitat, which equates to approximately 3% of the species known range, the project is unlikely to be deemed a significant risk to the species becoming extinct because it is an impact on the habitat of a species that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution. Within the project footprint, 8.58 ha of habitat for this species would remain and if impacts were further avoided and minimised through route refinement (EMM B1) this would likely result in a non-significant risk determination.
Prasophyllum keltonii	Kelton's Leek Orchid	True	-	*Prasophyllum keltonii* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. A population has been previously recorded 750 m to the west of the project footprint in Bago State Forest. Potential	Suitable habitat for *Prasopyllum keltonii* occurs within the project footprint in the Snowy Mountains IBRA subregion. Field surveys undertaken for the project recorded 14 individuals adjacent to (ie within 750m) the project footprint. 330 individuals have been historically recorded by the NSW Forestry Corporation (all during 2016) within the vicinity of the project footprint. Three of these historic records directly intersected the project footprint.

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
				habitat for the species would be impacted by the project at this location. SAII assessment required.	Species records are situated within the southern extent of the project footprint in the PCT 1224 paddocks. *Pterostylis oreophila* and *Prasophyllum innubum* have also been historically recorded within this habitat based on a review of BioNet data (DPE, 2022). Suitable habitat for the species is situated within the project footprint and species presence has been assumed within these habitats. Confirmation of habitat status through survey and/or further expert advice may remove the likelihood of an SAII finding. Given the project will impact on 31.70 ha of majority (98%) high condition habitat, the project is likely to be deemed a significant risk to the species becoming extinct because it is an impact on the habitat of the species that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.
Pterostylis oreophila	Blue-tongued Greenhood	True	-	*Pterostylis oreophila* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. Potential habitat for the species would be impacted by the project. SAII assessment required.	Suitable habitat for Blue-tongued Greenhood occurs within the project footprint within Snowy Mountains IBRA subregion. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within potential habitat as a precautionary approach. There are 5 nearby records of the Blue-tongued Greenhood, with the closest record 300 m from the project footprint boundary (DPE, 2022). All BioNet records were focused southern extent of the project footprint (DPE, 2022). It is known to occur within the Snowy Mountains IBRA subregion. Given the project would impact 0.56 ha of very high condition habitat, the project may be deemed a significant risk to the species becoming extinct because it is an impact on the habitat of the species that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
					(precautionary finding due to limited data available on known extent). If impacts were further avoided and minimised through route refinement (EMM B1) this would likely result in a non-significant risk determination. This should be achievable given the limited predicted area of impact.
Solanum armourense	-	True	-	*Solanum armourense* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. Potential habitat for the species would be impacted by the project. SAII assessment required.	Suitable habitat for *Solanum armourense* occurs within the project footprint within the Bungonia IBRA subregion. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable habitat. There are two nearby records of *Solanum armourense,* with the closest record 6.5 km from the project footprint boundary (DPE, 2022). BioNet records were focused on the eastern extent of the project footprint (DPE, 2022). It is known to occur within the Bungonia IBRA subregion. Given the project would impact 0.51 ha of moderate to high condition habitat and the species presence is assumed, the project may be deemed a significant risk to the species becoming extinct as it may cause a further decline of the species that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline (precautionary finding due to limited data available on rate of decline). If impacts were further avoided and minimised through route refinement (EMM B1) or if further survey confirmed absence of the species within areas of assumed presence this would likely result in a non-significant risk determination.
Threatened fauna					
Litoria castanea	Yellow-spotted Tree Frog	True	-	Yellow-spotted Tree Frog was not recorded in the project footprint. The species has a moderate	Suitable habitat for Yellow-spotted Tree Frog occurs within the project footprint within PCTs 335, 939, 1256, 9997 in the Crookwell,

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
				likelihood of occurrence within the Murrumbateman IBRA subregion where suitable permanent streams occur and historic records are known. No habitats within Murrumbateman would be impacted. Species presence has been assumed within some IBRA subregions predicted by the BAM-C due to survey limitations. Approximately 1.62 ha of potential habitat would be impacted within Crookwell and the Snowy Mountains. As such, an SAII assessment is required.	Murrumbateman and Snowy Mountains IBRA subregion. Given that there are no records of the species since 1980, the total population is likely to include fewer than 50 mature individuals and may already be extinct (TSSC, 2019). However, they may have remained undetected as a result of insufficient survey effort (TSSC, 2019). The total population in NSW is unknown, as such a percentage to be impacted of the total population cannot be attained. The species was not recorded in the project footprint during targeted surveys and is assumed present. There are 2 nearby records of the Yellow-spotted Tree Frog (400 estimated individuals) (DPE, 2022). All records are outside the project footprint, with the closest record 9 km from the project footprint. The project would have direct impacts on 1.36 ha of potential habitat for Yellow-spotted Tree Frog typically constituting trees or other woody vegetation fringing farm dams or other waterbodies with limited habitat potential. No breeding habitat is expected to be directly impacted for the species. About 1.09 ha (80%) of the potential habitat occurs within the TCZ and would be subject to permanent loss. The remaining habitat areas occur within the ECZ and HTZ and would be subject to partial clearing. A low likelihood of direct impacts to potential breeding habitat and the limited extent of impact on surrounding foraging habitats mean an SAII outcome is considered unlikely for this species, particularly given stated measures to avoid and mitigate impacts to waterbodies. Additional measures to reduce clearing within potential habitat would strengthen this conclusion.
Pseudomys fumeus	Smoky Mouse	True	-	Smoky Mouse was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. Potential habitat for the species would be impacted by the project.	Suitable habitat for Smoky Mouse occurs within the project footprint within PCTs 638, 953 and 1196 in the Bondo and Snowy Mountains IBRA subregions. Targeted fauna surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
				An SAII assessment is required for the species.	habitat. There are no records within 20 km of the project (DPE 2022). The total area of this species habitat that would be impacted by the project is 132.66 ha (0.06 ha and 132.6 ha in Bondo and Snowy Mountains IBRA subregions, respectively). The project would impact on 132.66 ha of high or very high condition potential habitat, 59.43 ha (45%) of this habitat would be subject to some selective thinning of large trees only (i.e. HTZ). Given this, microhabitat features are expected to be retained within these areas. Impacts to 132.66 ha of habitat potentially equates to 0.5% of the species known range. It is considered that the impacts from the project may be deemed a sufficiently high risk to be an SAII depending on the likelihood of the species being present. Additional survey and/or expert advice is likely to assist in confirmation of the species presence/ absence within the project footprint and therefore the considered level of risk for an SAII to occur.
Tyto tenebricosa	Sooty Owl	-	True	Sooty Owl was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. Potential breeding habitat for the species would be impacted by the project. SAII assessment required.	The number of individuals in NSW has been estimated as 10,000 birds (DEC, 2006). However, no individuals or nesting habitat (caves or hollow bearing trees) was identified within the project footprint during targeted survey efforts, as such a percentage to be impacted of the total population cannot be attained. There are nine nearby records (10 estimated individuals) on BioNet (DPE, 2022). All records are outside the project footprint, with the closest record 650 m from the project footprint. Records are focused around the southern extent of the project footprint. It is known to occur in Bondo, Bungonia and Snowy IBRA subregions. Associated PCTs and habitat occurs within the project footprint. This species may utilise habitats within the project footprint for foraging. The project would impact on 21.20 ha of potential habitat for Sooty Owl. However, based on the review of available plot and hollow bearing tree data, it is likely that a moderate proportion of this

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
					habitat does not support suitable hollows and could be removed from the species polygon altogether. Additional constraints mapping and survey during breeding season is recommended to confirm where breeding habitats are present/ absent. More than half (11.80 ha) of impacted habitats are situated within the HTZ. Where active roosts are recorded within this zone, it is likely that these could be avoided through design measures such as increased transmission line structure heights and micro-siting. Given impacts to breeding habitats are likely to be limited in extent, the project is deemed unlikely to pose a significant risk to the species becoming extinct.
Threatened biodiversity SAII candidates with limited potential to be impacted Species have been included in this section of the table where there is incomplete information to be able to exclude them from SAII assessment despite a limited likelihood of potential impacts and/or occurrence within the disturbance footprint, for example: • The species/entity was not found during field surveys of comparable habitat, however the survey coverage was incomplete or surveys were not conducted during the required season and the species is known or predicted from the broader IBRA sub-region.					
Threatened flora					
Acacia phasmoides	Phantom Wattle	True	-	Habitat for *Acacia phasmoides* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. Despite this, the species is considered unlikely to occur within the project footprint given it is only known from one location in NSW: Woomagarma National Park in Greater Hume Shire. A SAII assessment has been undertaken on a precautionary basis.	Habitat for *Acacia phasmoides* occurs within the project footprint within the Inland Slopes IBRA subregion, however the species was not directly recorded during targeted surveys. Where survey effort was not adequate, species presence has been assumed within suitable habitat. The species has not been recorded within 20 km of the project footprint and is only known from one location in NSW: Woomargama National Park in Greater Hume Shire, approximately 60 km south-west of the project footprint. Therefore, the project is unlikely to be deemed a significant risk to the species becoming extinct due to either an impact on the habitat of the species that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution, or; the impacted species being unlikely to respond to measures to

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
					improve its habitat and vegetation integrity and therefore its members are not replaceable. The total area of this species suitable habitat that would be directly impacted by the project is 2.00 ha.
Bossiaea fragrans	-	True	-	*Bossiaea fragrans* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. The species is only known from the Abercrombie Karst Conservation Reserve and within the adjacent Travelling Stock Reserve, south of Bathurst on the NSW central tablelands. It has a highly restricted distribution, with only a small number of discreet known sub-populations. Given this, the species is considered unlikely to occur within the project footprint.	Suitable habitat for *Bossiaea fragrans* occurs within the project footprint within PCT 268 in the Inland Slopes Subregion. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable habitat. There are no records within 20 km of the project (DPE, 2022). The total extent of potential habitat that would be directly impacted by the project is 6.10 ha. The project is unlikely to be deemed a significant risk to the species becoming extinct due to either a reduction in the population size of the species that is currently observed, estimated, inferred or reasonably suspected to have a very small population size, or due to an impact on the habitat of the species that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.
Caladenia concolor	Crimson Spider Orchid	True	-	*Caladenia concolor* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. The species has a low likelihood of occurrence. Known populations are limited to a property near Bethungra and within Burrinjuck Nature Reserve. Requires woodland with a high diversity of plant species.	Habitat for *Caladenia concolor* occurs within the project footprint within PCTs 268, 280 and 290 in the Murrumbateman and Inland Slopes subregions. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable habitat. There are 7 records near the project (43 individuals), and the closest is 4 km from the project footprint (DPE, 2022). The project would result in the direct impact to 34.10 ha of potential habitat for Crimson Spider Orchid in the project footprint. The project is unlikely to be deemed a significant risk to the species becoming extinct due to either causing a further decline of the species that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline or due to an impact on the

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
					habitat of the species that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.
Caladenia tessellata	Thick Lip Spider Orchid	True	-	*Caladenia tessellata* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. No known populations occur within proximity to the project footprint and the species likelihood of occurrence is considered low. A SAII assessment has been undertaken on a precautionary basis.	Suitable habitat for *Caladenia tessellata* occurs within the project footprint within the Bungonia IBRA subregion. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable habitat. There are no records within 20 km of the project (DPE, 2022). The total area of this species habitat to be directly impacted by the project is 16.00 ha. The project is unlikely to be deemed a significant risk to the species becoming extinct due to either causing a further decline of the species that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline or due to an impact on the habitat of the species that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.
Calotis glandulosa	Mauve Burr-daisy	True	-	*Calotis glandulosa* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. The species is known from three sites in the upper Shoalhaven catchment. Whilst it is a coloniser of disturbed lands it does not tolerate heavy grazing. The species has a low likelihood of occurring within the project footprint. A SAII assessment has been undertaken on a precautionary basis.	Suitable habitat for *Calotis glandulosa* occurs within the project footprint within the Bondo and Snowy Mountains IBRA subregions. Targeted flora surveys undertaken in areas of suitable habitat within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable habitat. There are no BioNet records within 20 km of the project footprint (DPE, 2022). The total area of this species habitat to be directly impacted by the project is 16.00 ha. The project is unlikely to be deemed a significant risk to the species becoming extinct due to causing a further decline of the species that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline.

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
Diuris ochroma	Pale Golden Moths	True	-	*Diuris ochroma* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. Known populations of the species are limited to Kosciuszko National Park and the Kybean area in NSW. The species has a low likelihood of occurring within the project footprint. A SAII assessment has been undertaken on a precautionary basis.	Suitable habitat for *Diuris ochroma* occurs within the project footprint within the Snowy Mountains IBRA subregion. Targeted flora surveys undertaken in areas of suitable habitat within the project footprint did not locate the species, as such a percentage present in the subpopulation of the total population cannot be attained. There are no BioNet records within 20 km of the project footprint (DPE, 2022). Where survey effort was not adequate, species presence has been assumed within potential habitat based on associated PCTs and other available desktop data including vegetation condition. In NSW, this species is confined to a single population, in 2008, this population contained an estimated 130 mature individuals in the Kybeyan area (TSSC, 2016). The species has a low likelihood of occurring within the project footprint. The total area of potential habitat to be directly impacted by the project is 0.25 ha. The project is unlikely to be deemed a significant risk to the species becoming extinct due to either further reducing the population size of the species that is currently observed, estimated, inferred or reasonably suspected to have a very small population size, or due to an impact on the habitat of the species that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.
Eucalyptus alligatrix subsp. *alligatrix*	-	True	-	*Eucalyptus alligatrix subsp. alligatrix* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. The species is only known from a single population south-west of Rylstone. The species has a low likelihood of occurring within the project footprint. A SAII assessment has been undertaken on a precautionary basis.	Suitable habitat for *Eucalyptus alligatrix* subsp. *alligatrix* occurs within the project footprint within PCTs 287 and 290 in the Inland Slopes IBRA subregion. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable habitat. There are no records within 20 km of the project (DPE, 2022). The species has a low likelihood of occurring within the project footprint. The project would result in the direct impact to 1.14 ha of potential habitat for *Eucalyptus alligatrix* subsp. *alligatrix*.

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
					The project is unlikely to be deemed a significant risk to the species becoming extinct due to an impact on the habitat of the species that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.
Eucalyptus robertsonii subsp. *hemisphaerica*	Robertson's Peppermint	True	-	*Eucalyptus robertsonii subsp. hemisphaerica* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. The species is known only from the central tablelands of NSW north of Orange to Burraga. The species has a low likelihood of occurring within the project footprint. A SAII assessment has been undertaken on a precautionary basis.	Suitable habitat for *Eucalyptus robertsonii* subsp. *hemispharica* occurs within the project footprint within PCTs 352 and 727 in the Crookwell and Inland Slopes IBRA subregions. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable habitat. There are no records within 20 km of the project (DPE, 2022). The species has a low likelihood of occurring within the project footprint. The project would result in the direct impact to 0.29 ha of potential habitat for *Eucalyptus robertsonii* subsp. *hemispharica* in the Crookwell IBRA subregion. The project is unlikely to be deemed a significant risk to the species becoming extinct due to either further reducing the population size of the species that is currently observed, estimated, inferred or reasonably suspected to have a very small population size, or due to an impact on the habitat of the species that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.
Euphrasia arguta	-	True	-	*Euphrasia arguta* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. Only known population of the species occurs in the Nundle area of NSW. The species has a low likelihood of occurring within the project footprint. A SAII assessment has been undertaken on a precautionary basis..	Habitat for *Euphrasia arguta* occurs within the project footprint in the Inland Slopes IBRA subregion. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable habitat. There are no nearby records (within 20 km of the project footprint, with only 1 previous record in the Inland Slopes Bioregion (DPE, 2022). The species has a low likelihood of occurring within the project footprint. The total area of potential habitat that would be directly

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
					impacted by the project is 92.90 ha. The project is unlikely to be deemed a significant risk to the species becoming extinct due to an impact on the habitat of the species that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.
Euphrasia scabra	Rough Eyebright	True	-	*Euphrasia scabra* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. There are three known populations of the species in NSW: Bondi State Forest, South East Forests National Park and near Nunnock Swamp. The species has a low likelihood of occurring within the project footprint. SAII assessment required.	Suitable habitat for *Euphrasia scabra* occurs within the project footprint in the Snowy Mountains IBRA subregion. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within potential habitat. There are no records within 20 km of the project (DPE, 2022). The species has a low likelihood of occurring within the project footprint. The total area of potential habitat to be directly impacted by the project is 1.90 ha. The project is unlikely to be deemed a significant risk to the species becoming extinct due to an impact on the habitat of the species that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.
Genoplesium superbum	Superb Midge Orchid	True	-	Suitable habitat for *Genoplesium superbum* was detected within the project footprint within the Bungonia IBRA subregion. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable habitat. The species is only known from two locations near Nerriga and Morton National Park in NSW. The species has a low likelihood of occurring within the project footprint. A SAII assessment has been undertaken on a precautionary basis.	Suitable habitat for *Genoplesium superbum* occurs within the project footprint within the Bungonia IBRA subregion. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable habitat. The species has a low likelihood of occurring within the project footprint. The total area of potential habitat to be directly impacted by the project is 8.80 ha. The project is unlikely to be deemed a significant risk to the species becoming extinct due to further reducing the population size of the species that is currently observed, estimated, inferred or reasonably suspected to have a very small population size.
Glycine latrobeana	Clover Glycine	True	-	*Glycine latrobeana* was not recorded in the project footprint, however the species has been assumed	According to the DPE (2015), there is a single population of about 500-1000 plants in the Kelly Plains. The species is confirmed in

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
				present over a portion of the project footprint due to survey limitations. The closest known population is within Kosciuszko National Park. The species has a low likelihood of occurring within the project footprint. A SAII assessment has been undertaken on a precautionary basis.	Kosciuszko National Park as of a 2013 transect line survey. Suitable habitat for *G. latrobeana* was detected within the project footprint within the Snowy Mountains IBRA subregion. Targeted flora surveys undertaken in areas of suitable habitat within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable habitat. There are no BioNet records within 20 km of the project footprint (DPE, 2022). The species has a low likelihood of occurring within the project footprint. The total area of potential habitat to be directly impacted by the project is 0.25 ha. The project is unlikely to be deemed a significant risk to the species becoming extinct due to an impact on the habitat of the species that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.
Grevillea iaspicula	Wee Jasper Grevillea	True	-	*Grevillea iaspicula* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. The species is only known to occur on the shores of Lake Burrinjuck. The species has a low likelihood of occurring within the project footprint. A SAII assessment has been undertaken on a precautionary basis.	Suitable habitat for Wee Jasper Grevillea occurs within the project footprint in the Crookwell, Inland Slopes and Murrumbateman IBRA subregions. Targeted flora surveys undertaken in areas of suitable habitat within the project footprint did not locate the species, as such a percentage present in the subpopulation of the total population cannot be attained. There are 24 nearby records of this species (1080 estimated individuals), the closest record is 11 km outside the project boundary (DPE, 2022). It is known to be present in the Bondo and Murrumbateman IBRA subregions. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within potential habitat. The species has a low likelihood of occurring within the project footprint. The project would result in the direct impact to 3.85 ha of potential habitat for this species within the project footprint. The project is unlikely to be deemed a significant risk to the species becoming extinct due to an impact on the habitat of the species that is currently observed, estimated, inferred or reasonably suspected

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
					to have a very limited geographic distribution.
Grevillea wilkinsonii	Tumut Grevillea	True	-	*Grevillea wilkinsonii* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. The species is only known from two locations in NSW: Goobarragandra River and overlapping two properties at Gundagai. The species has a low likelihood of occurring within the project footprint. A SAII assessment has been undertaken on a precautionary basis.	Suitable habitat for *Grevillea wilkinsonii* occurs within the project footprint within PCTs 266, 278 and 301 in the Inland Slopes IBRA subregion. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable habitat. There are 17 records near the project, and the closest is 14 km from the project footprint (DPE, 2022). The species has a low likelihood of occurring within the project footprint. The total area of potential habitat that would be directly impacted by the project is 34.70 ha. The project is unlikely to be deemed a significant risk to the species becoming extinct due to an impact on the habitat of the species that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.
Irenepharsus magicus	Elusive Cress	True	-	Habitat for Elusive Cress was detected within the project footprint in the Snowy Mountains IBRA subregion. Targeted flora surveys within the project footprint did not locate the species, however certain areas of potential suitable habitat within the project footprint were inaccessible for surveys, therefore the species has been assumed present in these areas. Despite this, the species is considered to have a low likelihood of occurring within the project footprint. The only known records from Geehi Dam within Kosciuszko National Park. A SAII assessment has been undertaken on a precautionary basis.	Habitat for *I.magicus* occurs within the project footprint in the Snowy Mountains IBRA subregion. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable habitat. There are no nearby records (DPE, 2022). Therefore, the project is unlikely to be deemed a significant risk to the species becoming extinct due to either further reducing the population size of the species that is currently observed, estimated, inferred or reasonably suspected to have a very small population size, or due to an impact on the habitat of the species that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution. The total area of potential habitat that would be directly impacted by the project is 26.50 ha.

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
Pomaderris delicata	Delicate Pomaderris	True	-	*Pomaderris delicata* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. Known from only two sites: between Goulburn and Bungonia and south of Windellama. The species has a low likelihood of occurring within the project footprint.	Potential habitat for *Pomaderris delicata* occurs within the project footprint within the Bungonia IBRA subregion. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within potential habitat. There are no records within 20 km of the project (DPE, 2022). Therefore, the project is unlikely to be deemed a significant risk to the species becoming extinct due to an impact on the habitat of the species that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution. The total area of this species habitat to be directly impacted by the project is 8.00 ha.
Pomaderris pallida	Pale Pomaderris	True	-	*Pomaderris pallida* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. There are no known records of the species within 20 km of the project footprint. The species is considered to have a low likelihood of occurring within the project footprint. A SAII assessment has been undertaken on a precautionary basis.	Potential habitat for *Pomaderris pallida* occurs within the project footprint within the Murrumbateman IBRA subregion. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within potential habitat. There are no records within 20 km of the project (DPE, 2022). The total area of this species habitat to be directly impacted by the project is 0.77 ha. The project is considered unlikely to lead to further decline or extinction of the species given it is not considered likely to be present within the project footprint.
Zieria obcordata	Granite Zieria	True	-	*Zieria obcordata* was not recorded in the project footprint, however the species has been assumed present over a portion of the project footprint due to survey limitations. The species is only known from two sites in NSW: one in the Wuuluman area near Wellington and the other at Crackerjack Rock/ Rock Forests area north-west of Bathurst. The species has a low likelihood of occurring within the project footprint.	Suitable habitat for *Zieria obcordata* occurs within the project footprint within PCTs 268, 280 and 287 in the Inland Slopes IBRA subregion. Targeted flora surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable habitat. There are no records within 20 km of the project (DPE, 2022). The project would result in direct impacts to a total of 43.40 ha of potential habitat for Granite Zieria. About 34.40 ha (79%) of this habitat would be permanently cleared (ie TCZ).

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
				A SAII assessment has been undertaken on a precautionary basis.	The project is considered unlikely to lead to further decline or extinction of the species given it is not considered likely to be present within the project footprint.
Threatened fauna					
Mixophyes balbus	Stuttering Frog	True	-	Stuttering Frog was not recorded in the project footprint. Suitable wet sclerophyll forest habitat and permanent streams occur within the Bungonia IBRA subregion however the closest historic records are within the Blue Mountains (about 40 km north). The species has been assumed present over a portion of the project footprint due to survey limitations. A SAII assessment has been undertaken on a precautionary basis.	Suitable habitat for Stuttering Frog occurs within the project footprint within PCTs 870, 1097, 1107 and 1150 in the Bungonia IBRA subregion. The species was not recorded in the project footprint during targeted surveys and is assumed present. There are no nearby records of the Stuttering Frog (DPE, 2022). The closest records are near Ruby Creek in the Blue Mountains (about 40 km north of the project). Up to 13.80 ha of potential habitat would be directly impacted as a result of the project. Based on a low likelihood of the species occurrence or direct impacts to breeding habitat and appropriate mitigation measures with regard to stream protection, it is considered an SAII outcome decision is very low likelihood.
Petrogale penicillata	Brush-tailed Rock-wallaby	True	-	Brush-tailed Rock Wallaby was not recorded in the project footprint. The closest known record (1997) is about 8km north of the project at Wombeyan Caves. There is potential for habitat to occur immediately north of Tarlo River National Park within a large patch of remnant vegetation. The species has been assumed present within this area due to survey limitations. However, further refinement of the species polygon is required as many lands are unlikely to support suitable rocky habitats. A SAII assessment has been undertaken on a precautionary basis.	Suitable habitat for Brush-tailed Rock-wallaby occurs within the project footprint within PCTs 283, 870, 1093, 1107, 1150, and 1330 in the Bungonia IBRA subregion. Targeted fauna surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable habitat. There are no records within 20 km of the project (DPE 2022). The total area of this species habitat that would be impacted by the project is 1.10 ha. Given the limited extent of impact and limited likelihood of occurrence of the species an SAII outcome decision is considered unlikely.
Chalinolobus dwyeri	Large-eared Pied Bat	True	-	Large-eared Pied Bat was not recorded in or adjacent to the project footprint. Species presence has been	According to BioNet, there are 15 nearby records (31 estimated individuals) of this species within 20 km of the subject land. All records are outside the project footprint and the closest record is 8

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
				assumed within 2 km of mapped potential karst and cliff lines, due to survey limitations. About 7.69 ha of potential foraging habitat for the species would be impacted by the project. The project would not interfere with habitat occurring within 100 m of mapped potential karst and cliff lines. A SAII assessment has been undertaken on a precautionary basis.	km from the project footprint boundary, connectivity of escarpment, boulders, crevices and other rock habitat is good in the area. It is known to occur within the Bungonia and Inland Slopes IBRA subregions where the project is partially located. The species was not recorded within the project footprint during targeted survey efforts and no maternity caves were identified during targeted surveys, however not all lands were accessed during surveys. The project would result in the removal of up to 7.70 ha of potential foraging habitat in the form of associated PCTs for this species. No breeding habitat for the species would be impacted. Confinement of impacts away from potential breeding habitat and no observations of the species from targeted survey suggests an SAII outcome is unlikely. Additional inspections for cave habitat or survey for the species would aid in confirming no impacts to habitat within 2 km of breeding habitat.
Miniopterus orianae oceanensis	Large Bent-winged Bat	-	True	Large Bent-winged Bat was recorded in the project footprint and foraging habitat would be impacted by the project, however the SAII component for this species is confined to breeding habitat. Potential breeding habitat for the species has not been recorded however a singly rocky gully situated in the Murrumbateman IBRA subregion has been identified as potential habitat. This potential breeding habitat would not be impacted by the project, however a small area (ie 0.11 ha) would be cleared within 100 m of the potential roost site. No ground disturbance is proposed in this location. Regardless, an SAII assessment is considered necessary given the clearing occurs within 100 m of potential roost habitat.	A total of 217 passes were acoustically recorded in all IBRA sub-regions traversed by the project footprint. It was recorded in non-native areas and several PCTs in poor, fair, moderate, good and high conditions. The age of these individuals could not be determined. No roosts were identified within the project footprint. The extent of roosting habitat was difficult to determine as a definitive end to the cavities could not always be seen. As such it cannot be established if a crevice/cave occupying the species is located within the project footprint. However, seasonal migration patterns and maternity roosts are well documented for this species and therefore, maternity roost was not recorded and is unlikely to be within the project footprint. According to BioNet, there are 131 nearby records (1061 estimated individuals), with the closest record 100 m from project footprint. All BioNet records along the alignment are within 20 km radius of the subject land. It is known to occur within all IBRA subregions the project is in (Bondo, Bungonia, Crookwell, Murrumbateman, Inland Slopes and Snowy Mountain subregions).

Scientific Name	Common Name	SAII	SAII Breeding	SAII Assessment required?	SAII Assessment Summary
					Two known maternity roosts are located within 40 km of the project footprint. Suitable habitat in the form of associated PCTs was identified present in the project footprint and direct impacts could result in the loss of approximately 0.12 ha of habitat within 100 metres of a gully modelled as potential breeding habitat. Based on a low likelihood of modelled roost habitat being confirmed as important breeding habitat and no direct impacts to this habitat, it is considered an SAII outcome decision is low likelihood.
Pseudophryne corroboree	Southern Corroboree Frog	True	-	Southern Corroboree Frog was not recorded in the project footprint. Some patches of suitable sphagnum bog habitats occur within the Snowy Mountains IBRA subregion. The species has been assumed present within these areas due to survey limitations. However, the known range of the species is limited to Kosciuszko National Park and the species is considered unlikely to occur within the project footprint. A SAII assessment has been undertaken on a precautionary basis.	Suitable habitat for *Pseudophryne corroboree* occurs within the project footprint within PCTs 679 and 1196 in the Snowy Mountains IBRA subregion. Targeted fauna surveys within the project footprint did not locate the species. Where survey effort was not adequate, species presence has been assumed within suitable habitat. There are no records within 20 km of the project (DPE, 2022). The project would result in the direct impact to 22.20 ha of potential habitat for the Southern Corroboree Frog. There is unlikely to be a significant risk that the species would be impacted such that an SAII occurs given the low likelihood of occurrence within the impacted areas. Additional targeted survey over the limited extent of potential impact areas will assist in clarifying whether habitat is suitable for the species.

13.7 Aquatic impacts

No operational direct impacts to waterways associated with the transmission line structures themselves would occur as a result of the project. The typical design of the transmission line includes a transmission line structure on either side of each major river crossing and avoiding minor waterways. Conductors are then pulled and strung in line, structure to structure, avoiding contact with waterways. No permanent stream crossing structures would be required for the transmission line structures on either side of major river crossings and waterways. Temporary works are likely to be required at the transmission line structure on each side of the crossing, however these would be at least 40 metres from the waterway bank (subject to detailed design). Appropriate environmental controls would be implemented to mitigate any indirect impacts (sediment and erosion) during construction of the transmission line structures. No underground work for laying cables across waterways (under boring/trenching) are proposed.

It is the construction of waterway crossings to support construction and maintenance for the project that has been identified as the primary pathway of potential impacts to aquatic habitats as this could result in direct disturbance to aquatic ecosystems. Potential impacts to aquatic systems that may occur as a result of the project include:

- installation of waterway crossings directly impacting aquatic habitat and resulting in alterations to habitat and stream flow conditions
- removal of riparian vegetation, aquatic vegetation and coarse woody debris to facilitate access track and waterway crossing construction
- disturbance to, or excavation of waterway banks
- impacts to water quality resulting from construction activities (ie excess runoff, sedimentation, bank erosion, spill incidents from the operation of plant and equipment).

Waterway crossings have been assessed as being permanent, maintained, structures. However, some of these crossings may be removed where work is no longer required. This would be determined as the design is developed.

Direct and indirect impacts associated with the construction of waterway crossings to support the project are addressed in the following sections.

13.7.1 Direct aquatic impacts

The potential for direct impacts to waterways associated with the project is primarily from waterway crossing construction to support the project.

An assessment of the aquatic ecological condition of indicative waterway crossings is presented in Section 13.7.4. The assessment found that majority of these streams are relatively small (stream order three or below) and typically in poor condition as a result of land clearing, online dam construction, grazing and existing informal access tracks. All of which have resulted in deleterious processes such as bank erosion and channel incision and contribute to an overall picture of degraded aquatic habitats. This poor condition is also typically reflected in the larger streams within the project footprint and those mapped as being KFH (DPI 2022a). Given this, the streams subject to proposed crossings are not considered likely to be critical habitat for any threatened aquatic species.

Access track construction is required to accommodate safe access of construction machinery and materials to each transmission line structure and substation site, which in places requires the construction of waterway crossings. Waterway crossings would only be established where waterways cannot be crossed under normal weather conditions and where alternatives are impractical. As noted in Section 10.3, numerous existing access tracks and informal waterway crossings occur within the project footprint.

The design and construction of waterway crossings would follow the process outlined in Transmission Line Construction Manual – Major New Build (Transgrid, 2020a).

The design of the waterway crossings would preference bed-level fords and causeways. Culverts may be installed where all weather crossings are required, or the stream has a deep cross section that would otherwise require bank excavation. Construction would follow the typical methodology outlined below (Transgrid, 2020a):

- All loose material would be removed from the waterway at the point to be crossed, forming a depression with firm base and sides.
- The depression would then be filled with graded layers of rock. The rock layers would be placed so as to produce an interlocked bed of rock, sloped and dished, to allow water to drain freely through and flow over the causeway (minimum thickness of around 450 millimetres but not higher than the bed of the watercourse). In some circumstances the entire rock surface may be covered with reinforced concrete.
- If required as part of a water crossing, culverts may also be installed in accordance with required standards (such as AS/NZS 4058 Precast concrete pipes (pressure and non-pressure)). The diameter of the pipe would be sufficient to carry the normal flow of water and/or runoff water after heavy rain. All culverts would include the construction of head and/or tailwalls.

All waterway crossings would be designed and installed in accordance with the relevant guidelines for waterway crossings including:

- *Policy and guidelines for fish habitat conservation and management* (Fairfull, 2013)
- *Policy and Guidelines for Fish Friendly Waterway Crossings* (DPI, 2004)
- *Why do fish need to cross the road? Fish Passage Requirements for Waterway Crossings* (Fairfull & Witheridge, 2003)
- *Guidelines for controlled activities on waterfront land* (NRAR, 2018).

Consideration of the investigation procedures and design planning elements outlined in the *Best Practice Erosion and Sediment Contro*l guidelines (Attachment I – Instream work) (IECA, 2012), *Fish passage in streams: Fisheries guidelines for design of stream crossings* (Cotterell, 1998), and Chapter 5 of Managing Urban Stormwater – Soils and Construction, Volume 1 (Landcom, 2004) (the 'Blue Book') are also recommended. A range of mitigation measures for the design and construction of waterway crossings are detailed in Section 14.2.

Excavation and disturbance to vegetation would be minimised as far as practicable and any disturbed areas will be protected against erosion and reseeded (Transgrid, 2020). Detailed recommendations to guide the design and siting of access track crossings to avoid sensitive aquatic habitat features (coarse woody debris, macrophyte beds, riparian vegetation) are made in Chapter 2, with recommended measures to mitigate any impacts to sensitive aquatic habitat features detailed in Chapter 4.

The construction of waterway crossings has the potential to impact fish passage at the indicative crossing locations. However, bed level fords and culverts are identified by Fairfull (2013) as the recommended and/or preferred waterway crossing methods for CLASS 2-4 streams, with causeways also included as one of the minimum crossing types for CLASS 4 streams. As such the proposed methods would be generally in accordance with that identified in Fairfull (2013) and Fairfull & Witheridge (2003), as detailed in Table 13-28. It is also noted that consultation with NSW DPI Fisheries is generally required for the design and construction of any waterway crossing. In many cases, informal crossings already exist and the establishment of formal crossing structures would have some benefits such as reducing the potential for erosion and sedimentation on the bed and banks of streams. A suite of mitigation measures are detailed in Section 14.2 to minimise the potential for impacts to fish passage through detailed design and construction. Key among these are:

- Where crossings are required, any existing crossings should be re-used or upgraded in preference to establishing new crossings where practicable.
- Crossing structures should be designed so that the existing nominal flow velocity, low flow conditions and fish passage are maintained wherever possible.
  - Following Fairfull (2013), for waterway crossings incorporating culverts, a minimum of 300 mm of water should pool through the structure, with a centrally placed low-flow cell being preferable.
  - In line with Cotterell (1998), it is recommended that flow over or through instream crossing structures are designed such that they maintain water velocity of 0.3 m/s or less any instream structure, which is likely to facilitate passage for native species of fish (velocities exceeding 1 m/s, are likely to prevent upstream migration of native fish).
- Any temporary stream crossings should be removed and rehabilitated at the completion of their operational use.

Table 13-28: DPI CLASS classification and recommended crossing type (adapted from Fairfull, 2013)

CLASS	Description	Minimum recommended crossing type	Additional design information
CLASS 1	Major Key Fish Habitat – Marine or estuarine waterway or permanently flowing or flooded freshwater waterway (eg river or major creek), habitat of a threatened or protected fish species or ‘critical habitat’.	Bridge, arch structure or tunnel.	Bridges are preferred to arch structures.
CLASS 2	Moderate Key Fish Habitat – Non-permanently flowing (intermittent) stream, creek or waterway (generally named) with clearly defined bed and banks with semi-permanent to permanent waters in pools or in connected wetland areas. Freshwater aquatic vegetation is present. TYPE 1 and 2 habitats present.	Bridge, arch structure, culvert or ford.	Bridges are preferred to arch structures, box culverts and fords (in that order).
CLASS 3	Minimal Key Fish Habitat – Named or unnamed waterway with intermittent flow and sporadic refuge, breeding or feeding areas for aquatic fauna (eg fish, yabbies). Semi- permanent pools form within the waterway or adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or other.	Culvert or ford.	Box culverts are preferred to fords and pipe culverts (in that order).
CLASS 4	Unlikely Key Fish Habitat – Waterway (generally unnamed) with intermittent flow following rain events only, little or no defined drainage channel, little or no flow or free standing water or pools post rain events (eg dry gullies or shallow floodplain depressions with no aquatic flora present).	Culvert, causeway or ford.	Culverts and fords are preferred to causeways (in that order).

Based on the indicative disturbance area, two CLASS 1 streams identified as KFH (V9-14 - Derringullen Creek and V9-28 - Gilmore Creek) have been identified as indicative crossing locations. The streams have a “Very Poor” freshwater fish community status, occur within a degraded landscape and there is presence of existing access tracks in proximity to the waterway. Based upon the CLASS 1 rating and size of the streams, the potential for impacts to KFH and fish passage is increased at these sites. Therefore, a single span bridge structure is recommended, aligning with the recommended crossing types identified by NSW DPI Fisheries (Table 13-28).

Yellow Creek (V9-13) and an unnamed stream (V9-12) that are included within indicative distribution mapping for Southern Pygmy Perch (DPI, 2022a), would generally align with a CLASS 1. However, the desktop assessment has identified that the unnamed stream (V8-12) is in fact a chain of dams within a modified agricultural landscape. While it is possible the species could persist under suitable conditions within vegetated dams, the dams are unlikely to be impacted by the indicative crossing which is located at the upstream of extent of the mapped stream and is likely to be dry under nominal conditions. The potential crossing location at Yellow Creek is at the site of an existing informal crossing (with no built structures apparent) and associated access tracks. The waterway has been assigned a CLASS 2 rating (as the presence of Southern Pygmy Perch would seem to be overall unlikely) with existing stream conditions indicating degraded environments, sub-optimal habitat features, and an existing informal crossing is in place. As such, a bed level crossing would seem to be appropriate at this location as it is likely to be more sensitive that the existing informal crossings. The need for and location of waterway crossings would be confirmed during detailed design by the construction contractors. It is recommended that, if crossings are required at these locations, crossing methods are reviewed during detailed design to establish the most suitable crossing method given the size of the streams and permanence of flow, this may include consultation with DPI Fisheries.

In the event that any further or alternative waterway crossings are required in areas mapped as KFH, or indicative threatened species distribution mapping (DPI, 2022a), in additional to those already assessed in Section 10.3 an aquatic ecological assessment should be undertaken. This assessment should be in line with that undertaken in this assessment and should address any potential impacts to threatened aquatic species or KFH. This assessment may be desktop based if suitable levels of information are available. However, a field inspection is recommended if threatened aquatic species or sensitive aquatic habitat features are considered to have a moderate or higher likelihood of occurring, in order to guide micro siting and design/mitigation measures to minimise potential impacts to aquatic environments.

Key Fish Habitat (DPI, 2022a) is mapped within the Tumbarumba accommodation facility (AC1). The unnamed stream occurs within a cleared paddock and is interrupted along its upstream and downstream extent by dams and road crossings. A review of aerial imagery indicates that the channel does not hold permanent water and would flow only after rainfall events, aligning with CLASS 4 – Unlikely KFH (Table 13-28). While this does not necessarily preclude the waterway as being KFH, as the channel does appear to lack sensitive habitat features (snags, boulders, macrophyte beds) and given its functional CLASS and landscape context, this stream is considered to represent overall low aquatic ecological value and poor condition.

Key Fish Habitat (DPI, 2022a) is mapped within a portion of the Wagga 330 KV substation compound (C01). A review of aerial imagery does not identify any waterway or waterbody within this area of mapping, with the landscape having been developed into existing energy infrastructure. As this does not constitute KFH, no impacts to KFH will occur in this section of the project footprint.

13.7.2 Indirect aquatic impacts

The project has the potential to result in the following types of indirect impacts:

- erosion and sedimentation impacts (pulse events)
- removal/reduction in riparian vegetation (reduced habitat features eg large woody debris, organic matter, stream shading, bank stabilisation)
- introduced pests and diseases.

These potential indirect impacts are addressed in the following section, with riparian impacts discussed in Section 13.7.4.

The primary pathway of potential indirect impacts is the construction of new access tracks within riparian zones and waterway crossings. The potential for indirect impacts associated with general construction work (erosion and sedimentation) is also addressed within this section.

New access tracks that are established as part of the project would be approximately six metres wide (although this may increase subject to cut and fill requirements) and generally follow the natural contour of the land as far as practicable to minimise the amount of cut and fill and soil disturbance. Access tracks would also include drainage control features such as table drains or cross banks to minimise erosion.

Waterway crossings would be approximately 3.5 metres wide. Waterway crossing construction would be carried out so as to cause minimum disturbance to soil and vegetation both on and adjacent to the crossing. There are potential residual risks to aquatic habitats through the construction of access tracks and waterway crossings. These include:

- the clearing of native riparian vegetation to facilitate work and establish access tracks
- erosion and sedimentation associated with cleared areas, earthworks / stockpiles.

Most indirect impacts associated with the proposed construction would be localised erosion or sedimentation pulse events (abrupt changes in ecological parameters) that are temporary in nature. The works have the potential to impact upon downstream receiving aquatic environments; however, it is expected that mitigation measures to prevent the occurrence of erosion and sedimentation pulse events would reduce this risk to downstream receiving environments during construction and operation.

Erosion and sedimentation

Any sedimentation or erosion events would be considered to be temporary pulse events. Sedimentation or erosion events could occur as a result of access track construction, waterway crossings and maintenance work and as such are anticipated to be limited in scale and localised. Nevertheless, these events have the potential to results in a loss of habitat through eroded complex habitat features (eg bank collapse), or smothering in sediment (eg infilling of interstitial spaces in riffle habitats).

A number of recommended design, management and mitigation measures are outlined in Chapter 14 to significantly mitigate potential risks as a result of erosion and sedimentation to aquatic habitats. The key measures proposed to avoid, manage and/or mitigate impacts to surface water, and groundwater and soils include:

- preparation of Soil and Water Management Plans (SWMP) as part of the Construction Environmental Management Plan (CEMP) to manage water quality impacts during construction of the project
- preparation of Erosion and Sediment Control Plans (ESCPs) and Water Quality Monitoring Program (WQMP) within the SWMPs, given erosion is identified as a key impact risk
- consideration of appropriately designed scour protection for stormwater.

Specific design, micro-siting and management measures relevant to the protection of aquatic environments associated with the waterway crossings and access tracks are detailed in Section 14.2. With the proposed management measures in place, any indirect impacts are expected to be minor to negligible.

Pest and diseases

There is a low potential for any instream plant or machinery used in crossing construction to transport the Epizootic Haematopoietic Necrosis Virus (EHNV), which is known to occur within the Murrumbidgee catchment and is associated with the invasive Redfin Perch *Perca fluviatilis* and is also known to occur in the Murrumbidgee catchment (DPI N.D.). EHNV is known to infect introduced wild populations of Redfin Perch and farmed Rainbow Trout *Oncorhynchus mykiss* (stocked at a number of locations within the locality), although it may also infect a number of native fish species listed under the FM Act and EPBC Act known to be susceptible to the virus (DPI N.D.).

It is recommended that this risk be managed through the use of wash down procedures for any plant used in-stream between crossing locations (Chapter 14).

13.7.3 Threatened aquatic biota

A total of five threatened aquatic species and one threatened aquatic ecological community listed under the FM Act and/or EPBC Act have been identified as potentially occurring within the project footprint. 7--part tests under the FM Act (Attachment 19) and Commonwealth Assessments of Significance under the EPBC Act (Section 13.8, Attachment 18) have been completed for these species, concluding that they are unlikely to be significantly impacted by the project.

A summary of the assessments of significance completed under the FM Act are provided in Table 13-29. The outcomes of Commonwealth Assessments of Significance under the EPBC Act are described in Section 13.8.4.

Table 13-29: FM Act threatened aquatic biota summary of assessment of significance

Scientific name	Common name	FM Act	Habitats/distribution	Impact summary	Significant impact?
Aquatic Ecological Community in the Natural Drainage System of the Lower Murray River Catchment	Lowland Murray River EEC	EEC	The project footprint intersects with the extent of the lower Murray River aquatic ecological community.	Any indirect impacts that may occur are anticipated be localised and temporary in nature eg disturbance to instream habitats during the construction of waterway crossings for access tracks or trimming of riparian trees to facilitate transmission line installation.	No
Bidyanus bidyanus	Silver Perch	V	None of the waterways that have been mapped as within the species indicative distribution would be crossed by any indicative access tracks by waterway crossings. However, given the potential for disturbance and residual indirect impacts to potential habitats a 7-part test under the FM Act has been completed.	It is anticipated that any constructed crossing upgrades (replacing existing informal crossings) associated with the project would contribute to overall improvements to aquatic conditions and be more sensitive than existing informal crossings and would not result in any additional deleterious processes. While waterway crossings for access tracks are proposed, mitigation measures to prevent as far as practical the creation of any barriers to fish passage have been recommended, with crossings designs aligning with relevant guidelines (Fairfull, 2013).	No
Euastacus armatus	Murray Crayfish	V	The species has the potential to occur within the project footprint, with indicative distribution mapping for the species (DPI, 2022a) including several waterways within the project footprint (Section 10.2.1).		No
Galaxias rostratus	Flatheaded Galaxias	CE	The species is considered overall unlikely to occur within the project footprint. However, the species has been formally assessed a as part of a precautionary approach given the project footprint intersects with indicative distribution mapping (DPI, 2022a).		No
Nannoperca australis	Southern Pygmy Perch	E	None of the known remaining known populations of Southern Pygmy Perch would be impacted by the project. It is overall unlikely that the Southern Pygmy Perch would occur within the project footprint based upon the		No

Scientific name	Common name	FM Act	Habitats/distribution	Impact summary	Significant impact?
			known distribution and habitat requirements of the species. Despite this, a precautionary approach has been adopted and a 7-part test under the FM Act has been completed for the species.		
Maccullochella macquariensis	Trout Cod	E	While the potential distribution and suitable habitats for the species are limited within the project footprint, the species cannot be ruled out as occurring and has been formally assessed.		No
Macquaria australasica	Macquarie Perch	E	Within the project footprint, the species has the potential to occur within the Lachlan River and Adjungbilly Creek.		No

13.7.4 Riparian corridors and clearing of native riparian vegetation

The nature of the project requires that work would be completed in riparian zones primarily to facilitate the construction and operation of waterway crossings where required. While the construction of the transmission lines and transmission line structures themselves would avoid direct impacts to waterways, clearing or trimming of riparian vegetation may also be required for the maintenance of transmission lines.

DPI Fisheries generally requires riparian buffer zones to be established and maintained for developments or activities in or adjacent to TYPE 1 or 2 KFH or CLASS 1-3 waterways, following Fairfull (2013). The riparian buffer distances recommended in Fairfull (2013) of between 50 to 100 metres for CLASS 1 – 3 streams would be commonly in excess of the existing riparian vegetation presence along streams within the project footprint. Riparian zones within the project footprint are frequently diminished in extent and degraded in condition, and occasionally absent. Although some areas of remnant riparian vegetation, woodland or native grasslands surrounding streams do persist in places within the project footprint.

Vegetated riparian zones (VRZs) have been identified (Figure 13-16) according to the buffer distances based upon stream order, as stipulated by (NRAR 2018). These buffer distances are considered to be most appropriate to existing landscape condition and scope of the assessment (section 4.8.4). The total extent of native vegetation within these VRZs is 646.87 hectares (Table 13-30: Area B [VRZs within project footprint]). Of this, 49.74 hectares of native vegetation is also located within the indicative disturbance footprint (Table 13-30: Area C). In other words, 7.69 percent of native vegetation within the VRZs would be impacted by the project.

Four PCTs identified as being primarily formed by riparian vegetation occur within the project footprint, combining to total an area of 165.50 hectares (Area A: Table 13-30). The extent of riparian PCTs within the identified VRZs (Figure 13-16) within the project footprint are shown in Table 13-30 (Area B). The project would impact upon 6.80 hectares of riparian PCTs (Area C), impacting PCT 299, PCT 278 and PCT 5, within the identified VRZs (refer to Figure 13-16). The total of 3.36 hectares of PCT 278 within Area C has been mapped as *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland*, listed as Critically Endangered under the BC Act. With 0.87 hectares of this meeting the threshold for *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland*, listed as Critically Endangered under the EPBC Act.

Table 13-30: Total area (ha) of riparian PCTs within the project footprint and VRZs

PCT	Area A: project footprint (ha)	Area B: VRZs within project footprint (ha)	Area C: indicative disturbance area (ha)
5: *River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.*	15.35	8.04	1.54
278: *Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South Western Slopes Bioregion*	95.5	25.64	3.36
299: *Riparian Ribbon Gum - Robertson's Peppermint - Apple Box riverine very tall open forest of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion*	54.5	18.32	1.91
356: *Blakely's Red Gum x Dirty Gum - White Cypress Pine tall riparian woodland, NSW South Western Slopes Bioregion*	0.15	0.15	0
Total riparian PCT area:	**165.50**	**52.14**	**6.81**

Desktop assessment identified that riparian zones across the project footprint, and in particular at the site of indicative access tracks, are commonly highly diminished both in extent and condition. This is supported by the findings of Table 13-30, which indicate a limited coverage of riparian PCTs within the project footprint, and also within the indicative disturbance footprint. The overall proportion of native vegetation disturbance within VRZs is also low. In light of the above, it is concluded that the project is unlikely to result in significant impacts to vegetated riparian corridors within the project footprint.

Details of the offset requirements necessary to address any residual biodiversity impacts associated with the project for impacts to riparian PCTs as a result of the project are detailed in Chapter 15 (Table 15-1).

Avoidance and mitigation of impacts to vegetated riparian corridors

Transmission line structures would be located and constructed to minimise impacts to vegetated riparian corridors, as presented in Figure 13-16. Key avoidance and impact minimisation measures include:

- Transmission line structures would be located and constructed to minimise impact to riparian zones to the greatest extent practicable.
- The transmission line easement would target narrow crossing points of waterways and riparian areas clear of vegetation to the greatest extent practicable.
- The clearing or trimming of riparian vegetation would be avoided and minimised wherever practicable.
- Tree stumps would not be removed in Protected Riparian Land (PRL). Defined as land within 20 m of the bed or bank of a prescribed stream. Generally, named watercourses are classed as PRL; however, some unnamed watercourses may be classed as protected riparian land.

Additional design refinement and construction mitigation measures that would be considered to further minimise and mitigate potential impacts to riparian or aquatic environments are detailed in Table 14-1.

13.7.5 Ongoing aquatic impacts

Potential impacts to aquatic environments have been identified as primarily associated with construction of the project, as addressed in Sections 13.7.1 and 13.7.2.

Potential impacts to aquatic environments during the operation would generally be limited to:

- changes to flow conditions or geomorphology from waterway crossings for permanent access tracks resulting in modified aquatic habitats
- disruption to fish passage from waterway crossings for permanent access tracks
- water quality impacts from sedimentation or accidental spills.

Permanent waterway crossings have the potential to alter flow conditions and bank stability, consequently affecting the geomorphology of waterways, aquatic habitats and/or interrupting fish passage. Notwithstanding, provided waterway crossings are constructed in accordance with mitigation measures included in Chapter 14, it is expected that any ongoing changes to waterway geomorphology during operation would be limited. Furthermore, the design and installation of waterway crossings would be in accordance with the relevant guidelines for waterway crossings (Section 13.7.1), and as such this is expected to minimize the risk of interrupting fish passage. The complete suite of mitigation measures in relation to managing risk to stream connectivity throughout the design refinement, construction and operational stages of the project are presented in Section 14.2 (Table 14 1).

Water quality impacts associated with sedimentation or accidental spills have the potential to impact aquatic environments. However, with the implementation of the mitigation measures listed in Chapter 14, water quality impacts from operational activities would be minimised and adequately addressed. Specific erosion and sediment control measures relevant to waterway crossings and work around waterways are specified in Table 14 1.

13.8 Impacts to Matters of National Environmental Significance

Chapter 11 outlines the MNES considered relevant to the project. An assessment of impacts was completed for each MNES in accordance with the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (DoE, 2013) and the Commonwealth requirements outlined within the project SEARs (refer to Attachment 18). A summary of the assessment outcomes is provided below.

13.8.1 Impacts on threatened ecological communities listed under the EPBC Act

The project would impact two TECs listed under the EPBC Act (refer to Table 13-12). The significance assessments and address of the Commonwealth requirements of the SEARs for TECs are provided in detail in Attachment 18.

For some of the TECs nominated as potentially significantly impacted, this conclusion is made due to the requirement to take a precautionary approach based on an element of uncertainly inherent in many biodiversity assessments especially where incomplete survey coverage occurs.

A summary of the outcomes of these assessments in provided in Table 13-31. Proposed avoidance and mitigation measures are outlined in Chapter 12 and 14 of the BDAR.

Table 13-31. EPBC Act threatened ecological community summary of significance of impact

Threatened ecological community	EPBC Act	Assessment required?	Impact summary	Significant impact?
White Box Yellow Box Blakely’s Red Gum Woodland (Box Gum Woodland)	CE	Yes - present	The direct impacts of the project on Box Gum Woodland includes the removal of approximately 111.47 ha of habitat. The national extent of Box Gum Woodland is approximately 416,326 ha and 250,729 ha occurs within NSW (DECCW, 2010). The project would impact 0.03% of extant Box Gum Woodland on a national scale, and 0.04% of extant Box Gum Woodland in NSW. Box-Gum Woodland TEC within the project footprint has been extensively cleared and is severely fragmented. Many of these remaining patches occur on road reserves, the edges of house paddocks, or beside steep slopes on the edges of cleared land. Despite this, the proposed clearing work would result in further loss and fragmentation of TEC remnants within the project footprint.	Likely significant impact
Alpine Sphagnum Bogs and Associated Fens	E	Yes - present	This TEC was recorded within the Snowy Mountains IBRA subregion in association with PCT 939. The potential direct impacts of the project footprint on Alpine Sphagnum Bogs and Associated Fens include removal of approximately 0.56 ha of habitat. The national extent of the TEC covers 8,000 ha (TSSC, 2009). The project proposes to directly impact 0.007% of extant Alpine Sphagnum Bogs on a national scale. As relatively small areas of this TEC could be subject to clearing, impacts associated with habitat fragmentation are unlikely.	Potential significant impact (precautionary)

13.8.2 Impacts on threatened flora listed under the EPBC Act

The project would potentially impact on 12 threatened flora listed under the EPBC Act (Table 13-32), constituting species deemed as having a moderate or higher potential to occur within the project footprint and be impacted. The significance assessments and address of the Commonwealth requirements of the SEARs for threatened flora are provided in detail in Attachment 18. A summary of the outcomes of these assessments are provided in Table 13-32 and proposed avoidance and mitigation measures are outlined in Chapters 12 and 14 of the BDAR. For many species conclusions of potentially significant impacts are driven by a precautionary approach given incomplete survey coverage and without being able to state with certainty that impacts could be avoided during detailed design for the project. Once additional survey is completed and avoidance measures undertaken, the risk of a significant impact would be substantially reduced.

Calculations in the impacts to threatened flora listed as MNES may vary from Section 13.3 for the following reasons (refer to Attachment 18):

- Habitats within some IBRA subregions have not been considered due to a low likelihood of species occurrence (refer to Attachment 16).
- Direct impacts within Category 1 exempt lands are documented where relevant. More detail regarding clearing impacts within Category 1 exempt lands is presented in Attachment 21 for relevant species.

Table 13-32. EPBC Act threatened flora summary of significance of impact

Scientific name	Common name	EPBC Act	Assessment required?	Impact summary	Significant impact?
Acacia bynoeana	Bynoe's Wattle	V	Yes – assumed present	No individuals of *Acacia bynoeana* have been recorded within the project footprint however there is approximately 3.00 ha of potential habitat for the species which would be cleared as a result of the project. *Acacia bynoeana* is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. The species is currently known from about 30 locations, with the size of the populations at most locations being very small (1-5 plants). The project is considered unlikely to lead to a long-term decrease in the species or a population of the species. This is on the consideration that direct impacts to the mapped indicative habitat of the species and any indirect impacts that may occur would be localised and threatened targeted flora surveys did not verify the species presence. Impacts to this species have been considered under a precautionary approach.	Potential significant impact (precautionary)
Ammobium craspedioides	Yass Daisy	V	Yes - present	Yass Daisy is known from localities in NSW near Crookwell, on the southern tablelands to near Wagga Wagga, on the south-western slopes. The species was recorded within and immediately adjacent to the project footprint: in PCT 1093 in the Crookwell IBRA-subregion, PCT 280 in the Inland Slopes IBRA subregion, PCT 278 in the Murrumbateman IBRA subregion and in PCTs 295, 299 and non-native vegetation in the Bondo IBRA subregion. Approximately 176.22 ha of potential habitat is located within the indicative disturbance area, as follows: • 1.56 ha within the Bondo IBRA subregion • 32.83 ha within the Crookwell IBRA subregion • 101.44 ha within the Inland Slopes IBRA subregion • 40.39 ha within the Murrumbateman IBRA subregion. Further, there is an additional 11.60 ha of impacts for Yass Daisy within Category 1 exempt lands (prescribed impacts). Therefore, the total impact to Yass Daisy habitat, including prescribed impacts, is 187.82 ha. No important populations for Yass Daisy have been defined. Despite this, the project has the potential to significantly impact Yass Daisy through the modification, destruction, removal and isolation of habitats within the project footprint.	Potential significant impact

Scientific name	Common name	EPBC Act	Assessment required?	Impact summary	Significant impact?
Eucalyptus aggregata	Black Gum	V	Yes – assumed present	A small area of potential habitat for the species would be impacted: approximately 1.10 ha in the Crookwell, 0.15 ha in the Inland Slopes IBRA subregions. The species was not recorded during field surveys carried out within potential habitats. Further, there is an additional 0.13 ha of impacts for Black Gum within Category 1 exempt lands (prescribed impacts). Therefore, the total impact to Black Gum habitat, including prescribed impacts, is 1.38 ha. The current 'Important Population' listed for the Black Gum is the Wingecarribee LGA subpopulation in NSW. The project would not impact this important population. Impacts to potential habitat are not considered to result in further species decline or reduce the area of occupancy where appropriate mitigation measures are implemented, including pre-clearing surveys to confirm species absence within potential habitats.	Significant impact unlikely
Kunzea cambagei	Cambage Kunzea	V	Yes – assumed present	The species has not been verified as known in the project footprint but is considered likely to occur based on indicative mapping and habitat assessments. With reference to associated PCTs present in the project footprint, 71.10 ha of potential habitat is mapped within PCT 1150 in the Bungonia subregion, of which 12.20 ha would be cleared as a result of the project. Further, there is an additional 0.14 ha of impacts for Cambage Kunzea within Category 1 exempt lands (prescribed impacts). Therefore, the total impact to Cambage Kunzea habitat, including prescribed impacts, is 12.34 ha. The project is considered to have the potential to lead to a long-term decrease in the species or a population of the species. This is based on the consideration that direct impacts to the mapped indicative habitat of the species is relatively large and general flora surveys occurred outside of the ideal time for its identification, therefore a precautionary approach has been adopted.	Potential significant impact (precautionary)
Leucochrysum albicans var. *tricolor*	Hoary Sunray	E	Yes - present	The species has been recorded in the project footprint. A total of 119,311 individuals were recorded in PCT 1330 in the Crookwell IBRA-subregion, and 8792 individuals were recorded in PCT 727 in the Murrumbateman IBRA subregion. The species was recorded in grasslands, in areas with existing or past disturbance, or on the edges of existing easement. In total there is 2,148.80 ha of potential and known habitat for the Hoary Sunray, of which, 182.63 ha would be impacted by the project. Further, there is an additional 17.60 ha of impacts for Hoary Sunray within Category 1 exempt lands (prescribed impacts). Therefore, the total impact to Hoary Sunray habitat, including prescribed impacts, is 200.23 ha. Populations recorded within the project footprint were large and could be necessary for maintaining genetic diversity or dispersal across the region. As such, any individuals or population of this species recorded within the project footprint are considered to form part of an important population. Hoary Sunray and associated habitats would be subject to direct and indirect impacts as a result of the project. Given this, there is potential for the project to result in a significant impact to the species through a reduction in the area of	Potential significant impact

Scientific name	Common name	EPBC Act	Assessment required?	Impact summary	Significant impact?
				occupancy and population size of any population. Habitats critical for survival would be adversely affected and subjected to increased fragmentation such that the species could decline further.	
Pomaderris cotoneaster	Cotoneaster Pomaderris	E	Yes – assumed present	The species has not recorded in the project footprint but is considered likely to occur based on indicative mapping and habitat assessments. The area of potential habitat is located through the eastern portion of the project footprint, particularly in the vicinity of Tumut and Goulburn. Within the project footprint, potential habitat for this species comprises 64.25 ha of PCT 1150 in the Bungonia subregion, of which 11.70 ha would be impacted by the project. The project is considered unlikely to lead to a long-term decrease in the species or a population of the species. This is based on the consideration that direct impacts to the mapped indicative habitat of the species and any indirect impacts that may occur would be localised and threatened targeted flora surveys did not verify the species presence. However, as targeted surveys were not completed in all potential habitat, a precautionary approach has been applied with the assumption that the project has the potential to cause a significant impact to this species through the removal of 11.70 ha of potential habitat.	Potential significant impact (precautionary)
Prasophyllum bagoense	Bago Leek Orchid	CE	Yes - present	The Bago Leek-Orchid is known from a single population at McPhersons Plain, east of Tumbarumba in the Southern Tablelands of New South Wales (DSEWPaC, 2012a). Preferred habitats are treeless plains and swamps. *Prasophyllum bagoense* was recorded adjacent (130 m to the west) of the project footprint within PCTs 1196 and 1224. Whilst the project would not directly clear any recorded individuals, approximately 31.90 ha of potential habitat would be impacted. There is a high probability that undetected individuals occupy these habitats. The project has the potential to significantly impact the species through the clearing and fragmentation of suitable habitats. This may result in a reduction in the species' population size and area of occupancy. Habitats may be adversely affected by means of clearing, proposed earthworks and changed hydrology which may lead to further decline of the species. Given the species occupies the ground layer and prefers treeless habitats, there is considerable potential for impact avoidance through sensitive design and the micrositing of transmission line structures and access tracks. Avoidance measures should be fully explored during detailed design.	Potential significant impact
Prasophyllum innubum	Brandy Marys Leek-orchid	CE	Yes – assumed present	Brandy Mary's Leek Orchid occurs east of Tumbarumba in the Southern Tablelands in Bago State Forest, Crown leases and on adjacent private land (DoE, 2014a). It has an extent of occurrence of 45 km^2 and an area of occupancy of 1.5 ha (0.015 km^2). Brandy Marys Leek-orchid was not recorded within the project footprint during targeted surveys. However, it is predicted to occur within PCT 1224. Approximately 0.25 ha of potential habitat for the Brandy Marys Leek-orchid	Significant impact unlikely

Scientific name	Common name	EPBC Act	Assessment required?	Impact summary	Significant impact?
				would be impacted. Where present, proposed clearing and earthworks are likely to reduce the area of occupancy of the species and adversely affect habitat of the type critical to its survival. Given the species occupies the ground layer and prefers treeless habitats, there is considerable potential for impact avoidance through sensitive design and the micrositing of transmission line structures and access tracks. Avoidance measures should be fully explored during detailed design.	
Prasophyllum keltonii	Kelton's Leek Orchid	CE	Yes – assumed present	Several small populations of Kelton's Leek Orchid were observed on McPhersons Plains and Modder Creek Plain. These areas are treeless plains and swamps. *Prasophyllum keltonii* was recorded immediately adjacent to the project footprint within PCT 1196. Suitable habitats for the species extent into the project footprint and approximately 31.70 ha of this habitat would be impacted. Where present, proposed clearing and earthworks are likely to reduce the area of occupancy of the species and adversely affect habitat critical to its survival. Given the species occupies the ground layer and prefers treeless habitats, there is considerable potential for impact avoidance through sensitive design and the micrositing of transmission line structures and access tracks. Avoidance measures should be fully explored during detailed design.	Potential significant impact
Pterostylis oreophila	Blue-tongued Greenhood	CE	Yes – assumed present	The Blue-tongued Greenhood was not recorded within the project footprint during targeted surveys. However, it has been predicted to occur within PCT 939 as a precautionary approach. Impacts to this species would include clearing of potential habitat. A total of approximately 0.56 ha of potential habitat for the Blue-tongued Greenhood could be impacted by the project footprint. Where present, proposed clearing and earthworks are likely to reduce the area of occupancy of the species and adversely affect habitat of the type critical to its survival. Given the species occupies the ground layer and prefers treeless habitats, there is considerable potential for impact avoidance through sensitive design and the micrositing of transmission line structures and access tracks. Avoidance measures should be fully explored during detailed design.	Potential significant impact (precautionary)

Scientific name	Common name	EPBC Act	Assessment required?	Impact summary	Significant impact?
Thesium australe	Austral Toadflax	V	Yes – assumed present	The species has not recorded within the project footprint but is considered likely to occur within the Snowy Mountains IBRA subregion based on indicative mapping and habitat assessments. Potential habitat for the species occurs within PCTs 679, 191, 1224 and 1330. Approximately 98.99 ha of potential habitat is located within the project footprint within the Snowy Mountains IBRA subregion. 23.70 ha of this habitat would be subject to clearing. The species has a low likelihood of occurrence within all other IBRA subregions within the project footprint. Where present, proposed clearing and earthworks are likely to reduce the area of occupancy of the species and adversely affect habitat of the type critical to its survival. Avoidance measures should be fully explored during detailed design.	Potential significant impact (precautionary)
Xerochrysum palustre	Swamp Everlasting	V	Yes - present	The Swamp Everlasting has a wide but scattered distribution, with a population estimate of about 10,000 plants. The species grows in specific habitat of wetlands including Sphagnum moss bogs at higher altitudes. Six individuals were recorded within the project footprint. Habitat comprised PCTs 679 and 939 within the Snowy Mountains IBRA subregion. Approximately 1.50 ha of known and potential habitat would be directly impacted as a result of the project. As the habitat for this species is easily identifiable and avoidable it has been assessed as potentially impacted on a precautionary basis. However, detailed design should be able to avoid impact to this species. No important populations for Swamp Everlasting have been defined. Despite this, the project has the potential to significantly impact Swamp Everlasting through the modification, destruction, removal and isolation of habitats within the project footprint.	Potential significant impact (precautionary)

13.8.3 Impacts on threatened fauna listed under the EPBC Act

The project would potentially impact on 23 threatened fauna listed under the EPBC Act (Table 13-3), constituting species deemed as having a moderate or higher potential to occur within the project footprint and be impacted. The significance assessments and a summary of how the Commonwealth requirements of the SEARs for threatened fauna have been addressed are provided in detail in Attachment 18. A summary of the outcomes of these assessments are provided in Table 13-32 and proposed avoidance and mitigation measures are outlined in Chapter 12 and 14 of the BDAR. For many species conclusions of potentially significant impacts are driven by a precautionary approach given incomplete survey coverage and without being able to state with certainty that impacts could be avoided during detailed design for the project. Once additional surveys are completed and avoidance measures undertaken, the risk of a significant impact would be substantially reduced.

Calculations in the impacts to threatened fauna listed as MNES may vary from Section 13.3 for the following reasons (refer to Attachment 18):

- Habitats within some IBRA subregions have not been considered within this section due to a low likelihood of species occurrence (refer to Attachment 16).
- Direct impacts within Category 1 exempt lands are documented where relevant. More detail regarding clearing impacts within Category 1 exempt lands is presented in Attachment 21 for relevant species.
- Impacts to both breeding and foraging habitats for dual credit species are presented within this section for relevant dual credit species.

Table 13-33. EPBC Act threatened fauna summary of significance of impact

Scientific name	Common name	EPBC Act	Assessment required?	Impact summary	Significant impact?
Frogs					
Crinia sloanei	Sloane's Froglet	E	Yes– assumed present	Sloane's Froglet has not been recorded in the project footprint but is considered likely to occur based on indicative mapping and habitat assessments. The area of potential habitat is located throughout the project footprint as various waterbodies. Potential habitat to be cleared includes 2.60 ha of PCTs associated with the Sloane's Froglet (PCT 5 and PCT 25). Further, there is an additional 0.05 ha of impacts on non-native habitats for Sloane's Froglet (prescribed impacts). Therefore, the total impact to Sloane's Froglet habitat, including prescribed impacts, is 2.65 ha. The construction process for the transmission line structures would avoid direct impacts to major waterways and none of the waterways that have been mapped as within the species indicative distribution (DoE, 2022a) are crossed by any indicative access tracks with potential waterway crossings. As such, this assessment of significance focusses on the potential for residual indirect impacts to potential habitats following the implementation of avoidance and mitigation measures, to the species (ie, the removal of native riparian vegetation, erosion, and sedimentation risk) during construction.	Significant impact unlikely
Litoria booroolongensis	Booroolong Frog	E	Yes– assumed present	Booroolong Frog has not been recorded in the project footprint but is considered likely to occur based on indicative mapping and habitat assessments. The area of potential habitat is located throughout the project footprint as various waterbodies. Potential habitat to be cleared includes 0.11 ha of PCTs associated with the Booroolong Frog (PCTs 85, 268, 277, 278, 280, 283, 287, 290, 295, 298, 299, 306, 322, 343, 349, 351, 352, 727, 731, 858, 870, 1097, 1107, 1150, 1256, 1330). The construction process for the transmission line structures would avoid direct impacts to major waterways and none of the waterways that have been mapped as within the species indicative distribution (DoE 2022a) are crossed by any indicative access tracks with potential waterway crossings. As such, this assessment of significance focusses on the potential for residual indirect impacts to potential habitats following the implementation of avoidance and mitigation measures, to the species (ie, the removal of native riparian vegetation, erosion and sedimentation risk) during construction.	Significant impact unlikely
Litoria castanea	Yellow-spotted Tree Frog	CE	Yes– assumed present	Yellow-spotted Tree Frog has not been recorded in the project footprint but is considered likely to occur based on indicative mapping and habitat assessments. The area of potential habitat is located throughout the project footprint as various waterbodies within the project footprint. Potential habitat to be cleared includes 0.05 ha of prescribed impacts. No associated PCTs would be impacted. The construction process for the transmission line structures would avoid direct impacts to major waterways and none of the waterways that have been mapped as within the species indicative distribution (DoE, 2022a) are crossed by any indicative access tracks with potential waterway	Significant impact unlikely

Scientific name	Common name	EPBC Act	Assessment required?	Impact summary	Significant impact?
				crossings. As such, this assessment of significance focusses on the potential for residual indirect impacts to potential habitats following the implementation of avoidance and mitigation measures, to the species (ie, the removal of native riparian vegetation, erosion and sedimentation risk) during construction.	
Birds					
Anthochaera phrygia	Regent Honeyeater	CE	Yes – assumed present	Within the project footprint, the Regent Honeyeater has a moderate likelihood of occurrence as a nomadic forager in all IBRA subregions impacted by the project due to the presence of suitable myrtaceous and lerp foraging resources. The project footprint would result in the loss of approximately 149.34 ha (12%) of potential foraging habitat for the species, which is widespread across the species range. No breeding habitat or important mapped habitat would be impacted by the project.	Potential significant impact (precautionary)
Callocephalon fimbriatum	Gang-gang Cockatoo	E	Yes– present	The Gang-gang Cockatoo is known to occur within the project footprint in all IBRA subregions impacted, with multiple species sightings and suitable foraging and potential nesting habitat recorded. Breeding pairs were also identified in Bungonia, with breeding habitat likely nearby. The project would result in the removal of 423.78 ha (17%) of foraging habitat and potential breeding habitat used by this species and has the potential to cause direct impacts to the species via injury or mortality during clearing and construction work.	Potential significant impact
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	Yes– present	The Glossy Black Cockatoo is known to occur in the project footprint in Bungonia and has a high likelihood of occurrence in Inland Slopes. The project would result in the removal of 19.31 ha (6%) of known habitat and 22.98 ha (7%) of potential habitat.	Potential significant impact
Grantiella picta	Painted Honeyeater	V	Yes– assumed present	The Painted Honeyeater has not been recorded in the project footprint but is considered to have a high likelihood of occurrence in Inland Slopes. The project would result in the clearing of 85.10 ha (11%) of potential habitat in the Inland Slopes IBRA subregion.	Potential significant impact
Hirundapus caudacutus	White-throated Needletail	V	Yes– assumed present	The White-throated Needletail was not recorded during the field surveys for the project and there are no previous records within the project footprint, and no recent records in the broader locality. Potential foraging habitat is present in the project footprint in the form of associated PCTs. Vegetation clearing for the installation of transmission lines and associated infrastructure may reduce the availability of foraging resources for these species, as well as suitable hollow bearing trees used as roosting habitat by the White-throated Needletail. Potential direct impacts include species injury or mortality during clearing and construction. An area of approximately 85.09 ha (5%) of potential habitat for this species would be impacted by the project. Extensive areas of potential foraging habitat for this species are also present within the locality and would be retained.	Significant impact unlikely

Scientific name	Common name	EPBC Act	Assessment required?	Impact summary	Significant impact?
Lathamus discolor	Swift Parrot	CE	Yes– assumed present	Within the project footprint, the Swift Parrot has a moderate likelihood of occurrence as a nomadic forager in the Bungonia and Murrumbateman IBRA subregions due to the presence of suitable myrtaceous and lerp foraging resources. In the Inland Slopes IBRA subregion, it has a high likelihood of occurrence due to both the presence of suitable myrtaceous and lerp foraging resources and the project footprint intersecting a Priority Management Area for the species under the NSW Save our Species (SoS) program. The project footprint would result in the loss of approximately 190.73 ha (12%) of potential foraging habitat, including vegetation within a Priority Management Area for the species.	Potential significant impact
Polytelis swainsonii	Superb Parrot	V	Yes– present	The Superb Parrot is known to occur within the project footprint in the Murrumbateman and Inland Slopes IBRA subregions, with suitable foraging and potential nesting habitat occurring in grassy box woodland. It also has a moderate likelihood of occurrence in Bondo and Crookwell as a forager, with suitable open woodland habitats occurring but no species sightings during targeted surveys. The project would result in the clearing of 125.41 ha (12%) of known habitat and 18.21 ha (2%) of potential habitat.	Potential significant impact
Pycnoptilus floccosus	Pilotbird	V	Yes– assumed present	The Pilotbird has not been recorded in the project footprint but is considered to have a high likelihood of occurrence in the Bondo, Inland Slopes and Snowy Mountains IBRA subregions. The project would result in the clearing of 130.5 ha of potential habitat in Bondo, Inland Slopes and Snowy Mountains IBRA subregions.	Potential significant impact (precautionary)
Invertebrates					
Keyacris scurra	Key's Matchstick Grasshopper	E	Yes– assumed present	Key's Matchstick Grasshopper was opportunistically recorded during the field survey in the Murrumbateman IBRA subregion, however no targeted survey for the species was performed as it was listed as a threatened species with credit status after the majority of field surveys were conducted. It assumed present as it has moderate likelihood of occurrence within at least the Inland Slopes IBRA subregion due to the presence of suitable grassland habitat and Atlas records within the vicinity of the project footprint. The project would result in the loss of approximately 192.30 ha of modelled habitat where the species is considered likely to occur, however as the species occurrence is poorly known this is likely to significantly inflate the potential impact area.	Potential significant impact
Synemon plana	Golden Sun Moth	CE	Yes– assumed present	The Golden Sun Moth was not detected during field surveys, however it assumed present as it has a high likelihood of occurrence and is known to occur in the Murrumbateman and Inland Slopes IBRA subregions due to the presence of suitable grassland habitat and with multiple sightings across records within 5 km the project footprint in suitable grassland habitat. The project would result in the loss of approximately 38.63 ha of foraging and breeding habitat for the Golden Sun Moth (including 2.75 ha of prescribed impacts on non-native habitat).	Potential significant impact

Scientific name	Common name	EPBC Act	Assessment required?	Impact summary	Significant impact?
Mammals					
Chalinolobus dwyeri	Large-eared Pied Bat	V	Yes–assumed present	No individuals or roosting sites were recorded within the project footprint during targeted surveys. The Large-eared Pied Bat has a medium likelihood of occurrence in the Bungonia IBRA subregion portion of the project footprint. The species is considered likely to occur based on the presence of suitable cliffline roosting and foraging habitats within the project footprint and multiple species records in the broader subregion. The species is considered to have a low likelihood of occurrence in the Inland Slopes IBRA subregion portion of the project footprint, based on a low number of species records in the locality, and lack of suitable habitat components to support the species. The proposed project footprint will result in the direct loss of approximately 7.70 ha of potential habitat within the Bungonia IBRA subregion portion of the project footprint. Indirect impacts resulting from the project include increased edge effects and reduced connectivity. It has been acknowledged that new forest edges may act as barriers because they interrupt existing linear flyways, or because some species avoid lit, or open areas (Threlfall *et al.*, 2011; Altringham & Kerth, 2016; Haddock *et al.*, 2019). The maximum gap between new forest edges within the project footprint is likely to be 70 – 80 m. Despite this, the lattice transmission line structures proposed as a part of the development and the transmission lines are highly permeable structures, and a Connectivity Strategy would be implemented to mitigate any impacts of habitat fragmentation on this species.	Significant impact unlikely
Dasyurus maculatus	Spotted-tailed Quoll	E	Yes – assumed present	The Spotted-tailed Quoll has not been recorded in the project footprint but is considered likely to occur in all IBRA subregions, with a high likelihood of occurrence in Bondo, Inland Slopes and Snowy Mountains and a moderate likelihood of occurrence in Bungonia, Crookwell and Murrumbateman. The project would result in the removal of 414.15 ha (17%) of foraging and denning habitat potentially used by this species.	Potential significant impact
Pteropus poliocephalus	Grey-headed Flying-fox	V	Yes–assumed present	During field surveys, no breeding or roosting habitat (camps) were observed and no Nationally Important Flying Fox Camps occur within the project footprint (DCCEEW, 2012). However, the Grey-headed Flying Fox has a medium likelihood of occurrence in Bungonia, Murrumbateman, Crookwell, and Inland Slopes IBRA subregion portion of the project footprint, which contains a variety of suitable forage habitats (comprising of native and non-native vegetation). There are eight known Grey-headed Flying-fox camps within foraging range (within 20 km) of the project footprint. Where field surveys have been undertaken, no Grey-headed Flying-fox camps have been identified. The potential habitat within project footprint is assumed to be foraging purposes only. Approximately 226.68 ha (17%) of potential foraging habitat for the Grey-headed Flying Fox will be directly impacted	Potential significant impact (foraging habitats only)

Scientific name	Common name	EPBC Act	Assessment required?	Impact summary	Significant impact?
				by the project. Given that the species is nomadic and has a wide variety of native and non-native foraging resources that it relies on, it is difficult to quantify the scale of impact this loss of vegetation would incur on local populations. The Bungonia, Crookwell, Inland Slopes and Murrumbateman IBRA subregions, consist of extensive areas that have been historically cleared for grazing and agricultural land practices. Native remnants primarily persist in the landscape as reserves and vegetation corridors, with varying degrees of fragmentation. Grey-headed Flying-fox in these regions are likely to rely on a combination of native flowering myrtaceous species, and non-native vegetation (eg, crops and planted gardens) within the locality. Indirect impacts resulting from the project include increased risk of entanglement and collision. In Mo et al. (2020), a broad range of factors were involved in flying-fox mortality or injury, the main ones being entanglements and electrocutions. Upon review of BioNet records (2022), there have been numerous Grey-headed Flying-fox individuals that have experienced electrocution (resulting in injury or mortality from existing transmission lines), particularly within proximity to the Tumut River Island and Wagga Wagga flying-fox camps (more urbanised areas). Based on the known distribution of Grey-headed Flying-fox camps within the region, the increased risk of entanglement and collision from the project and the scale of vegetation loss within the region, it is considered likely that the project will lead to the long-term decrease in the size of an important population of the Grey-headed Flying Fox.	
Petauroides volans	Greater Glider	E	Yes– present	The Greater Glider is known to occur within the project footprint in the Bondo, Bungonia and Snowy Mountains IBRA subregions in high condition, mature remnants. It also has a moderate likelihood of occurrence in the Crookwell, Inland Slopes and Murrumbateman IBRA subregions in intact remnants, with moderate to high connectivity. The proposed project footprint would result in the loss of approximately 109.25 ha of known habitat and 3.10 ha of potential habitat. The long, linear transmission line would result in a >70m easement clearing within these habitats which the species is unlikely to be able to glide across and the species has little ability to safely traverse cleared landscapes without the ability to glide.	Potential significant impact
Petaurus australis	Yellow-bellied Glider	V	Yes– present	The Yellow-bellied Glider is known to occur in the project footprint in Bondo, Inland Slopes and Snowy Mountains and is considered to have a high likelihood of occurrence in Bungonia. The project footprint would result in the loss of approximately 167.96 ha (22%) of known habitat and 50.63 ha (7%) of potential habitat.	Potential significant impact

Scientific name	Common name	EPBC Act	Assessment required?	Impact summary	Significant impact?
Phascolarctos cinereus	Koala	E	Yes– assumed present	The species was not recorded during field surveys but is considered likely to occur based on the high number of local records and the occurrence of Koala feed tree species. Habitat to be removed within the project footprint is subject to varying degrees of disturbance and varied conditions. About 418.40 ha of potential habitat in the form of native vegetation (including Koala use trees), including 19.40 ha of high potential foraging and shelter habitat in the Bungonia IBRA subregion, and 399.00 ha of moderate potential foraging and shelter habitat in the Bondo, Crookwell, Inland Slopes, Murrumbateman and Snowy Mountains IBRA subregions, are estimated to occur within the project footprint and would be directly impacted.	Likely significant impact
Mastacomys fuscus	Broad-toothed Rat	V	Yes– assumed present	The Broad-toothed Rat has not been recorded in the project footprint but is considered to have a high likelihood of occurrence in Snowy Mountains. The proposed project footprint will result in the loss of approximately 2.20 ha of potential habitat in the Snowy Mountains IBRA subregion.	Significant impact unlikely
Pseudomys fumeus	Smoky Mouse	E	Yes– assumed present	The Smoky Mouse has not been recorded in the project footprint but is considered to have a moderate likelihood of occurrence in Bondo and Snowy Mountains. The project footprint would result in the loss of approximately 132.66 ha of potential habitat in the Snowy Mountains IBRA subregion.	Significant impact unlikely
Reptiles					
Aprasia parapulchella	Pink-tailed Legless Lizard	V	Yes– present	Pink-tailed Legless Lizard was recorded (5 individuals) in the Murrumbateman IBRA subregion. The species was commonly identified in open woodland areas with rocky outcrops or scattered, partially buried rocks. Vegetation clearing for the installation of transmission lines and associated infrastructure is likely to reduce the availability of grassland habitat containing foraging resources potentially used by the species and may disturb rock boulder fields potentially used as foraging and shelter habitat by the species. Potential direct impacts include species injury or mortality during clearing and construction work. An area of approximately 57.40 ha of potential foraging and shelter habitat (including 3.00 ha of prescribed impacts) for the Pink-tailed Legless Lizard would be impacted by the project.	Likely significant impact
Delma impar	Striped Legless Lizard	V	Yes– assumed present	Vegetation clearing for the installation of transmission lines and associated infrastructure may reduce the availability of grassland habitat containing foraging resources potentially used by this species and may disturb rock boulder fields potentially used as foraging and shelter habitat by these species. Potential direct impacts include species injury or mortality during clearing and construction work. An area of approximately 124.90 ha of potential foraging and shelter habitat for the Striped Legless Lizard would be impacted by the project.	Potential significant impact

13.8.4 Impacts on aquatic species listed under the EPBC Act

The project has the potential to impact on six threatened aquatic species listed under the EPBC Act (refer to Table 13-34).

The significance assessments and Commonwealth requirements of the SEARs for threatened aquatic species are addressed in detail in Attachment 18.

The construction process for the transmission line structures and associated transmission lines would avoid direct impacts to streams. As such, these significance assessments focus on the potential for disturbance and residual indirect impacts to potential habitats following the implementation of avoidance and mitigation measures, to the species (ie the removal of native riparian vegetation, erosion and sedimentation risk) during access track and waterway crossing construction.

The significance assessments have concluded that no significant impacts to threatened aquatic species listed under the EPBC Act would be likely to occur due to the project.

Table 13-34: EPBC Act threatened aquatic species summary of significance of impact

<table>
<tr><th>Scientific name</th><th>Common name</th><th>EPBC Act</th><th>Assessment required</th><th>Impact summary</th><th>Significant impact?</th></tr>
<tr><td>Bidyanus bidyanus</td><td>Silver Perch</td><td>CE</td><td>Yes</td><td rowspan="4">None of the waterways that have been mapped as within the species indicative distribution (DPI, 2022a) would be crossed by any proposed access tracks associated with waterway crossings.

Any indirect impacts that may occur are anticipated be localised and temporary in nature eg disturbance to instream habitats during the construction of waterway crossings for access tracks or trimming of riparian trees to facilitate transmission line installation.

While waterway crossings for access tracks are proposed, mitigation measures to prevent as far as practical the creation of any barriers to fish passage have been recommended, with crossings designs aligning with relevant guidelines (Fairfull, 2013).</td><td>Significant impact unlikely</td></tr>
<tr><td>Galaxias rostratus</td><td>Flatheaded Galaxias</td><td>CE</td><td>Yes</td><td>Significant impact unlikely</td></tr>
<tr><td>Maccullochella macquariensis</td><td>Trout Cod</td><td>E</td><td>Yes</td><td>Significant impact unlikely</td></tr>
<tr><td>Macquaria australasica</td><td>Macquarie Perch</td><td>E</td><td>Yes</td><td>Significant impact unlikely</td></tr>
<tr><td>Nannoperca australis</td><td>Southern Pygmy Perch</td><td>V</td><td>Yes</td><td>Based on the indicative disturbance area, potential waterway crossings are located at Yellow Creek (V9-13) and an unnamed stream (V9-12) have been included in indicative distribution mapping for the Southern Pygmy Perch (DPI 2022a). However, these streams are not considered to be of significant importance to the species as they are outside the known range of remnant populations in NSW, combined with the levels of landscape modification at these locations, and presence of existing access tracks and crossings.

It is anticipated that any constructed waterway crossings upgrades associated with the project would contribute to overall improvements to aquatic conditions and be more sensitive than existing informal crossings and would not result in any additional deleterious processes.

While waterway crossings for access tracks are proposed, mitigation measures to prevent as far as practical the creation of any barriers to fish passage have been recommended, with crossings designs aligning with relevant guidelines (Fairfull, 2013).

Any impacts that may occur are anticipated be localised and temporary in nature eg disturbance to instream habitats during the construction of waterway crossings for access tracks or trimming of riparian trees to facilitate transmission line installation.</td><td>Significant impact unlikely</td></tr>
</table>

Scientific name	Common name	EPBC Act	Assessment required	Impact summary	Significant impact?
Maccullochella peelii	Murray Cod	V	No	The Murray Cod has the potential to occur within the project footprint in larger streams, particularly the Murrumbidgee River. However, any population present within these stream intersecting with the project footprint would not constitute part of any important population identified in the recovery plan for the species (National Murray Cod Recovery Team, 2010) and it is considered unlikely that any population that may occur within the project footprint would represent a key source population for breeding or necessary for maintaining the genetic diversity of the species. As no important populations would be impacted by the project the species has not been subject to a formal assessment. However, it is anticipated that the findings would be in line with other large-bodied native fish species (Trout Cod and Macquarie Perch) assessed. It is also noted that the avoidance and mitigation measures presented within this BDAR would apply to any Murray Cod individuals that may occur within the project footprint.	Not assessed

13.8.5 Impacts on migratory species listed under the EPBC Act

The project could impact on 10 migratory species listed under the EPBC Act (Table 13-35). For some of the species nominated as potentially significantly impacted, this conclusion is made due to the requirement to take a precautionary approach based on an element of uncertainly inherent in many biodiversity assessments especially where incomplete survey coverage occurs. The significance assessments and address of the Commonwealth requirements of the SEARs for migratory species are provided in detail in Attachment 18. The proposed avoidance and mitigation measures are outlined in Chapter 12 and 14 of the BDAR.

Table 13-35: EPBC Act migratory species summary of significance of impact

Scientific name	Common name	EPBC Act	Assessment required?	Impact summary (ha)	Significant impact?
Apus pacificus	Fork-tailed Swift	M	Yes - present	The Fork-tailed Swift is known to occur in the project footprint in the Inland Slopes IBRA subregion. The project has the potential to remove approximately 727.40 ha of opportunistic non-breeding habitat suitable for this species. The project would result in the installation of transmission lines which may intersect the flight path of these migratory birds. Potential direct impacts include species injury or mortality from strikes with the new transmission lines, or during clearing and construction work. The potential collision related impacts to these species have been considered further in Section 13.5.4.	Potential significant impact (precautionary)
Calidris acuminata	Sharp-tailed Sandpiper	M	Yes – assumed present	The Sharp-tailed Sandpiper has not been recorded in the project footprint but is considered to have a high likelihood of occurrence in Inland Slopes. The project has the potential to indirectly impact 54.98 ha of riparian habitat within the Inland Slopes portion of the project footprint. The project would result in the installation of transmission lines which may intersect the flight path of these migratory birds. Potential direct impacts include species injury or mortality from strikes with the new transmission lines, or during clearing and construction work. The potential collision related impacts to these species have been considered further in Section 13.5.4.	Potential significant impact
Calidris ruficollis	Red-necked Stint	M	Yes – assumed present	The Red-necked Stint has not been recorded in the project footprint but is considered to have a high likelihood of occurrence in Inland Slopes. The project has the potential to indirectly impact 54.98 ha of riparian habitat within the Inland Slopes portion of the project footprint. The project would result in the installation of transmission lines which may intersect the flight path of these migratory birds. Potential direct impacts include species injury or mortality from strikes with the new transmission lines, or during clearing and construction work. The potential collision related impacts to these species have been considered further in Section 13.5.4.	Potential significant impact
Gallinago hardwickii	Latham's Snipe	M	Yes – assumed present	The Latham's Snipe has not been recorded in the project footprint but is considered to have a high likelihood of occurrence in Inland Slopes and Snowy Mountains, and a moderate likelihood of occurrence in Bungonia and Murrumbateman. The project has the potential to indirectly impact 54.98 ha of riparian habitat within the Inland Slopes portion of the project footprint. The project would result in the installation of transmission lines which may intersect the flight path of these migratory birds. Potential direct impacts include species injury or mortality from strikes with the new transmission lines, or during clearing and construction work. The potential collision related impacts to these species have been considered further in Section 13.5.4.	Potential significant impact

Scientific name	Common name	EPBC Act	Assessment required?	Impact summary (ha)	Significant impact?
Hirundapus caudacutus	White-throated Needletail	V, M	Yes	The White-throated Needletail was not recorded during the field surveys for the project and there are no previous records within the project footprint, and no recent records in the broader locality. Potential foraging habitat is present in the project footprint in the form of associated PCTs. Vegetation clearing for the installation of transmission lines and associated infrastructure may reduce the availability of foraging resources for these species, as well as suitable hollow bearing trees used as roosting habitat by the White-throated Needletail. Potential direct impacts include species injury or mortality during clearing and construction work. An area of approximately 85.09 ha of potential habitat for this species would be impacted by the project. Extensive areas of potential foraging habitat for this species are also present within the locality and would be retained.	Significant impact unlikely
Monarcha melanopsis	Black-faced Monarch	M	No	The Black-faced Monarch has not been recorded in the project footprint and is considered to have a low likelihood of occurrence in all IBRA, subregions however as it was identified in SEARs further was assessment required. The project has the potential to remove approximately 131.13 ha of potential migratory habitat. Vegetation clearing for the installation of transmission lines and associated infrastructure may reduce the availability of foraging resources for these species. Extensive areas of potential habitat for these species are also present within the locality. The habitat within the project footprint to be impacted is therefore not considered important habitat for these species. The removal of the potential habitat as a result of the project is unlikely to disrupt the lifecycle of an ecologically significant proportion of these species.	Significant impact unlikely
Myiagra cyanoleuca	Satin Flycatcher	M	No	The Satin Flycatcher is known to occur in the project footprint in Murrumbateman. The project has the potential to remove approximately 595.03 ha of potential foraging habitat for this species. Vegetation clearing for the installation of transmission lines and associated infrastructure may reduce the availability of foraging resources for these species. Extensive areas of potential habitat for these species are also present within the locality. The habitat within the project footprint to be impacted is therefore not considered important habitat for these species. The removal of the potential habitat as a result of the project is unlikely to disrupt the lifecycle of an ecologically significant proportion of these species.	Significant impact unlikely

Scientific name	Common name	EPBC Act	Assessment required?	Impact summary (ha)	Significant impact?
Rhipidura rufifrons	Rufous Fantail	M	No	The Rufous Fantail is known to occur in the project footprint in Bondo IBRA subregion. The project has the potential to remove approximately 722.67 ha of opportunistic non-breeding habitat. Vegetation clearing for the installation of transmission lines and associated infrastructure may reduce the availability of foraging resources for these species. Extensive areas of potential habitat for these species are also present within the locality. The habitat within the project footprint to be impacted is therefore not considered important habitat for these species. The removal of the potential habitat as a result of the project is unlikely to disrupt the lifecycle of an ecologically significant proportion of these species.	Significant impact unlikely
Tringa nebularia	Common Greenshank	M	Yes	The Common Greenshank has not been recorded in the project footprint but is considered to have a high likelihood of occurrence in Inland Slopes. The project would result in the installation of transmission lines which may intersect the flight path of these migratory birds. Potential direct impacts include species injury or mortality from strikes with the new transmission lines, or during clearing and construction work. Vegetation clearing for the installation of transmission lines and associated infrastructure may reduce the availability of foraging resources for these species. The proposed transmission line has the potential to indirectly impact 54.98 ha of riparian habitat within the Inland Slopes project footprint. The potential collision related impacts to these species have been considered further in Section 13.5.4.	Potential significant impact
Tringa stagnatilis	Marsh Sandpiper	M	Yes	The Marsh Sandpiper has not been recorded in the project footprint but is considered to have a moderate likelihood of occurrence in Inland Slopes. The project would result in the installation of transmission lines which may intersect the flight path of these migratory birds. Potential direct impacts include species injury or mortality from strikes with the new transmission lines, or during clearing and construction work. Vegetation clearing for the installation of transmission lines and associated infrastructure may reduce the availability of foraging resources for these species. The proposed transmission line has the potential to indirectly impact 54.98 ha of riparian habitat within the Inland Slopes project footprint. The potential collision related impacts to these species have been considered further in Section 13.5.4.	Potential significant impact

13.8.6 Impacts on Bogong Moth

Key summer aestivation sites are generally found in the caves, boulder fields and tors of the Australian Alps (Green, 2010). These sites are scattered across the south-eastern Australian alpine areas (limited to areas of the project footprint occurring the Snowy Mountains IBRA subregion) (Keaney, 2016).

Over the past decade, there has been a rapid decline in Bogong Moth numbers within the Australian Alps, and this likely due to several factors. In Green *et al*.'s 2020 study, they reported a 99.5 per cent decline in Bogong Moth numbers at alpine summer aestivation sites. It is possible, that due to severe drought and warmer temperatures had impacted cave microclimates (maximum temperature for aestivation is 16°C) used by the species, restricting aestivation sites to higher altitudes. Further, larvae of Bogong Moth are susceptible to ingesting arsenate from agricultural sprays, used against their weedy food plants amongst crops, and the developing migrant adults transport this to high altitudes. Analysis of soils washed out of aestivation sites revealed high levels of arsenic (Green *et al.*, 2001), possibly accumulated from larval food, and later released from the bodies of dead adult moths in the new environment. Other secondary threats include increased artificial light hampering migration efforts (Warrant & Dacke, 2016), and changes in agricultural practices; this includes the replacement of traditional agricultural land with cotton and rice monocultures that do not provide suitable larval host plants (Green *et al.*, 2021).

Within the project footprint, the Bogong Moth has a moderate likelihood of occurrence during spring migration to summer aestivation sites in the Bogong Ranges. Adult moths are likely to forage on myrtaceous and proteaceous shrubs and trees, and agricultural crops (Warrant *et al.*, 2016) during this period. The project footprint would result in the loss of approximately 1124.66 ha of potential foraging habitat for the species. There is also likely to be an increase in artificial lighting during construction of the project, however, the consequences of this would be relatively minor given work would mostly be carried out during daylight hours (refer to Chapter 4).

13.9 Key Threatening Processes

There are currently 19 Key Threatening Processes (KTPs) listed under the EPBC Act and Schedule 4 of the BC Act that are relevant to the project (Table 13-36). Three KTPs listed under Schedule 6 of the FM Act are also considered relevant.

Table 13-36: Key Threatening Processes relevant to the project

Key Threatening Process	Assessment of likelihood	Proposed mitigation
Environment Protection and Biodiversity Conservation Act 1999/ Biodiversity Conservation Act 2016		
Bushrock removal	High; Rocky habitats within the project footprint would be impacted where they are situated within the Total Clearing Zone and Easement Clearing Zone. Bushrock serves many purposes in the natural environment. It provides habitat for many plants and animals, some of which are threatened. Many animals use rocks and rock environments for shelter, to hide from predators, find food, avoid extreme weather conditions and escape bushfires. Bushrock is also known to provide egg-laying sites for reptiles. Bushrock removal may impact reptiles including the Pink-tailed Legless Lizard and Striped Legless Lizard, where intersecting with habitat for these threatened species.	Avoid bushrock removal where possible. If bushrock removal is required, assess areas where threatened biodiversity is likely to be present and redesign activity around area, or through lesser condition habitat. Salvage bushrock and return to area after activity or return to land near activity (NSW Scientific Committee (1999)).
Clearing of native vegetation	High; 670.21 ha of native vegetation would be cleared as a result of the project. There is a risk of disturbance and/ or destruction of adjacent habitats and vegetation through accidental clearing and unauthorised vehicle movements during the construction stage.	Avoid clearing of native vegetation where possible. Plan activities away from areas of known or likely biodiversity values. Plan activities in areas of low biodiversity value and consider revegetation techniques after activities are finalised. Minimise fragmenting vegetation or disturbing soils as to not disrupt ecological function (NSW Scientific Committee, 2001b).
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss	Moderate; Fire regimes within the locality are already subject to considerable alteration as a result of the agricultural and forestry	The implementation of a Bush Fire Emergency Management and Evacuation Plan to manage the bushfire risk during construction. Develop species/ecosystem specific fire management guidelines to maintain species lifecycle processes and maintain vegetation structure/composition.

Key Threatening Process	Assessment of likelihood	Proposed mitigation
of vegetation structure and composition	land uses which dominate the landscape. Climate change may result in further change. There would be an increased risk of bushfire during construction due to several potential ignition sources, eg hot works, equipment or services failure, or accidental ignitions (refer to Chapter 19 of EIS (Hazards and risks) for further discussion). There would be an increased risk of bushfire during operation where the transmission lines become damaged from storm activity or fallen vegetation. However, these risks are low with appropriate maintenance.	Incorporate Asset Protection Zones, particularly in areas with a history of fire (OEH, 2022a).
Infection of frogs by amphibian chytrid causing the disease *chytridiomycosis*	Low; There is the potential for the introduction or spread of pathogens by means of imported materials, machinery movements and increased foot traffic during the construction phase. No evidence of pathogens such as Root Rot *Phytophthora cinnamomi*, Myrtle Rust *Austropuccinia psidii* and Chytrid Fungus *Batrachochytrium dendrobatidi*s was recorded within the project footprint. However, these have potential to occur.	Currently no proven method to control the disease. Given the likelihood is low, mitigation can be implemented via hygiene protocols. This may include washing down vehicles and keeping up to date where current chytrid infestations are in relation to areas previously worked at (DEE, 2016).
Infection of native plants by *Phytophthora cinnamomi*		Given the likelihood is low, mitigation can be implemented via hygiene protocols. This includes washing down vehicles and PPE, especially if work has been conducted previously on sites of known infestations.
Introduction and establishment of exotic rust fungi of the order Pucciniales pathogenic on plants of the family *Myrtaceae*		Mitigation can be implemented via hygiene protocols. This includes washing down vehicles and PPE, especially if work has been conducted previously on sites of known infestations.
Invasion and establishment of exotic vines and scramblers	Low/Moderate; There is the potential for the introduction or spread of weeds by means of imported materials, machinery movements and increased foot traffic during the construction phase. Weeds	Mitigation can be implemented via hygiene protocols, ensuring no foreign materials are on tyres or shoes prior to entering site. Develop a weed management plan, including species-specific targets to avoid and minimise establishment (DCCEEW, 2013).

Key Threatening Process	Assessment of likelihood	Proposed mitigation
Invasion of native plant communities by exotic perennial grasses	recorded as a part of field survey activities are detailed in Section 6.4 of this BDAR relative to each vegetation zone and IBRA subregion. Vegetated fragments remaining within the landscape are generally small, isolated and already likely to be subject to considerable edge effects such as weed invasion and altered floristic composition and structure. Despite this, increased clearing and fragmentation as a result of the project may further intensify these pressures within remaining fragments and has the potential to impact habitat viability for some threatened flora and fauna species generally reliant on the availability of larger contiguous habitats.	Mitigation can be implemented via hygiene protocols, ensuring no foreign materials are on tyres or shoes prior to entering site. Develop a weed management plan, including species-specific targets to avoid and minimise establishment (DCCEEW, 2013).
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants		Mitigation can be implemented via hygiene protocols, ensuring no foreign materials are on tyres or shoes prior to entering site. Develop a weed management plan, including species-specific targets to avoid and minimise establishment (DCCEEW, 2014a).
Loss of hollow-bearing trees	Low/ Moderate; The loss of habitat such as, hollows, stick nests, drays, dead trees and fallen timber has the potential to affect native animals such as: ▪ hollow-dependent bats ▪ hollow-nesting and canopy-nesting birds ▪ arboreal mammals ▪ reptiles. The loss of habitats is unlikely to extend beyond the disturbance area. Impacts beyond this area would be avoided through mitigation and management measures.	Where possible retain hollow-bearing trees (HBTs), recruitment hollow-bearing trees, and avoid areas of high occurrence. Implement and maintain nestboxes in areas that HBTs must be removed (NRM, 2004).
Removal of dead wood and dead trees		Where possible retain dead wood and trees in situ. Alternatively, remove dead wood and trees intermittently and return to impact site as woody debris for habitat (NRM, 2004).
Predation and hybridisation by Feral Dogs, *Canis lupus familiaris*	Low/Moderate; Feral Dogs; 0 records European Red Foxes; 21 records Feral Cats; 28 records Noisy Miners; 2 records European Rabbits; 6 records Feral Goats; 3 records	Transgrid would consult with relevant agencies and groups involved with pest management in order to contribute to existing or future monitoring and management programs. If isolated threatened species populations are detected which are prone to pest animal incursion, then specific measures will be developed and undertaken to address threats in these areas after consultation with the BCD and/or NSW NPWS as appropriate. For Noisy Miners, limit forest and woodland clearance and fragmentation, particularly in the form of reduced understory.
Predation by the European red Fox *Vulpes vulpes*		

Key Threatening Process	Assessment of likelihood	Proposed mitigation
Predation by Feral Cat *Felis catus*	Feral Deer; 9 records Feral Pigs; 4 records Section 7.5 identifies pest animals known or likely to occur within the project footprint. It is unlikely that work associated with the project would result in the introduction or spread of pest species within the project footprint. Despite this, it is possible that native fauna may be more susceptible to predation as a result of vegetation clearing and increased levels of fragmentation within the locality.	See other relevant measures in Table 13-14
Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners *Manorina melanocephala.*		
Competition and grazing by the feral European rabbit		
Competition and habitat degradation by Feral Goats, *Capra hircus Linnaeus* 1758		
Herbivory and environmental degradation caused by feral deer		
Predation, habitat degradation, competition and disease transmission by Feral Pigs *Sus scrofa*		

<table>
<tr><th>Key Threatening Process</th><th>Assessment of likelihood</th><th>Proposed mitigation</th></tr>
<tr><td colspan="3">Fisheries Management Act 1994</td></tr>
<tr><td>Degradation of native riparian vegetation along New South Wales water courses.</td><td rowspan="3">The project would require activities that would align with these KTPs. However, it is considered unlikely that the project would significantly increase the operation of any of these KTPs beyond those levels encountered in the existing landscape.
These KTPs have been observed within the existing aquatic environments at significant levels. It is considered unlikely that the project would significantly increase the operation of any of these KTPs beyond those levels encountered in the existing landscape.
A standard construction methodology for access tracks and waterway crossings has developed, aligning with the relevant guidelines, to construct the crossings in an environmentally sensitive manner and detail relevant mitigation measures.
Recommended avoidance (Section 12.1) and mitigation measures (Section 14) have been detailed to reduce potential risk to aquatic habitats associated with these KTPs.</td><td>Avoid and minimise disturbances around riparian zones.
Monitor riparian quality for changes pre and post impact activities and effectiveness of mitigation strategies.
Revegetate areas disturbed or with little to no vegetation.
Control stock access.
Manage exotic vegetation along riparian zones (DPI, 2005a).</td></tr>
<tr><td>Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams.</td><td>Avoid installing instream structures where possible.
Remove redundant structures at the closure of the impact activity.
Minimise the impact of essential instream structures by mimicking natural flows and constructing fishways/crossings (DPI, 2005b)</td></tr>
<tr><td>Removal of large woody debris from New South Wales rivers and streams.</td><td>Large woody debris (LWD) should be retained.
Lopping/trimming LWD, realign LWD within stream, or relocate LWD instead of removal from waterway (DPI, 2005c)</td></tr>
</table>

13.10 Cumulative impacts

The overarching aim in considering cumulative impacts is to describe the scale and nature of the potential impacts of the project and other relevant past, present or future projects on biodiversity matters. Consideration of the project in this context ensures that potential impacts are not considered in isolation.

The consideration of cumulative impacts has been prepared with reference to the Cumulative Impact Assessment for State Significant Projects guideline (DPE, 2022), which identifies six key questions to inform the assessment, which are summarised in Table 13-37.

Table 13-37: Cumulative Impact Assessment six key questions (DPIE, 2022)

Question	Detail
1. What to assess?	The assessment has focussed upon biodiversity matters (threatened species and ecological communities) that are most at risk of serious harm from the project.
2. What study area?	Due to the scale of the project, the cumulative assessment has considered similar projects within the broader region, which would include for the purposes of this assessment includes overlapping and/or adjacent IBRA subregions to the project.
3. Over what time period?	Based upon the availability of information, the assessment focuses on major similar projects that have occurred in recent times and can be predicted to occur within the life of the project.
4. What other projects to include?	The assessment focuses on the predicted impacts of major similar projects. The following projects have been considered in the cumulative impact assessment for biodiversity matters: • EnergyConnect (NSW – Eastern Section) • Gregadoo Solar Farm • Jeremiah Wind Farm • Rye Park Wind Farm • Victoria to NSW Interconnector West (VNI West) • Snowy 2.0 - Transmission Connection • Snowy 2.0 - Main Works • Inland Rail – Albury to Illabo • Crookwell 3 Wind Farm.
5. What is the proposed approach to assessment?	Information pertaining to the predicted and/or recorded impacts to biodiversity associated with similar projects from the available project documentation, in relation to key biodiversity matters relevant to the project have been summarised in Table 13-38. Consideration of potential cumulative impacts is also summarised in Table 13-38. Avoidance and mitigation measures undertaken to date and proposed to be employed have been described in Chapter 12 and Chapter 14.
6. What are the key uncertainties?	The assessment is based upon the accuracy and level of information contained in the available documentation and it is possible that not all relevant documents may be publicly available. The cumulative impact assessment focusses on key biodiversity matters that could be materially affected by the cumulative impacts of the project and other relevant future projects, it is not within the scope of the assessment to consider all conceivable potential cumulative impacts on every biodiversity matters.

To manage the potential cumulative impacts to biodiversity as a result of the project, an options report has considered routes to avoid and minimise impacts to biodiversity (described in Chapter 12). A range of mitigation measures have been detailed in Section 14.2 to further mitigate residual impacts associated with the project. In addition, biodiversity offsets would be provided for the project, where removal of habitat and vegetation is unavoidable (detailed in Chapter 15).

Nevertheless, the biodiversity impacts associated with impacts to native vegetation and habitat required as part of the project have the potential to result in cumulative impacts beyond the construction stage of the project. To assist in the consideration of cumulative impacts, a review of large-scale projects that may be predicted to occur within the life of the proposed project in the region has been made. A number of developments (refer to Table 13-37) planned within the region have the potential to interact with and/or compound the project's biodiversity impacts. Further detail on each of these projects is and potential for cumulative biodiversity are described in Table 13-38.

Table 13-38: Potential cumulative impacts associated with planned projects

Project	IBRA subregions	Details	Timing	Cumulative impacts
EnergyConnect (NSW – Eastern Section) EIS approved 2022	Murray Darling Depression region: • South Olary Plain subregion Riverina: • Lachlan subregion • Murrumbidgee subregion NSW South-Western Slopes region: • Lower slopes subregion • Inland slopes subregion.	The project includes a new transmission line connecting the existing Buronga substation and existing Wagga 330 kV substation, and construction of the new Dinawan substation (170 km west of Wagga Wagga). The project also involves associated infrastructure (optical repeater structures), construction of new and/or upgrades to access tracks as required, as well as ancillary work to support construction.	Early 2023 to late 2024	Both HumeLink and EnergyConnect (NSW – Eastern Section) require upgrades of the existing Wagga 330 kV substation. However, the rest of the developments would be in distinct areas. In light of this, the projects are unlikely to significantly contribute to cumulative biodiversity impacts at the regional scale.
Gregadoo Solar Farm EIS approved 2018 Modification 2 approved 2021	NSW South-Western Slopes region: • Inland slopes subregion.	The Gregadoo Solar Farm project involves the construction and operation of a proposed 47 Megawatt (MW) photovoltaic (PV) solar farm at Gregadoo, Wagga Wagga. The Gregadoo Solar Farm development site covers about 150 ha of land. The Gregadoo Solar Farm project site is located on land adjacent the existing Wagga 330 kV substation and is proposed to connect to the existing Wagga 330 kV substation on the northern side of substation.	9 months of construction expected to commence mid-2023	The majority of the Gregadoo Solar Farm development site (98%) is formed by cleared and highly modified agricultural land, with the development site designed to minimise impacts to native vegetation communities. While both developments occur in proximity to the Wagga 330 kV substation, the rest of the developments would be in distinct areas. Significant cumulative impacts to biodiversity are considered to be unlikely. This is given the existing levels of modification to the Gregadoo Solar Farm development site, primarily distinct development areas, along with the avoidance and minimisation measures, in addition to the offset requirements and mitigation measures for residual impacts detailed in this BDAR.

Project	IBRA subregions	Details	Timing	Cumulative impacts
Jeremiah Wind Farm EIS in preparation	NSW South-Western Slopes region: • Upper Slopes subregion NSW South-Eastern Highlands region: • Bondo subregion	The project is located approximately 29 km east of Gundagai around the Adjungbilly area. The project proposes a 65 turbine wind farm with a maximum tip height of 300 m, battery energy storage system and associated ancillary infrastructure. There is likely to be a high level of interaction between the projects as transmission lines between the proposed Gugaa 500 kV substation and Bannaby 500 kV substation, and future Maragle 500 kV substation and Bannaby 500 kV substation go through the Jeremiah Wind Farm development area.	Construction expected to be 24 to 30 months and take place early 2023 to 2025	The majority of the Jeremiah Wind Farm development area is modified or degraded, predominantly consisting of exotic pasture. Two PCTs mapped correspond with a Critically Endangered Ecological Community's (CEEC) listed under the BC Act. However, no TECs listed under the EPBC Act have been mapped within the development area due to the disturbed and degraded nature of the vegetation present. A number of threatened flora and fauna species have been identified as having the potential to occur within the proposed Jeremiah Wind Farm development area. Impact avoidance, mitigation and offset obligations in relation to biodiversity will be provided in the BDAR and EIS. Given the overlap in development area, there is the potential for biodiversity impacts within the locality to be compounded by the projects, despite the predominantly modified or degraded landscape. The avoidance and minimisation measures, along with the offset requirements and mitigation measures for residual impacts detailed in this BDAR, along with similar provisions in the Jeremiah Wind Farm impact assessment are considered likely to control the risk of potentially significant cumulative biodiversity impacts in the locality.
Rye Park Wind Farm EIS approved 2017 Modification 1 approved 2021 Modification 2 in preparation 2022	NSW South-Western Slopes region: • Northern Inland Slopes subregion South-Eastern Highlands region: • Murrumbateman subregion	The project is located to the west of Rye Park, north-west of Yass and south-east of Boorowa. The modified project involved the construction and operation of up to 80 wind turbines. The project also includes construction of associated infrastructure (substations, operation and maintenance facilities) and	Under construction since December 2021 with commissioning scheduled for June 2023	Modification 2 has reduced the overall biodiversity impacts of the approved project. Prior to the wind farm development, the project area had been subject to past land clearing and agricultural development. The ecological assessment

Project	IBRA subregions	Details	Timing	Cumulative impacts
		upgrades to local roads. In addition to this, a 330 kV switching station is proposed to the north of the HumeLink transmission line at Bango. There are likely to be moderate to high levels of interaction between the projects, as transmission lines for HumeLink between the proposed Gugaa 500 kV substation and Bannaby 500 kV substation, and future Maragle 500 kV substation and Bannaby 500 kV substation, go through the southern end of the wind farm project boundary at Bango. HumeLink would also require the connection of optical ground wire (OPGW) from the HumeLink 500 kV transmission line into the Rye Park 330 kV switching station auxiliary services building (the Rye Park Wind Farm substation).		for the project concluded that impacts arising from the wind farm to EEC's and threatened species known or likely to occur in the project area were unlikely to be significant. Given the overlap in development area, there is the potential for biodiversity impacts within the locality to be compounded by the projects, despite the predominantly modified landscape of the Rye Park Wind Farm development area. The avoidance and minimisation measures, along with the offset requirements and mitigation measures for residual impacts detailed in this BDAR, along with similar provisions in the Rye Park Wind Farm impact assessment are considered likely to control the risk of potentially significant cumulative biodiversity impacts in the locality.
Victoria to NSW Interconnector West (VNI West) Scoping/market modelling phase	The Victoria to NSW Interconnector West (VNI West) would be likely to extend across multiple IBRA subregions along eastern, south-eastern, and southern NSW.	The project involves targeted interconnector expansion between Victoria and NSW to address transmission network limitations and improve supply reliability. VNI West is still in scoping/market modelling phase to assess the technical and economic viability of expanding transmission interconnector capacity between Victoria and NSW. Several options have been developed with new interconnector corridors (VNI 6 – 8) connecting to the existing Wagga 330 kV substation. VNI West may require connection at the existing Wagga 330 kV substation (depending on preferred option).	Construction scheduled to commence in 2026 with commissioning by 2030	The current scope that interfaces with HumeLink includes a new double circuit transmission line between Wagga 330 kV substation and the proposed Gugaa 500 kV substation to extend the EnergyConnect lines. As the VNI West project is at the scoping stage, it is difficult to predict the nature and magnitude of potential cumulative biodiversity impacts at the regional scale. However, the avoidance and minimisation measures, along with the offset requirements and mitigation measures for residual impacts detailed in this BDAR would assist in reducing the likelihood of potential cumulative impacts. Similar provisions would be anticipated to be adopted as part of the VNI West project.

Project	IBRA subregions	Details	Timing	Cumulative impacts
Snowy 2.0 - Transmission Connection EIS approved 2022	South-Eastern Highlands region: • Bondo subregion Australian Alps region: • Snowy Mountains subregion.	The project involves a new transmission connection between the proposed Snowy 2.0 pumped hydro and generation project to the existing high voltage transmission network. Including construction of access tracks to the transmission structures, and upgrade to existing tracks where required. An Amendment Report for the project has resulted in less disturbance than that originally described in the EIS. However, a wider asset protection zone and substation footprint is provided for the future 500 kV Maragle substation. HumeLink would connect to the future Maragle 500 kV substation being constructed as part of the Snowy 2.0 - Transmission Connection project.	Mid 2022 to 2026 with a 55 month construction program	Given both projects would involve work associated with the new Maragle substation development, there is the potential for biodiversity impacts within the locality to be compounded by the projects. The linear nature of both developments in the region may somewhat reduce the potential for cumulative biodiversity impacts, given they primarily occur in distinct areas, except at the new Maragle substation development area. The avoidance and minimisation measures, along with the offset requirements and mitigation measures for residual impacts detailed in this BDAR, along with similar provisions in the Snowy 2.0 - Transmission Connection BDAR are considered likely to control the risk of potentially significant cumulative biodiversity impacts in the locality.
Snowy 2.0 - Main Works EIS approved 2020 Modification 1 approved 2022	NSW South-Eastern Highlands region: • Bondo subregion • Monaro subregion NSW South-Western Slopes IBRA region: • Inland slopes subregion Australian Alps region: • Snowy Mountains subregion.	The project includes an underground pumped hydro power station and ancillary infrastructure. The main work at the Talbingo Reservoir site include excavated rock placement, portal construction and tunnelling, access roads and ancillary facilities for emplacement activities and tunnelling support.	Construction was to commence in mid-2020 and be completed by mid-2025	The project areas do not overlap, with approximately 5 km distance between the southern end of the HumeLink footprint and the western end of the Snowy 2.0 - Main Works footprint, at the southern end of the Talbingo Reservoir. The linear nature of both developments in the region may somewhat reduce the potential for cumulative biodiversity impacts. The avoidance and minimisation measures, along with the offset requirements and mitigation measures for residual impacts detailed in this BDAR, along with similar provisions in the Snowy 2.0 - Main Works BDAR are considered likely to control the risk of potentially significant cumulative

Project	IBRA subregions	Details	Timing	Cumulative impacts
				biodiversity impacts in the locality. In light of these factors, no significant cumulative biodiversity impacts are considered likely to occur at the regional scale.
Inland Rail – Albury to Illabo EIS exhibited, responding to submissions.	NSW South-Western Slopes region: • Lower slopes • Inland slopes.	The Australian Rail Track Corporation (ARTC) is proposing to upgrade the Albury to Illabo Section of Inland Rail, along the 185 km of existing operational narrow-gauge railway from the Victorian/New South Wales border to Illabo in regional NSW. The project will involve Upgrades to 185 km of rail track from Albury to Illabo. Subject to planning approval, construction is expected to commence in 2024 and expected to be completed in mid-2025, with operations to commence in 2025. The project would primarily use the existing rail line, but additional areas for enhancements and modifications would be impacted in order to provide sufficient height and width to support the safe running of double-stacked freight trains.	Construction is proposed to commence in early 2024 and expected to take about 16 months. Construction expected to be completed in mid-2025.	The Inland Rail – Albury to Illabo project is considered unlikely to lead to a significant impact on any threatened species or ecological community listed under the EPBC Act, or on threatened aquatic species, ecological communities or their habitats. Impacts to biodiversity from the Inland Rail – Albury to Illabo project have been minimised, with impacts typically confined to edge areas along the existing railway. The predicted level of impacts are not considered likely to substantially contribute to cumulative impacts in relation to the potential impacts from HumeLink in a regional context. The linear nature of both developments in the region may somewhat reduce the potential for cumulative biodiversity impacts, given they primarily occur in distinct areas. The avoidance and minimisation measures, along with the offset requirements and mitigation measures for residual impacts detailed in this BDAR and the Inland Rail BDAR would assist in reducing the likelihood of potential cumulative impacts.
Crookwell 3 Wind Farm Addendum EIS approved 2019	NSW South-Eastern Highlands region: • Crookwell subregion	The project involves the proposed energy facility known as the Crookwell 3 Wind Farm, which will involve the construction and operation of 16 wind turbines, connected	Construction to commence in 2022 and is likely to take 18 months to complete.	The ecological assessment for the project concluded that the Crookwell Wind Farm is unlikely to have a significant impact on any communities, populations or

Project	IBRA subregions	Details	Timing	Cumulative impacts
		to the grid via the 330 kV transmission line and ancillary infrastructure. The project site is beneath a portion of the HumeLink project footprint.		threatened species. The project is consistent with the principles of "improve or maintain" in relation to ecological impacts and although no offset is required, an offset of 60 ha is being proposed. Given the overlap in development area, there is the potential for biodiversity impacts within the locality to be compounded by the projects. However, this is unlikely, given the avoidance and minimisation measures, along with the offset requirements and mitigation measures for residual impacts detailed in this BDAR. Especially when this is considered that the Crookwell Wind Farm is consistent with the principles of "improve or maintain".

14. Mitigation and management measures

This chapter addresses the mitigation and management measures to be implemented during construction and operation of the project.

14.1 Approach to impact mitigation and management

Environmental management strategies to mitigate and manage biodiversity impacts have been developed for the following stages of the project:

- detailed design
- construction
- operation.

These are discussed further in the following sections.

14.1.1 Detailed design phase

Impacts to matters of biodiversity conservation significance would be avoided to the greatest extent practicable during finalisation of the design and construction methodology for the project. Micrositing of the transmission line infrastructure and associated construction work sites and other areas of disturbance would occur to avoid impacts wherever practicable. Site features with the highest biodiversity conservation significance would be given the highest priority. In particular threatened species recorded and their habitat.

Where native vegetation disturbance activities are required in areas that have not been previously subject to biodiversity survey, additional survey will be carried out prior to work occurring in any such areas to inform detailed design. Priorities for additional survey would be based on: potential conservation value as identified through vegetation and habitat mapping for threatened species; and to address data gaps with regard to geographic and landform/habitat coverage. Additionally, this would potentially allow for impact reduction through field validation of conditions which have been assessed conservatively at this stage with assumed presence. These surveys would be carried out by a suitably qualified ecologist.

Opportunities to locate construction compounds and ancillary facilities in areas of limited biodiversity value (ie cleared land or areas of native vegetation with vegetation integrity scores of less than 17 where an offset is not required) would be prioritised during design refinement. Existing access tracks, waterway crossings and clearings would be used, where possible, to avoid the construction of new tracks. Where this is not possible, the design would seek to minimise impacts to native vegetation. Transmission line structures would be located and constructed to minimise impact to vegetated riparian zones wherever practicable.

A Connectivity Strategy would be developed following design refinement and pre-clearing. The core objectives of the strategy would be to outline the final location of the proposed mitigation measures (Table 14-1) identified within the BDAR.

The Connectivity Strategy would be implemented to maintain connectivity in areas identified as facilitating fauna movement (as identified in Attachment 21). Consideration of connectivity corridors would occur as a minimum at:

- key riparian crossings
- areas of the transmission line joining proposed biodiversity stewardship sites (ie Donna Valley Biodiversity Stewardship Site) and or conservation reserve estate (ie Tarlo River National Park, Bango Nature Reserve, Mudjarn Nature Reserve and Minjary National Park)
- transmission line structure locations that occur in woodland vegetation at strategic locations.

A series of 20 m wide connectivity corridors would be considered near transmission line structure locations that occur in woodland vegetation. These would occur at strategic locations that would be developed as part of a Connectivity Strategy, targeting the strategic locations (wherever practicable; as identified in Attachment 21, Section 3).

Exact locations and mapping of connectivity areas would be based on the Connectivity Strategy developed following design refinement and pre-clearing.

Any biodiversity offset credit liabilities related to retained vegetation such as the connectivity corridors would be considered in final BAM calculations (refer to Table 14-1 and Section 13.5).

The following electrical transmission industry-recognised method is proposed in regard to mitigating bird strike and EMF impacts during detailed design:

- design considerations to minimise interaction of birds with the transmission lines which might otherwise result in injury or fatality
- design considerations to minimise nesting on the transmission line structures, which might otherwise result in low-level EMF impacts to birds
- use of fauna deterrent devices, most likely consisting of the “flapper” variety. Positioning and exact diverter model is to be finalised during design refinement but at minimum these will be used within one kilometre of wetland/riverine habitats to reduce impacts on aerial fauna species from collision and allow safer passage within these areas
- in addition to these measures, under-transmission connective structures (to be developed within the Connectivity Strategy) would be considered in at least three locations across the project footprint to facilitate ongoing movement opportunities for Squirrel Glider across the project footprint (refer to Figure 13-8, and Attachment 21, Section 3).

Two CLASS 1 streams (Derringullen Creek and Gilmore Creek) have been identified as proposed indicative crossing locations (Section 13.7.1). It is recommended that waterway crossing methods are reviewed for any CLASS 1 streams during detailed design to establish the most suitable crossing method given the size of the streams and permanence of flow. Based upon the CLASS 1 rating and size of the streams, the potential for impacts to KFH and fish passage is increased at these sites. Therefore, a single span bridge structure is recommended, aligning with the recommended crossing types identified by NSW DPI Fisheries.

The complete suite of detailed design measures is detailed in Table 14-1. In addition to the development and implementation of the CEMP, specific mitigation measures have been identified for inclusion in a Biodiversity Management Plan (BMP). The proposed measures have been identified to manage both construction and operational impacts and some measures have been identified to manage impacts in a site-specific location. The location/s applicable to each mitigation measure are identified in the Table 14-1 where relevant. For construction, the BMP would set out measures to minimise and manage impacts on biodiversity. See Table 14-1 for detailed measures to be addressed in the BMP. Other specific pre-construction measures are also listed in Table 14-1.

These include preparation of:

- Supplementary Hollow and Nest Strategy to offset loss of tree hollow fauna habitat
- Connectivity Strategy.

These strategies may be prepared pre-clearing, updated and implemented on a staged basis across the project footprint, aligned with the proposed construction and clearing schedule.

14.1.2 Construction phase

The construction phase would be guided by implementation of the CEMP and related BMP as well as the Supplementary Hollow and Nest Strategy and Connectivity Strategy.

The complete suite of proposed mitigation measures during construction of the project are detailed in Table 14-1.

14.1.3 Operation phase

Transgrid would amend and/or develop and implement guidelines and procedures for operation and maintenance of the project that address the vegetation clearing and maintenance commitments in the BDAR and EIS and seek to avoid or minimise disturbance in areas of high biodiversity conservation significance (ie threatened species and communities). Relevant Transgrid operational workers and vegetation maintenance contractors would receive training regarding the operational and maintenance guidelines and procedures.

Proposed mitigation measures during operation of the project are outlined in Table 14-1.

14.2 Proposed mitigation and management measures

Proposed mitigation and management measures are documented in Table 14-1, which includes details of the matter, timing, and location for implementing each measure. The mitigation and management measures proposed have been developed based on experience on other major transmission line projects similar in nature and location, and with consideration of mitigation and management measures adopted on other linear infrastructure projects (such as roads, rail and pipelines). This includes the implementation of risk assessment processes guided by experienced construction environment professionals. As such, the proposed measures are considered likely to be effective.

Government and industry policies, guidelines and procedures have been developed to address potential impacts from major infrastructure projects. Mitigation measures carried out in accordance with these guidelines and procedures have proven to be effective on similar projects. As such, the proposed measures are considered to be proven.

Monitoring programs, inspections and independent auditing would confirm the effectiveness of these measures. Further measures would be developed and undertaken if required, including implementation of corrective and preventative actions for any actual or potential non-compliant activities.

The estimated costs of the environmental mitigation measures provided in this BDAR are considered an integral component to the project and as a result have been captured in the project capital costs. In order to confirm the effectiveness of these mitigation measures, compliance monitoring audits would be undertaken by the Environmental Representative, Transgrid, independent auditors and regulators. Audit frequency and reporting parameters would be identified in the Construction Environmental Management Plan. Independent audits would be carried out in accordance with the Independent Audit Post Approval Requirements (DPIE, 2020g).

Table 14-1: Proposed mitigation and management measures

ID	Matters	Mitigation measures	Project stage	Application location(s)	Likely efficacy
B1	Biodiversity conservation significance	Impacts to matters of biodiversity conservation significance will be avoided to the greatest extent practicable during finalisation of the design and construction methodology for the project. Micro-siting of the transmission line infrastructure and associated work sites and other areas of disturbance will occur to avoid or minimise impacts wherever practicable. Site features with the highest biodiversity conservation significance, in particular recorded threatened species, and their habitat, will be given the highest priority for impact avoidance. This will also include micro-siting to avoid or minimise prescribed impacts (as described in the BDAR) where possible (ie avoiding impact to rocky habitats or caves and waterways). Micro-siting of infrastructure requiring sub-surface work, such as transmission line structure footings, will be undertaken as part of the detailed design stage of the project, to minimise prescribed impacts where possible (ie avoiding impact to breeding habitat features, GDEs, aquatic habitats and supporting aquifers). Spatial data (refer to Attachment 12 for species polygons for species credit species) and buffered threatened species locations will be provided to the design and construction teams and considered in detailed design. Associated mapping will be included on sensitive area plans and provided to the construction workforce.	Detailed design and construction	All locations	Proven
B2	Biodiversity conservation	Where native vegetation disturbance activities are required in areas that have not been previously subject to biodiversity survey, additional survey will be carried out prior to work occurring in any such areas to inform detailed design. Priorities for additional survey will be based on potential conservation value (identified through vegetation and habitat mapping for threatened species), and geographic and landform/habitat coverage data gaps. Additional biodiversity survey will be conducted to assess the condition of vegetation where threatened species habitat has conservatively been assumed to be present). The surveys will be carried out by a suitably qualified ecologist and will allow for additional impact reduction opportunities.	Detailed design	All locations	Effective
B3	Hazard tree clearing	Opportunities for individually assessing and selectively clearing hazard trees will be considered further during detailed design to minimise impacts. Hazard tree inspections would be undertaken by an appropriately qualified arborist prior to the commencement of construction in accordance with Transgrid's Maintenance Plan – Easement and Access Tracks.	Detailed design and construction	Hazard tree zone	Effective

ID	Matters	Mitigation measures	Project stage	Application location(s)	Likely efficacy
B4	Biodiversity conservation along access tracks	Existing tracks and clearings will be used, where possible, to limit the construction of new tracks. Where this is not possible, the design will seek to minimise impacts to native vegetation, including cut and fill. Design and micro-siting of new access tracks will seek to avoid or minimise impacts to habitat trees and rocky habitats (ie rock outcrops, large boulders, piled rock, and rock features that provide potential sheltering and breeding habitat for fauna, including threatened species). Access track corridors will be established with consideration to terrain to minimise cut/fill and vegetation clearing.	Detailed design and construction	All locations	Proven
B5	Biodiversity conservation within protected areas and conservation lands	Design and micro-siting of project infrastructure including transmission line structure benches and access tracks will avoid and/or minimise impacts within protected areas (ie nature refuges) and conservation lands (ie established BioBank and Biodiversity Stewardship sites and Conservation Agreement sites) occurring within the project footprint.	Detailed design	Conservation Agreement site situated adjacent to Bago State Forest or any established BioBank and Biodiversity Stewardship sites within the project footprint	Proven
B6	Booroolong Frog habitat	Where Booroolong Frog habitats have been identified the following avoidance measures will be implemented: • avoid installing waterway crossings • avoid disturbance within 50 m of the top of bank of the waterway (including riparian vegetation). Where avoidance is not possible: • Waterway crossing designs should avoid instream structures to minimise the potential for hydrological change, erosion and sedimentation impacts of downstream environments. • Location of waterway crossings will be determined in consultation with a suitably qualified Ecologist to avoid or minimise impacts to potential habitats or ecological features. • Develop site specific erosion and sedimentation control plans to ensure the potential for erosion and sedimentation impacts are minimized as far as practicable, including monitoring the success of erosion and sediment control measures. A suitably qualified ecologist will be engaged to undertake monitoring surveys for the species at the crossing site and in downstream receiving environments, in accordance with the Biodiversity Management Plan (BMP) and in consultation with the BCD.	Detailed design and construction	Leech Gully (and associated first and second order tributaries), Gilmore Creek and Adjungbilly Creek	Effective

ID	Matters	Mitigation measures	Project stage	Application location(s)	Likely efficacy
B7	Surface water, soils and groundwater	The key measures proposed to avoid, manage and/or mitigate impacts to surface water, and groundwater and soils will involve: • Preparation of Soil and Water Management Plans (SWMPs) as part of the Construction Environmental Management Plan (CEMP) to manage water quality impacts during construction of the project. • Preparation of Erosion and Sediment Control Plans (ESCPs) by a certified professional in erosion and sediment control and Water Quality Monitoring Program (WQMP) within the SWMPs. • Consideration of appropriately designed scour protection at new stormwater management points. The SWMP will include a combination of the following plans: • ESCPs • WQMP • Excavation Dewatering Plans • Emergency Spill Plans • Unexpected Contaminants Finds Protocol . ESCPs will be developed for the activities and areas that are considered higher risk. The plans will detail the processes, responsibilities and measures to manage potential soil and water quality impacts in accordance with the principles and requirements in: • Managing Urban Stormwater – Soils and Construction, Volume 1 (Landcom, 2004) and Volumes 2A (DECC, 2008a) and Volume 2C (DECC, 2008b), commonly referred to as the 'Blue Book' • Best Practice Erosion and Sediment Control (IECA, 2008) • Guidelines for Controlled Activities on Waterfront Land (NRAR, 2018).	Detailed design and construction	All locations	Proven
B8	Riparian corridors	To the greatest extent practicable: • Transmission line structures will be located and constructed to minimise impact to vegetated riparian zones (VRZs) • The final transmission line easement will target narrow crossing points of waterways and riparian areas clear of vegetation. Shrub or ground stratum native vegetation within vegetated riparian zones will be protected to the greatest extent practicable, with vegetation clearing ideally limited to the tree stratum only, with trunk bases being retained in-situ. Where threatened species are known to occur, work methods will avoid or minimise impacts by limiting clearing wherever possible and delineating their habitat outside the final disturbance area as no-go zones.	Detailed design and construction	Transmission line corridor - within riparian corridors	Effective

ID	Matters	Mitigation measures	Project stage	Application location(s)	Likely efficacy
		Work near waterways will be undertaken to avoid impacts such as herbicide drift/overspray, erosion and damage to the banks. Riparian areas subject to disturbance will be progressively stabilised and rehabilitated.			
B9	Waterway crossing (access tracks)	The following factors will be considered during the detailed design and micro siting process for waterway crossings to minimise potential impacts to aquatic environments, wherever practicable: • Any existing crossings will be re-used or upgraded in preference to establishing new crossings. • Disturbance to waterways (bed, banks and associated riparian zones), will be avoided or minimised. • The crossing design and construction work sites will minimise disturbance to any native vegetation, including native instream, fringing, and riparian vegetation within the access track alignment. • Waterway crossings will be constructed perpendicular to the flow of the water and be positioned away from channel bends (where erosive forces are typically greatest). Preferably crossings will be located in straight stream sections with well-defined channel geometries and shallow stream gradients, in stable dry reaches. • Micro-siting will avoid direct and indirect (erosion or sedimentation) impacts to riverine features such as riffles and rapids and sensitive habitat features (ie snags, coarse woody debris, instream macrophytes, boulders). • Where instream structures are required, considerations to potential flooding and erosive effects will be made in the design and construction of the crossing.	Detailed design and construction	Transmission line corridor - access track waterway crossing	Proven
B10	Waterway crossing (access tracks)	Crossing structures will be designed so that the existing nominal flow velocity, low flow conditions and fish passage are maintained wherever possible. This will include the following considerations: • Minimise the impact of essential instream structures by mimicking natural flows (DPI, 2005b). • Following Fairfull (2013), for waterway crossings incorporating culverts, a minimum of 300 mm of water should pool through the structure, with a centrally placed low-flow cell being preferable. • In line with Cotterell (1998), it is recommended that flow over or through instream crossing structures are designed such that they maintain water velocity of 0.3 m/s or less, which is likely to facilitate passage for native species of fish (velocities exceeding 1 m/s, are likely to prevent upstream migration of native fish).	Detailed design	Transmission line corridor - access track waterway crossing	Proven
B11	Waterway crossing (access tracks)	Any sections of stream or waterway banks that are impacted or modified by the project will be reformed or remediated to resemble the pre-work condition and form wherever possible or alternatively to a stable design form, as appropriate following the completion of construction work. This may include revegetation to stabilise bank sediments.	Construction and operation	Transmission line corridor - access track waterway crossing	Proven

ID	Matters	Mitigation measures	Project stage	Application location(s)	Likely efficacy
		Waterway banks impacted by the project will be reinstated such that bank stability at the crossing location is the same or better than prior to construction. Stabilising materials such as rock armouring, hydro mulch, jute matting, or other suitable geotextile materials may be utilised where necessary. Any temporary stream crossings will be removed and rehabilitated at the completion of their operational use.			
B12	Waterway crossing (access tracks)	The need for and location of waterway crossings at identified locations (V9-14 - Derringullen Creek, V9-28 - Gilmore Creek, as well as V9-13 - Yellow Creek and V9-12) will be confirmed during detailed design by the construction contractors. This may include consultation with DPI Fisheries. Crossing design would preference a single span bridge structure at Derringullen Creek and Gilmore Creek (aligning with the recommended crossing types identified by NSW DPI Fisheries for CLASS 1 streams).	Detailed design and construction	V9-14 - Derringullen Creek, V9-28 - Gilmore Creek, V9-13 - Yellow Creek, V9-12 - unnamed stream	Effective
B13	Waterway crossing (access tracks)	In the event that any further or alternative waterway crossings are required in areas mapped as Key Fish Habitat (KFH) or indicative threatened species distribution mapping (DPI 2022a), an aquatic ecological assessment will be undertaken at the proposed crossing location. The assessment approach will be consistent with that used for the EIS and will address any potential impacts to threatened aquatic species or KFH. This assessment may be desktop based if suitable levels of information are available but may also recommend a field inspection if threatened aquatic species or sensitive aquatic habitat features are considered to have a moderate or higher likelihood of occurring, in order to guide micro-siting and design/mitigation measures to minimise impacts to aquatic environments.	Detailed design and construction	Access track waterway crossing	Effective
B14	Waterway crossing (access tracks)	In addition to standard erosion and sediment control measures, the following procedures and considerations will be incorporated into construction methodologies for waterway crossings, where appropriate and practicable: • Minimise disturbance to native vegetation, including instream, fringing and riparian vegetation within the indicative disturbance area. This may include the demarcation of areas of native vegetation to be retained during work. • In addition to standard erosion and sediment control measures, the following procedures and considerations will be incorporated into construction methodologies for waterway crossings, where appropriate and practicable: • Minimise disturbance to native vegetation, including instream, fringing and riparian vegetation within the construction footprint. This may include the demarcation of areas of native vegetation to be retained during work.	Construction	Transmission line corridor - access track waterway crossing	Effective

ID	Matters	Mitigation measures	Project stage	Application location(s)	Likely efficacy
		• Any coarse woody debris or boulders located within instream work sites will be temporarily relocated during construction and then returned to the watercourse, at locations where scour risk can be avoided. • Waterway crossing work will be constructed during no or low flow conditions and under calm weather conditions. Work will also be timed to occur outside of any locally high seasonal flow periods. • Silt curtains or coffer dams will be deployed around instream work sites where required, to protect against any impacts to water quality or indirect impacts to retained vegetation. These measures will be situated so to avoid blocking fish passage wherever practical and removed as soon as they are no longer required. • Flow diversion measures will be installed on bunded waterway crossings as appropriate or where construction during no or low flow conditions is not feasible. Flow diversion measures may include pumps to ensure that water can be moved from one side of blockages to the other, with screened inlets to prevent the entrapment of aquatic fauna and outlet structures that are designed to avoid scouring of the channel. Where waterways are bunded or flow obstructed, all obstructions to flow will need to be removed as soon as practical after watercourse crossing construction has been completed. • Appropriate erosion and sediment controls that take into account the potentially flood prone nature of the land will be employed to protect against any impacts to water quality or indirect impacts to retained vegetation. • Waterway bed and bank material excavated during construction will be stockpiled outside of the active channel and avoid riparian vegetation. Any material excavated from the bed of waterways will be stockpiled separately from other materials and returned to the waterway bed following the completion of construction work. • If the stockpiling of sediment or soil is required, it will be located as far away from waterways as practicable and managed so that it is secure against flooding and runoff to prevent any sediment entering waterways. Adequate erosion and sediment control measures will be in place to protect stockpiled sediment against runoff during rainfall or flooding. • Any coarse woody debris or boulders located within instream work sites will be temporarily relocated during construction and then returned to the watercourse, at locations where scour risk can be avoided. • Waterway crossing work will be constructed during no or low flow conditions and under calm weather conditions. Work will also be timed to occur outside of any locally high seasonal flow periods.			

ID	Matters	Mitigation measures	Project stage	Application location(s)	Likely efficacy
		• Silt curtains or coffer dams will be deployed around instream work sites where required, to protect against any impacts to water quality or indirect impacts to retained vegetation. These measures will be situated so to avoid blocking fish passage wherever practical and removed as soon as they are no longer required. • Flow diversion measures will be installed on bunded waterway crossings as appropriate or where construction during no or low flow conditions is not feasible. Flow diversion measures may include pumps to ensure that water can be moved from one side of blockages to the other, with screened inlets to prevent the entrapment of aquatic fauna and outlet structures that are designed to avoid scouring of the channel. Where waterways are bunded or flow obstructed, all obstructions to flow will need to be removed as soon as practical after watercourse crossing construction has been completed. • Appropriate erosion and sediment controls that take into account the potentially flood prone nature of the land will be employed to protect against any impacts to water quality or indirect impacts to retained vegetation. • Waterway bed and bank material excavated during construction will be stockpiled outside of the active channel and avoid riparian vegetation. Any material excavated from the bed of waterways will be stockpiled separately from other materials and returned to the waterway bed following the completion of construction work. • If the stockpiling of sediment or soil is required, it will be located as far away from waterways as practicable and managed so that it is secure against flooding and runoff to prevent any sediment entering waterways. Adequate erosion and sediment control measures will be in place to protect stockpiled sediment against runoff during rainfall or flooding. • Only excavated natural materials (ENM) or virgin excavated natural materials (VENM) will be used as fill during reclamation work, ie no contaminated material, building or demolition rubble will be used as fill in any stream crossings. • Chemicals will be stored in adequate bunding (in accordance with Australia Standard 1940 – The storage and handling of flammable and combustible liquids) as far away from streams as practicable and appropriately protected against flooding or runoff. Spill kits will be made available, and a spill response plan developed. • Plant refuelling will occur as far away from streams as possible and appropriate spill prevention measures (such as diversion bunds/cut off drains upslope and drip trays and spill kits) will be implemented when refuelling.			

ID	Matters	Mitigation measures	Project stage	Application location(s)	Likely efficacy
B15	Waterway crossing and access tracks	Regular monitoring/inspections of waterway crossing and access track conditions will be undertaken during operation. Consideration of the maintenance and inspection recommendations detailed in Fish passage in streams: Fisheries guidelines for design of stream crossings (Cotterell 1998) to inform the monitoring/inspection details are recommended. This may include monitoring/inspections following random events, eg flooding. This will review: • The crossing structures, access tracks and associated erosion and sediment control measures to determine if they are continuing to operate satisfactorily • Any maintenance requirements in order to prevent impacts to aquatic environments • Any issues that require intervention or rehabilitation eg bank erosion as a result of, or in proximity to, crossing locations.	Operation	Transmission line corridor - access track waterway crossing	Effective
B16	Connectivity strategy	As a part of the BMP, a Connectivity Strategy will be developed following design refinement and pre clearing. The core objectives of the strategy will be to outline the final location of the proposed mitigation measures identified within the BDAR. The Connectivity Strategy will be implemented to maintain connectivity in areas identified as facilitating fauna movement (as identified in Attachment 21). Consideration of connectivity corridors will occur as a minimum at: • Key riparian crossings • Areas of the transmission line joining proposed biodiversity stewardship sites (ie Donna Valley Biodiversity Stewardship Site) and or conservation reserve estate (ie Tarlo River National Park, Bango Nature Reserve, Mudjarn Nature Reserve and Minjary National Park) • Transmission line structure locations that occur in woodland vegetation at strategic locations (i.e. vegetation corridors with moderate to high landscape connectivity, and with moderate to high levels of fauna activity/ movement). The final locations of connectivity corridors and minimum width requirements will be identified as part of a Connectivity Strategy developed in consultation with BCD (as identified in Attachment 21*; Figure 13-15*). Access tracks will avoid connectivity corridors and favour existing access wherever possible. Construction will avoid and minimise any disturbance of connectivity corridors, where practicable. Connectivity measures such as fauna sensitive structures (ie under transmission glider poles), vegetation stepping stones, or reduced clearing will be considered in at least six locations within the project footprint, where gliders have been observed using the area.	Detailed design and construction	Transmission line corridor at strategic locations (as identified in Attachment 21; Figure 13-15)	Effective

ID	Matters	Mitigation measures	Project stage	Application location(s)	Likely efficacy
B17	Bird-strike	As a part of the BMP, conductor line-marking techniques will be considered at specific locations identified in the BDAR during design refinement to minimise bird strike. Use of fauna deterrent devices, most likely consisting of the "flapper" variety, will be considered. Positioning and exact diverter model will also be considered during detailed design and will be developed as part of the Connectivity Strategy. At a minimum, these will be used at sites recommended for specific corridors (refer to Attachment 21) where flapper devices are considered warranted based on distribution, and nature of avifauna records, and nearby suitable waterbird habitat (within 1 km).	Detailed design	Transmission line corridor – at sites recommended for specific corridors (as identified in Attachment 21).	Effective
B18	Biodiversity management	A BMP will be prepared in consultation with BCD and approved by DPE prior to construction. The BMP will be prepared by a qualified ecologist and include a plan for implementing, evaluating and reporting on the effectiveness of all mitigation measures outlined in the BDAR, including: • Measures to minimise impacts to biodiversity, including measures to reduce disturbance to sensitive flora and fauna procedures for clearing of vegetation, including pre-clearing inspections and procedures for the relocation of flora and fauna • Preparation of a fauna handling and rescue procedure to be implemented during construction and operation for the ethical handling of injured or displaced fauna. Further, the fauna handling and rescue procedure would include an incident reporting protocol for fauna relocations, rescue and rehabilitation, euthanasia and/or fatality. • Procedures for the demarcation and protection of retained vegetation, including vegetation adjacent to construction areas and weed management • Vegetation clearing procedures for a two staged habitat removal process required for removal of key habitat features (hollow-bearing trees, habitat trees, and bushrock) identified in the BDAR and/or pre-clearing inspection. Including procedures to record the effort and outcomes of the habitat removal process • Measures to protect retained vegetation • Measures to avoid and minimise impacts to Golden Sun Moth, Striped Legless Lizard and Pink-tailed Legless Lizard habitats within transmission line easements during construction and operation • A rehabilitation plan for Golden Sun Moth habitat temporarily disturbed during construction incorporating seeding without the use of fertiliser or clover. The plan would include a suitable mix of native C3 grasses including Wallaby grasses *Rytidosperma* spp. and Speargrasses *Austrostipa bigeniculata, A. scabra* and a low biomass dryland C4 grass (ie Redleg grass *Bothriochloa macra*). A temporary nurse crop such as sterile ryecorn could be used to stabilise the soil and suppress weeds	Detailed design and construction	All locations.	Proven

ID	Matters	Mitigation measures	Project stage	Application location(s)	Likely efficacy
		during establishment. Planting specifications and requirements for post-care, including weed control, are to be outlined in the plan. • Retention of habitat features such as rocky outcrops, surface rock, logs, wherever practicable • Habitat supplementation measures such as nest boxes, hollow re-use / creation, re-use of timber/logs as habitat within the transmission line easement where practicable. A monitoring program will also be developed to assess the efficacy of supplementary habitat measures on an ongoing basis in accordance with a Supplementary Hollow and Nest Strategy • Proposed rehabilitation of temporary disturbance areas including management and maintenance measures • Unexpected species finds protocol to be implemented if threatened ecological communities, flora and fauna species, not assessed in the BDAR, are encountered during pre-clearing inspections • A description of biosecurity protocols for plant and equipment movement between sites, including species specific measures • Education of construction teams regarding the presence of native fauna and risks of vehicle collision, particularly early in the morning and late in the afternoon/at night; implementation of speed limits on sealed and unsealed tracks and roads • Outline monitoring and compliance management requirements • Approach to relocation of nests by suitably qualified ecologist where found within construction work sites (i.e. nests found in hazardous areas will be translocated to nearby safe areas, direct handling of eggs and chicks will be avoided where possible). This could include potentially new poles/nest platforms • Details on the pre-clearing and clearing supervision process • Approach to avoid building during raptor nesting periods • Site specific monitoring of Booroolong Frog habitats within and adjacent to proposed work locations to inform appropriate construction controls and contingency measures. This plan will also the guide the re-use of hollows, logs, limbs and other habitat features encountered during clearing to be retained for placement within adjacent vegetation or on the maintained easement within shrub retention areas, in accordance with the revegetation plan. The BMP will include a program to monitor, evaluate and report on the outcomes of a biodiversity monitoring program, as relevant. The monitoring program will be developed to target specific species			

ID	Matters	Mitigation measures	Project stage	Application location(s)	Likely efficacy
		considered to be most at risk of significant impacts, as determined during the detailed design phase. The BMP will stipulate objectives for monitoring, and how baseline data will be captured and represented.			
B19	Biosecurity and hygiene protocols	A Biosecurity Management Plan will be developed as a part of the BMP, to be implemented during construction. The plan will include: • Protocols for the identification of priority weed species, relevant pests and diseases of concern, mandatory reporting obligations and management of Emergency, Control and Biosecurity zones as per the NSW Biosecurity Act 2015. • Weed and pest animal management and monitoring requirements would also be outlined within the plan where relevant. • Locations, timing and methods for removing soil and plant matter from vehicles and machinery and sourcing clean soil and materials free of contaminants for construction work. • Clean down stations (water or air, dependent on the identified biosecurity risk) will be constructed at suitable locations to clean down vehicles and employee shoes to stop the spread of weeds, pathogens (eg amphibian chytrid fungus, Phytophthora cinnamomic, exotic rust fungi and Epizootic Haematopoietic Necrosis Virus (EHNV)) and the introduction of new species. The biosecurity plan would address any Property Management Plan requirements where relevant.	Detailed design and construction	All locations	Proven
B20	Weed management	Weed control strategy during the operational stage of the project will be guided by existing Transgrid operational weed management procedures to manage existing or emerging issues.	Operation	All locations, as relevant	Effective
B21	Alternative roosting and/or nesting habitat for threatened fauna	Nest boxes will be provided for alternative roosting and/or nesting habitat for threatened fauna displaced during clearing in accordance with a Supplementary Hollow and Nest Strategy. The strategy will include the following requirements: • Survey of tree hollows and nests within the proposed clearing extents • Identify the size, type, number and location of nest boxes required based on the results of the ecological surveys and active hollow resources in adjacent areas • Appropriately sized nest boxes will be installed within the vicinity of hollow-bearing trees (subject to landowner agreement and suitable trees being present) no more than two weeks prior to clearing of the tree • Nest boxes will also include the re-use of existing hollows salvaged prior to or during clearing where practicable measures to address and manage nests (such as raptor nests) prior to clearing.	Construction	All locations where hollow bearing trees are being removed.	Effective

ID	Matters	Mitigation measures	Project stage	Application location(s)	Likely efficacy
B22	Pre-clearing survey	Pre-clearing surveys will be completed prior to clearing at each location by a suitability qualified and experienced ecologist. The proposed clearing extents will be marked out on site prior to the pre-clearing surveys. During the surveys, the ecologist will: • survey the proposed clearing extent • identify any fauna that will require relocation prior to clearing • confirm the location and mark out the extents of any biodiversity exclusion zones • confirm that hollow-bearing trees within and adjacent to the clearing extents are prominently marked/tagged • confirm that nest boxes are in place (where required) in suitable locations adjacent to areas to be cleared, or suitable locations for installation have been identified • survey and confirm the presence of raptor nests within and adjacent to the clearing extents • document, mark and record the location of threatened flora/fauna • document, mark and record other habitat features (eg rock piles) to be retained if possible. The results of the pre-clearing surveys will be used to update and confirm the accuracy of sensitive area maps.	Detailed design and construction	Transmission line corridor (at relevant sites)	Proven
B23	Biodiversity exclusion zones	Biodiversity exclusion zones for retained vegetation and threatened species habitats will be confirmed by a suitably qualified ecologist and identified as 'No disturbance' zones prior to the commencement of clearing or any site activity that could damage the vegetation within the exclusion zone. These areas will be identified as a no-go zone within approved plans and on-site demarcation will be required. High visibility protection fencing will be erected on site including signage clearly identifying these areas as no-go zones. Requirements for the protection and management of no-go zones will be addressed as a part of the site induction. Biodiversity exclusion zones will be physically marked and demarcated, and included on sensitive area maps and project GIS/GPS systems, prior to clearing. Further information regarding priorities for biodiversity exclusion zones are detailed in Section 14.	Detailed design and construction	Transmission line easement (at relevant sites)	Proven
B24	Biodiversity management training	All relevant project personnel involved in vegetation clearance, including relevant sub-contractors will be trained on biodiversity management protocols and the requirements for the project, through inductions, toolbox talks and targeted training, and provided with sensitive area maps (showing clearing boundaries and exclusion zones) and updates as required.	Construction	All locations	Effective

ID	Matters	Mitigation measures	Project stage	Application location(s)	Likely efficacy
B25	Features of high biodiversity conservation significance	Features of high biodiversity conservation significance within the operational easement, including biodiversity exclusion zones identified during construction and retained habitat for threatened species, will be recorded in Transgrid's GIS. The GIS information will be reviewed during the planning of all maintenance or other future activities that could cause disturbance.	Construction and operation	All locations, as relevant	Effective
B26	Vegetation clearing and maintenance	Update and implement existing procedures and guidelines for operation and maintenance of the project that address the following: • vegetation clearing and maintenance commitments in the BDAR and EIS • avoiding access and disturbance in biodiversity exclusion zones identified during the construction • avoiding access and disturbance in areas of high biodiversity conservation significance • avoiding maintenance of vegetation that does not need to be maintained during operation. • Provide training to relevant Transgrid operational workers and vegetation maintenance contractors regarding the operational and maintenance guidelines and procedures.	Operation	All locations	Effective
B27	Revegetation of disturbed areas	All disturbed lands/areas must be managed throughout the construction work (in accordance with the relevant Managing Urban Stormwater (Landcom, 2004) (Blue Book) or comparable best practice guidelines, including: vegetation removal, restoration, and management • stockpiling, erosion and sediment management • stabilisation / rehabilitation of disturbed lands/areas must be undertaken within suitable timeframes • temporary erosion and sediment controls must be maintained (and not removed) until rehabilitation measures are providing effective stabilisation of disturbed lands/areas. Disturbed areas (including areas not required for operation) will be stabilised/rehabilitated to a standard either: • as agreed with the landowner • in accordance with the relevant Managing Urban Stormwater (Blue Book) or comparable best practice guidelines.	Construction	All locations	Effective
B28	Vegetation clearing	Works for clearing and construction of access tracks will be carried out in such a manner that the least practicable disturbance to actual ground cover and contours is caused. Trees will be removed as close as possible to ground level and root balls will be left in situ wherever practicable. Areas of particular focus for minimising ground disturbance include the following:	Construction	Transmission line corridor - Protected Lands or waterfront land.	Effective

ID	Matters	Mitigation measures	Project stage	Application location(s)	Likely efficacy
		• Steep or Highly Erodible lands where slopes are in excess of 18 degrees from the horizontal. • Protected Riparian Land (PRL) defined as land within 20 m of the bed or bank of a prescribed stream. Generally, named watercourses are classed as protected riparian land; however, some unnamed watercourses may be classed as protected riparian land. • Waterfront land (40 m from the top of bank) • In areas where large rock outcrops are prevalent on the easement. Hazard trees identified from the LiDAR assessment will be flagged for removal, and any adjacent and important habitat trees and features identified for retention will be clearly marked and included in maps within the CEMP to avoid disturbance during the felling activities.			
B29	Re-use of felled timber	Logs and tree hollows that could provide fauna habitat (the total length of wood at least 10 cm in diameter and at least 0.5 m long) will be relocated to adjacent woodland and/or suitable woodland locations where available/feasible. The opportunity to stockpile and supply felled trees for KFH rehabilitation or improvement work will be discussed with DPI Fisheries. Trees within the boundaries of State forests, Crown Lands, Travelling Stock Reserves, public roads or within 40 m of the bank of any river will be disposed of strictly in accordance with the requirements of the appropriate authorities. These requirements will be determined by the contractors before carrying out such work.	Construction	Transmission line corridor	Effective
B30	Access track construction	Access tracks will be used as necessary for the construction work and as far as is practicable, vehicle traffic shall be confined to these tracks. Track construction will be carried out to cause minimum disturbance to soil and vegetation both on and adjacent to the track. Tracks will be routed to follow the natural contour of the land as far as practicable to minimise the amount of cut and fill and soil disturbance. For any temporary access tracks, the disturbed surfaces and formed areas will be revegetated in accordance with the approved CEMP or *Managing Urban Stormwater: Soils and Construction - Volume 2C Unsealed Roads* (DECC, 2008a). In addition, other erosion control mechanisms will be put in place during the initial track construction work to contain any sediment that may erode from the disturbed surfaces.	Construction	Transmission line corridor, construction compounds, accommodation facility	Effective
B31	Light	Directional lighting will be used for any permanent lighting required (ie substation) to minimise light spill as much as possible in accordance with Australian standard AS4282:2019.	Detailed design and construction	All locations	Effective

ID	Matters	Mitigation measures	Project stage	Application location(s)	Likely efficacy
		Artificial lighting required during construction will be directed towards the work site and minimise light spill, to the extent practicable.			
B32	SAII entities	Impacts to SAII entities are to be addressed through the following measures: • Additional surveys scheduled for completion in spring 2023 to confirm presence/ absence within habitat areas where species presence is assumed. • Route refinement and design avoidance during the detailed design to avoid and minimise impacts wherever practicable. Design refinements have been identified and will be incorporated into the project design where practicable to avoid impacts to the following four SAII entities: • *Glycine latrobeana* • *Diuris ochroma* • *Prasophyllum innubum* • *Pterostylis oreophila.*	Detailed design	All locations	Effective

15. Offset requirements

This chapter details offset requirements necessary to address any residual biodiversity impacts associated with the project in accordance with Section 9 and 10 of the BAM (DPIE, 2020a).

A summary of the ecosystem credit requirement for the project are provided below. The credit report is provided in Attachment 20. Credits have been calculated and displayed for direct impacts within each IBRA subregion.

15.1 Offsets for direct impacts

15.1.1 Ecosystem credits

The total ecosystem credit offset requirement, as determined using the BAM-C (version 61), for unavoidable impacts on native vegetation is summarised in Table 15-1 and detailed for each IBRA subregion in Table 15-2 to Table 15-7. The full credit reports for each subregion, including like-for-like trading options, provided in Attachment 20.

Table 15-1: Summary of ecosystem credits for the project

PCT	PCT name	TEC	BUN		CRO		MUR		INL		BON		SNO		Total	
			Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem creditst	Total clearing (ha)	Total credits
5	River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains	-	-	-	-	-	-	-	2.59	27	-	-	-	-	**2.59**	**27**
266	White Box grassy woodland	White Box Yellow Box Blakely's Red Gum Woodland	-	-	-	-	3.01	8	32.73	311	-	-	-	-	**35.74**	**319**
268	White Box - Blakely's Red Gum - Long-leaved Box - Norton's Box - Red Stringybark grass-shrub woodland on shallow soils on hills	White Box Yellow Box Blakely's Red Gum Woodland	-	-	-	-	-	-	16.88	509	-	-	-	-	**16.88**	**509**
277	Blakely's Red Gum - Yellow Box grassy tall woodland	White Box Yellow Box Blakely's Red Gum Woodland	-	-	-	-	-	-	70.06	1129	-	-	-	-	**70.06**	**1129**
278	Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest	White Box Yellow Box Blakely's Red Gum Woodland	-	-	-	-	0.05	0	13.59	128	-	-	-	-	**13.64**	**128**
280	Red Stringybark - Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland	White Box Yellow Box Blakely's Red Gum Woodland	-	-	1.76	31	13.62	95	42.94	723	-	-	-	-	**58.32**	**849**

PCT	PCT name	TEC	BUN		CRO		MUR		INL		BON		SNO		Total	
			Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem creditst	Total clearing (ha)	Total credits
283	Apple Box - Blakely's Red Gum moist valley and footslopes grass-forb open forest	White Box Yellow Box Blakely's Red Gum Woodland	0.4	9	3.16	44	1.58	49	-	-	-	-	-	-	**5.14**	**102**
285	Broad-leaved Sally grass - sedge woodland on valley flats and swamps	-	-	-	-	-	-	-	-	-	0.74	9	-	-	**0.74**	**9**
287	Long-leaved Box - Red Box - Red Stringybark mixed open forest	-	-	-	-	-	1.24	21	1.16	16	-	-	-	-	**2.4**	**37**
290	Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills	-	-	-	-	-	-	-	5.47	66	-	-	-	-	**5.47**	**66**
294	Norton's Box - Red Box - White Box tussock grass open forest	-	-	-	-	-	-	-	0.04	1	-	-	-	-	**0.04**	**1**
295	Robertson's Peppermint - Broad-leaved Peppermint - Norton's Box - stringybark shrub-fern open forest	-	-	-	-	-	-	-	-	-	1.78	29	-	-	**1.78**	**29**

PCT	PCT name	TEC	BUN		CRO		MUR		INL		BON		SNO		Total	
			Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem creditst	Total clearing (ha)	Total credits
296	Brittle Gum - peppermint open forest of the Woomargama to Tumut region	-	-	-	-	-	-	-	-	-	0.02	1	-	-	**0.02**	**1**
297	Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills	-	-	-	-	-	-	-	1.08	11	-	-	-	-	**1.08**	**11**
299	Riparian Ribbon Gum - Robertson’s Peppermint - Apple Box riverine very tall open forest	-	-	-	-	-	-	-	1.42	5	2.62	27	-	-	**4.04**	**32**
300	Ribbon Gum - Narrow-leaved (Robertson’s) Peppermint montane fern - grass tall open forest on deep clay loam soils	-	-	-	-	-	-	-	-	-	-	-	23.83	373	**23.83**	**373**
301	Drooping Sheoke - Ricinocarpus bowmannii - grasstree tall open shrubland of the Coolac - Tumut Serpentinite Belt	Coolac-Tumut Serpentinite Shrubby Woodland	-	-	-	-	-	-	1.42	28	-	-	-	-	**1.42**	**28**
306	Red Box - Red Stringybark - Norton’s Box hill heath shrub - tussock grass open forest of the Tumut region	-	-	-	-	-	-	-	6.69	58	-	-	-	-	**6.69**	**58**

PCT	PCT name	TEC	BUN		CRO		MUR		INL		BON		SNO		Total	
			Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem creditst	Total clearing (ha)	Total credits
314	Apple Box - Red Stringybark basalt scree open forest in the upper Murray River region	-	-	-	-	-	-	-	23.5	393	-	-	-	-	**23.5**	**393**
316	Norton's Box - Red Box - Red Stringybark +/- Nodding Flax Lily forb-grass open forest	-	-	-	-	-	-	-	12.93	292	-	-	-	-	**12.93**	**292**
319	Tumbledown Red Gum - White Cypress Pine hill woodland	-	-	-	-	-	-	-	1.32	22	-	-	-	-	**1.32**	**22**
322	Inland Scribbly Gum - Red Stringybark - Black Cypress Pine hillslope shrub-tussock grass open forest	-	-	-	-	-	0.52	14	-	-	-	-	-	-	**0.52**	**14**
335	Tussock grass - sedgeland fen - - rushland - reedland wetland in impeded creeks in valleys in the upper slopes sub-region of the NSW South-Western Slopes Bioregion	-	-	-	0.61	26	-	-	-	-	-	-	-	-	**0.61**	**26**
343	Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates in the Tarcutta - Gundagai region	-	-	-	-	-	-	-	5.7	51	-	-	-	-	**5.7**	**51**

PCT	PCT name	TEC	BUN		CRO		MUR		INL		BON		SNO		Total	
			Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem creditst	Total clearing (ha)	Total credits
349	Inland Scribbly Gum - Red Stringybark open forest on hills composed of silicous substrates	-	-	-	-	-	2.95	46	-	-	-	-	-	-	**2.95**	**46**
351	Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest	-	-	-	-	-	3.5	71	-	-	-	-	-	-	**3.5**	**71**
352	Red Stringybark - Blakely's Red Gum hillslope open forest on meta-sediments in the Yass - Boorowa - Crookwell region	White Box Yellow Box Blakely's Red Gum Woodland	-	-	-	-	3.47	35	4.19	11	-	-	-	-	**7.66**	**46**
638	Alpine Ash - Mountain Gum moist shrubby tall open forest of montane areas	-	-	-	-	-	-	-	-	-	-	-	30.55	377	**30.55**	**377**
679	Black Sallee - Snow Gum low woodland of montane valleys, South-Eastern Highlands Bioregion and Australian Alps Bioregion	Monaro Tableland Cool Temperate Grassy Woodland	-	-	0.55	17	-	-	-	-	-	-	-	-	**0.55**	**17**
		-	-	-	-	-	-	-	-	-	-	-	3.6	56	**3.6**	**56**

PCT	PCT name	TEC	BUN		CRO		MUR		INL		BON		SNO		Total	
			Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem creditst	Total clearing (ha)	Total credits
727	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest	-	-	-	3.32	59	-	-	-	-	-	-	-	-	**3.32**	**59**
731	Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills	-	-	-	6.63	143	0.47	15	1.44	14	-	-	-	-	**8.54**	**172**
870	Grey Gum - Thin-leaved Stringybark grassy woodland	-	1.69	40	-	-	-	-	-	-	-	-	-	-	**1.69**	**40**
939	Montane wet heath and bog of the eastern tablelands	Montane Peatlands and Swamps	-	-	-	-	-	-	-	-	-	-	0.56	13	**0.56**	**13**
952	Mountain Gum - Narrow-leaved Peppermint - Snow Gum dry shrubby open forest on undulating tablelands	Tableland Basalt Forest	-	-	3.08	16	-	-	-	-	-	-	-	-	**3.08**	**16**
953	Mountain Gum - Snow Gum - Broad-leaved Peppermint shrubby open forest of montane ranges	Tableland Basalt Forest	-	-	-	-	-	-	-	-	33.68	579	-	-	**33.68**	**579**

PCT	PCT name	TEC	BUN		CRO		MUR		INL		BON		SNO		Total	
			Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem creditst	Total clearing (ha)	Total credits
		-	-	-	-	-	-	-	-	-	-	-	86.5	1482	**86.5**	**1482**
1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest	-	3.22	101	12.07	211	12.87	339	-	-	-	-	-	-	**28.16**	**651**
1097	Ribbon Gum - Narrow-leaved Peppermint grassy open forest on basalt plateaux	Tableland Basalt Forest	0.35	1	-	-	-	-	-	-	-	-	-	-	**0.35**	**1**
1107	River Peppermint - Narrow-leaved Peppermint open forest on sheltered escarpment slopes	Tableland Basalt Forest	0.31	11	-	-	-	-	-	-	-	-	-	-	**0.31**	**11**
1150	Silvertop Ash - Blue-leaved Stringybark shrubby open forest on ridges	-	12.19	166	-	-	-	-	-	-	-	-	-	-	**12.19**	**166**
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	-	-	-	10.81	375	-	-	-	-	-	-	-	-	**10.81**	**375**

PCT	PCT name	TEC	BUN		CRO		MUR		INL		BON		SNO		Total	
			Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem credits	Clearing (ha)	Ecosystem creditst	Total clearing (ha)	Total credits
1191	Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes	Monaro Tableland Cool Temperate Grassy Woodland	-	-	1.15	0	-	-	-	-	-	-	-	-	**1.15**	**0**
		-	-	-	-	-	-	-	0.14	3	-	-	-	-	**0.14**	**3**
1196	Snow Gum - Mountain Gum shrubby open forest of montane areas	-	-	-	-	-	-	-	-	-	-	-	31.68	473	**31.68**	**473**
1224	Sub-alpine dry grasslands and heathlands of valley slopes	-	-	-	-	-	-	-	-	-	-	-	0.25	8	**0.25**	**8**
1256	Tableland swamp meadow on impeded drainage sites	Montane Peatlands and Swamps	-	-	0.19	3	-	-	-	-	-	-	-	-	**0.19**	**3**
1330	Yellow Box - Blakely’s Red Gum grassy woodland on the tablelands	White Box Yellow Box Blakely's Red Gum Woodland	16.01	373	33.5	537	54.83	916	-	-	-	-	-	-	**104.34**	**1826**
Total			**34.17**	**701**	**76.83**	**1462**	**98.11**	**1,609**	**245.29**	**3,798**	**38.84**	**645**	**176.97**	**2782**	**670.21**	**10,997**

Table 15-2: Ecosystem credits for the Bungonia IBRA subregion

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Scores	VI loss	Ecosystem credits
283	Apple Box - Blakely's Red Gum moist valley and footslopes grass-forb open forest	Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 0.14	26	TCZ - 26	TCZ - 2
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.23	39.6	TCZ - 39.6	TCZ - 6
					ECZ - 0.03		ECZ - 28.3	ECZ - 1
					HTZ - nil		N/A	N/A
Total PCT 283								9
870	Grey Gum - Thin-leaved Stringybark grassy woodland	Very high	No associated TEC	>100	TCZ - 0.81	81.3	TCZ - 81.3	TCZ - 25
					ECZ - 0.65		ECZ - 57.7	ECZ - 14
					HTZ - 0.23		HTZ - 14.4	HTZ - 1
Total PCT 870								40
1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest	Low	No associated TEC	>100	TCZ - 0.22	37.4	TCZ - 37.4	TCZ - 4
					ECZ - 0.08		ECZ - 33	ECZ - 1
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.57	53.2	TCZ - 53.2	TCZ - 13
					ECZ - 0.01		ECZ - 42.2	ECZ - 1
					HTZ - nil		N/A	N/A
		High		>100	TCZ - 0.22	73.3	TCZ - 73.3	TCZ - 7
					ECZ - 0.06		ECZ - 51.8	ECZ - 1
					HTZ - 0.1		HTZ - 5.3	HTZ - 1
		Very High		>100	TCZ - 1.93	83.6	TCZ - 83.6	TCZ - 71
					ECZ - 0.01		ECZ - 69.9	ECZ - 1
					HTZ - 0.02		HTZ - 25.5	HTZ - 1
Total PCT 1093								101
1097	Ribbon Gum - Narrow-leaved Peppermint grassy open forest on basalt plateaux	Very Low	Tableland Basalt Forest	>100	TCZ - 0.3	13.4	TCZ - 13.4	TCZ - 0
					ECZ - 0.02		ECZ - 13.4	ECZ - 0
					HTZ - nil		N/A	N/A
				<5	TCZ - nil		N/A	N/A
					ECZ - 0.02		ECZ -13.4	ECZ - 0
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.01	52.5	TCZ - 52.5	TCZ - 1
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
Total PCT 1097								1

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Scores	VI loss	Ecosystem credits
1107	River Peppermint - Narrow-leaved Peppermint open forest on sheltered escarpment slopes	High	Tableland Basalt Forest	>100	TCZ - 0.3	65	TCZ - 65	TCZ - 10
					ECZ - nil		N/A	N/A
					HTZ - 0.01		HTZ -7.8	HTZ - 1
Total PCT 1107								11
1150	Silvertop Ash - Blue-leaved Stringybark shrubby open forest on ridges	Very Low	No associated TEC	>100	TCZ - 0.22	4.8	TCZ - 4.8	TCZ - 0
					ECZ - 0.06		ECZ - 2.1	ECZ - 0
					HTZ - nil		N/A	N/A
		Low		>100	TCZ - 0.09	26.5	TCZ - 26.5	TCZ - 1
					ECZ - 0.14		ECZ - 24.2	ECZ - 1
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.32	37.7	TCZ - 37.7	TCZ - 5
					ECZ - 0.3		ECZ - 27.3	ECZ - 3
					HTZ - 0.05		HTZ - 3.2	HTZ - 1
		High		>100	TCZ - 6.25	45.2	TCZ - 45.2	TCZ - 106
					ECZ - 3.64		ECZ - 34.8	ECZ - 48
					HTZ - 1.12		HTZ - 0	HTZ - 1
Total PCT 1150								166
1330	Yellow Box - Blakely's Red Gum grassy woodland on the tablelands	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	<5	TCZ - nil	1.1	TCZ - 0	N/A
					ECZ - 0.02		ECZ - 0.5	ECZ - 0
					HTZ - nil		N/A	N/A
		Low		>100	TCZ - 14.39	34.2	TCZ - 34.2	TCZ - 307
					ECZ - 0.29		ECZ - 4.7	ECZ - 1
					HTZ - 0.02		HTZ - 0.9	HTZ - 1
		Very high		>100	TCZ - 1.2	81.2	TCZ - 81.2	TCZ - 61
					ECZ - 0.05		ECZ - 57.4	ECZ - 2
					HTZ - 0.04		HTZ - 16.8	HTZ - 1
Total PCT 1330								373
Total					**34.17**	-	-	**701**

Table 15-3: Ecosystem credits for the Crookwell IBRA subregion

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Scores	VI loss	Ecosystem credits
280	Red Stringybark - Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland	Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 0.03	10.4	TCZ - 10.4	TCZ - 0
					ECZ - 0.09		ECZ - 4.9	ECZ - 0
					HTZ - 0.02		HTZ - 0	HTZ - 0
		Moderate		>100	TCZ - 0.65	42	TCZ - 42	TCZ - 17
					ECZ - 0.67		ECZ - 27.6	HTZ - 12
					HTZ - 0.22		HTZ - 11.6	ECZ - 2
Total PCT 280								31
283	Apple Box - Blakely's Red Gum moist valley and footslopes grass-forb open forest	Very low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 1.83	2.2	TCZ - 2.2	TCZ - 0
					ECZ - 0.02		ECZ - 0.9	ECZ -0
					HTZ - nil		N/A	N/A
		Low		>100	TCZ - 0.01	75.7	TCZ - 75.7	TCZ - 1
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.16	61.7	TCZ - 61.7	TCZ - 6
					ECZ - 0.24		ECZ - 34.2	ECZ - 5
					HTZ - 0.05		HTZ - 18.2	HTZ - 1
		High		>100	TCZ - 0.42	79.8	TCZ - 79.8	TCZ - 21
					ECZ - 0.31		ECZ - 45.9	ECZ - 9
					HTZ - 0.12		HTZ - 7.2	HTZ - 1
Total PCT 283								44
335	Tussock grass - sedgeland fen - rushland - reedland wetland in impeded creeks in valleys	High	No associated TEC	>100	TCZ - 0.61	84.4	TCZ - 84.4	TCZ - 26
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
Total PCT 335								26
679	Black Sallee - Snow Gum low woodland of montane valleys	Low	Monaro Tableland Cool Temperate Grassy Woodland	>100	TCZ - 0.33	54.4	TCZ - 54.4	TCZ - 11
					ECZ - 0.05		ECZ - 21.2	ECZ -1
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - nil	41.8	N/A	N/A
					ECZ - 0.1		ECZ - 16.8	ECZ -1
					HTZ - 0.01		HTZ - 0	HTZ -1
		High		>100	TCZ - nil	65.5	N/A	N/A

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Scores	VI loss	Ecosystem credits
					ECZ -0.05		ECZ -62.1	ECZ -2
					HTZ - 0.01		HTZ -17.5	HTZ -1
Total PCT 679								17
727	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest	Very Low	No associated TEC	>100	TCZ - 1.25	10.4	TCZ - 10.5	TCZ - 0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.53	50.3	TCZ - 50.3	TCZ - 12
					ECZ - 0.16		ECZ - 42.3	ECZ -3
					HTZ - 0.04		N/A	N/A
				<5	TCZ -0.09		TCZ -50.3	TCZ - 2
					ECZ -0.16		ECZ -42.3	ECZ - 3
					HTZ - 0.04		HTZ - 3.9	HTZ - 1
		Very High		>100	TCZ - 0.82	86	TCZ - 86	TCZ - 31
					ECZ - 0.2		ECZ - 65.6	ECZ - 6
					HTZ - 0.07		HTZ -20.2	HTZ - 1
Total PCT 727								59
731	Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills	Low	No associated TEC	>100	TCZ - 2.39	18.7	TCZ - 18.7	TCZ - 22
					ECZ - 0.01		ECZ - 11	ECZ - 1
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 1.53	68.3	TCZ - 68.3	TCZ - 52
					ECZ - 1.78		ECZ - 48.5	ECZ - 43
					HTZ - 0.27		HTZ - 0.6	HTZ - 1
		High		>100	TCZ - 0.52	81.8	TCZ - 81.8	TCZ - 21
					ECZ - 0.06		ECZ - 66.2	ECZ -2
					HTZ - 0.07		HTZ - 22.8	HTZ -1
Total PCT 731								143
952	Mountain Gum - Narrow-leaved Peppermint - Snow Gum dry shrubby open forest on undulating tablelands	Very Low	Tableland Basalt Forest in the Sydney Basin and South-Eastern Highlands Bioregions	>100	TCZ - 2.28	5.7	TCZ - 5.7	TCZ - 0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Low		>100	TCZ - 0.31	40.8	TCZ - 40.8	TCZ - 6
					ECZ - 0.08		ECZ - 35	ECZ - 1
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.33	45.2	TCZ - 45.2	TCZ - 7
					ECZ - 0.08		ECZ - 37.8	ECZ - 2
					HTZ - nil		N/A	N/A
Total PCT 952								16
1093		Very Low		>100	TCZ - 2.19	5.2	TCZ - 5.2	TCZ - 0

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Scores	VI loss	Ecosystem credits
	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands		No associated TEC		ECZ - 0.1		ECZ - 2.3	ECZ - 0
	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands		No associated TEC		HTZ - 0.01		HTZ - 0	HTZ - 0
	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands	Low	No associated TEC	>100	TCZ - 1.95	33.4	TCZ - 33.4	TCZ - 28
	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands	Low	No associated TEC	>100	ECZ - 0.1	33.4	ECZ - 28	ECZ - 1
	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands	Low	No associated TEC	>100	HTZ - 0.09	33.4	HTZ - 1.2	HTZ - 1
	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands	Low	No associated TEC	<5	TCZ - nil	33.4	N/A	N/A
	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands	Low	No associated TEC	<5	ECZ - 0.01	33.4	ECZ -28	ECZ - 1
	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands	Low	No associated TEC	<5	HTZ - nil	33.4	N/A	N/A
	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands	Moderate	No associated TEC	>100	TCZ - 0.26	53.2	TCZ - 53.2	TCZ - 6
	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands	Moderate	No associated TEC	>100	ECZ - 0.24	53.2	ECZ - 42.2	ECZ - 4
	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands	Moderate	No associated TEC	>100	HTZ - 0.02	53.2	HTZ - 2.5	HTZ - 1
	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands	Moderate	No associated TEC	<5	TCZ -0.03	53.2	TCZ - 53.2	TCZ - 1
	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands	Moderate	No associated TEC	<5	ECZ - nil	53.2	N/A	N/A
	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands	Moderate	No associated TEC	<5	HTZ - nil	53.2	N/A	N/A
	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands	High	No associated TEC	>100	TCZ - 2.99	73.3	TCZ - 73.3	TCZ - 96
	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands	High	No associated TEC	>100	ECZ - 3.1	73.3	ECZ - 51.8	ECZ - 70
	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands	High	No associated TEC	>100	HTZ - 0.98	73.3	HTZ - 5.3	HTZ - 2
Total PCT 1093								211
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	Very Low	No associated TEC	>100	TCZ - 0.02	4.6	TCZ - 4.6	TCZ - 0
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	Very Low	No associated TEC	>100	ECZ - 0.08	4.6	ECZ - 2.1	ECZ - 0
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	Very Low	No associated TEC	>100	HTZ - nil	4.6	N/A	N/A
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	Low	No associated TEC	>100	TCZ - 0.28	25.6	TCZ - 25.6	TCZ - 4
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	Low	No associated TEC	>100	ECZ - 0.09	25.6	ECZ - 23.4	ECZ - 1
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	Low	No associated TEC	>100	HTZ - 0.09	25.6	HTZ - 1.4	HTZ - 1
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	Moderate	No associated TEC	>100	TCZ - 0.23	48.4	TCZ - 48.4	TCZ - 7
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	Moderate	No associated TEC	>100	ECZ - 0.54	48.4	ECZ - 43.6	ECZ - 15
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	Moderate	No associated TEC	>100	HTZ - 0.13	48.4	HTZ - 37.2	HTZ - 3
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	High	No associated TEC	>100	TCZ - 1.24	77.1	TCZ - 77.1	TCZ - 60
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	High	No associated TEC	>100	ECZ - 2.57	77.1	ECZ - 58.4	ECZ - 94
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	High	No associated TEC	>100	HTZ - 0.66	77.1	HTZ - 23.6	HTZ - 10
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	Very High	No associated TEC	>100	TCZ - 1.18	81.4	TCZ - 81.4	TCZ - 60
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	Very High	No associated TEC	>100	ECZ - 2.75	81.4	ECZ - 60.6	ECZ -104
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	Very High	No associated TEC	>100	HTZ - 0.95	81.4	HTZ - 26.5	HTZ - 16
Total PCT 1151								375
1191	Snow Gum - Candle Bark woodland on	Low	Monaro Tableland Cool	>100	TCZ - 1.14	5.6	TCZ - 5.6	TCZ - 0

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Scores	VI loss	Ecosystem credits
	broad valley flats of the tablelands and slopes		Temperate Grassy Woodland		ECZ - 0.01		ECZ - 5.2	ECZ - 0
					HTZ - nil		N/A	N/A
Total PCT 1191								0
1256	Tableland swamp meadow on impeded drainage sites	Low	Montane Peatlands and Swamps	>100	TCZ - 0.16	27.8	TCZ - 27.8	TCZ - 2
					ECZ - 0.03		ECZ - 0	ECZ - 1
					HTZ - nil		N/A	N/A
Total PCT 1256								3
1330	Yellow Box - Blakely's Red Gum grassy woodland on the tablelands	Very low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 15.26	1.1	TCZ - 1.1	TCZ - 0
					ECZ - 0.3		ECZ - 0.5	ECZ - 0
					HTZ - 0.04		HTZ - 0	HTZ - 0
				25-100	TCZ - 2.15		TCZ - 1.1	TCZ - 0
					ECZ -0.02		ECZ - 0.5	ECZ - 0
					HTZ - 0.02		HTZ - 0	HTZ - 0
		Low		>100	TCZ - 7.79	53.4	TCZ -53.4	TCZ - 260
					ECZ - 1.91		ECZ - 40.1	ECZ - 48
					HTZ - 0.18		HTZ - 25.3	HTZ - 3
				<5	TCZ - 0.01		TCZ - 53.4	TCZ - 1
					ECZ - 0.13		ECZ - 40.1	ECZ - 3
					HTZ - 0.01		HTZ - 25.3	HTZ - 1
		High		>100	TCZ - 2.18	81.1	TCZ - 81.8	TCZ - 110
					ECZ - 2.81		ECZ - 60.9	ECZ - 107
					HTZ - 0.69		HTZ - 9.2	HTZ - 4
Total PCT 1330								537
Total					**76.83**	-	-	**1462**

Table 15-4: Ecosystem credits for the Murrumbateman IBRA subregion

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Score	VI loss	Ecosystem credits
266	White Box grassy woodland	Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 2.59	4.3	TCZ - 4.3	TCZ - 0
					ECZ - 0.09		ECZ - 1.9	ECZ - 0
					HTZ - nil		N/A	N/A
				<5	TCZ - 0.04		TCZ - 4.3	TCZ - 0
					ECZ - 0.03		ECZ - 1.9	ECZ - 0
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.25	47.8	TCZ - 47.8	TCZ - 7
					ECZ - 0.01		ECZ - 26.2	ECZ - 1
					HTZ - nil		N/A	N/A
Total PCT 266								8
278	White Box grassy woodland	Very low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 0.05	2.2	TCZ - 2.2	TCZ - 0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
Total PCT 278								0
280	Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 0.34	5.2	TCZ - 5.2	TCZ - 0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Low		>100	TCZ - 9.6	7.9	TCZ - 7.9	TCZ - 0
					ECZ - 0.1		ECZ - 3.7	ECZ - 0
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 1.34	32.7	TCZ - 32.7	TCZ - 27
					ECZ - 0.11		ECZ - 29.3	ECZ - 2
					HTZ - 0.04		HTZ - 25.7	HTZ - 1
				<5	TCZ -0.19		TCZ - 32.7	TCZ - 4
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		High		>100	TCZ - 1.03	62.1	TCZ - 62.1	TCZ - 40
					ECZ - 0.72		ECZ - 42.5	ECZ - 19
					HTZ - 0.15		HTZ - 16.5	HTZ - 2
Total PCT 280								95
283	Apple Box - Blakely's Red Gum moist valley and footslopes grass-forb open forest	Moderate	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 0.07	61.7	TCZ - 61.7	TCZ - 3
					ECZ - 0.05		ECZ - 34.2	ECZ - 1
					HTZ - nil		N/A	N/A
		High		>100	TCZ - 0.11	48.2	TCZ - 48.2	TCZ - 3
					ECZ - 0.1		ECZ - 26.9	ECZ - 2

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Score	VI loss	Ecosystem credits
					HTZ - 0.02		HTZ - 17.2	HTZ - 1
		Very High		>100	TCZ - 0.28	78.9	TCZ - 78.9	TCZ - 14
					ECZ - 0.74		ECZ - 50.3	ECZ - 23
					HTZ - 0.21		HTZ - 11.9	HTZ - 2
Total PCT 283								49
287	Long-leaved Box - Red Box - Red Stringybark mixed open forest	Very Low	No associated TEC	>100	TCZ - 0.14	14.3	TCZ - 14.3	TCZ - 0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Low		>100	TCZ - 0.64	26.9	TCZ - 26.9	TCZ - 8
					ECZ - 0.02		ECZ - 23.1	ECZ - 1
					HTZ - nil		N/A	N/A
				<5	TCZ - 0.01		TCZ -26.9	TCZ - 1
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		High		>100	TCZ - 0.42	56.5	TCZ - 56.5	TCZ - 10
					ECZ - 0.01		ECZ - 45.4	ECZ - 1
					HTZ - nil		N/A	N/A
Total PCT 287								21
322	Inland Scribbly Gum - Red Stringybark - Black Cypress Pine hillslope shrub-tussock grass open forest	Very Low	No associated TEC	>100	TCZ - 0.01	3.3	TCZ - 3.3	TCZ - 0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		High		>100	TCZ - 0.39	75.7	TCZ - 75.7	TCZ - 11
					ECZ - 0.09		ECZ - 52.2	ECZ - 2
					HTZ - 0.03		HTZ - 24	HTZ - 1
Total PCT 322								14
349	Inland Scribbly Gum - Red Stringybark open forest on hills composed of silicous substrates	Low	No associated TEC	>100	TCZ -0.83	10.4	TCZ - 10.4	TCZ - 0
					ECZ - 0.01		ECZ - 8.6	ECZ - 0
					N/A		N/A	N/A
		Moderate		>100	TCZ - 0.75	46.3	TCZ - 46.3	TCZ - 15
					ECZ - 0.03		ECZ - 36.6	ECZ - 1
					HTZ - nil		N/A	N/A
				5 - 25	TCZ - 0.69		TCZ - 46.3	TCZ - 14
					ECZ - 0.16		ECZ -36.6	ECZ - 3
					HTZ - 0.07		HTZ - 0.2	HTZ - 1

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Score	VI loss	Ecosystem credits
		High		>100	TCZ - 0.19	77.6	TCZ - 77.6	TCZ - 6
					ECZ - 0.19		ECZ - 59.1	ECZ - 5
					HTZ - 0.03		HTZ -16.3	HTZ - 1
Total PCT 349								46
351	Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest	Very Low	No associated TEC	>100	TCZ - 0.33	10.8	TCZ - 10.8	TCZ - 0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Low		>100	TCZ - 0.41	33.6	TCZ - 33.6	TCZ - 6
					ECZ - 0.04		ECZ - 31	ECZ - 1
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 2.27	56.7	TCZ - 56.7	TCZ - 56
					ECZ - 0.31		ECZ - 48.5	ECZ - 7
					HTZ - 0.14		HTZ - 17.3	HTZ - 1
Total PCT 351								71
352	Red Stringybark - Blakely's Red Gum hillslope open forest on meta-sediments in the Yass - Boorowa - Crookwell region	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 1.6	8.2	TCZ - 8.2	TCZ - 0
					ECZ - 0.03		ECZ - 7.1	ECZ - 0
					HTZ - 0.03		HTZ - 0	HTZ - 0
		Low		>100	TCZ - 0.24	18.2	TCZ - 18.2	TCZ - 3
					ECZ - 0.14		ECZ - 9.9	ECZ - 1
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 0.72	38.3	TCZ - 38.3	TCZ - 17
					ECZ - 0.65		ECZ - 32.8	ECZ - 13
					HTZ - 0.06		HTZ - 16.1	HTZ -1
Total PCT 352								35
731	Broad-leaved Peppermint - Red Stringybark grassy open forest	High	No associated TEC	>100	TCZ - 0.35	69.5	TCZ - 69.5	TCZ - 12
					ECZ - 0.1		ECZ - 41.9	ECZ - 2
					HTZ - 0.02		HTZ - 4.5	HTZ - 1
Total PCT 731								15
1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest	Very Low	No associated TEC	>100	TCZ - 0.05	5.2	TCZ - 5.2	TCZ - 0
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Low		>100	TCZ - 0.67	26.4	TCZ - 26.4	TCZ - 8
					ECZ - 0.07		ECZ - 21	ECZ - 1
					HTZ - 0.06		HTZ - 3	HTZ - 1

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Score	VI loss	Ecosystem credits
		Moderate		>100	TCZ - 1.64	66.8	TCZ - 66.8	TCZ - 48
					ECZ - 1.07		ECZ - 43.9	ECZ - 21
					HTZ - 0.22		HTZ - 10.6	HTZ - 1
		High		>100	TCZ - 2.21	83.6	TCZ - 83.6	TCZ - 81
					ECZ - 3.06		ECZ - 66	ECZ - 88
					HTZ - 0.68		HTZ - 26.2	HTZ - 8
		Very High		>100	TCZ - 1.5	76.5	TCZ - 76.5	TCZ - 50
					ECZ - 1.05		ECZ - 60	ECZ - 28
					HTZ - 0.59		HTZ - 14.2	HTZ - 4
Total PCT 1093								339
1330	Yellow Box - Blakely's Red Gum grassy woodland on the tablelands	Very low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ - 32.31	18.2	TCZ - 18.2	TCZ - 367
					ECZ - 0.68		ECZ - 14.4	ECZ - 6
					HTZ - 0.29		HTZ - 0	HTZ - 1
		Low		>100	TCZ - 8.28	35.2	TCZ - 35.2	TCZ - 182
					ECZ - 3.16		ECZ - 32.9	ECZ - 65
					HTZ - 0.84		HTZ - 5.2	HTZ - 3
				5	TCZ - 0.03		TCZ - 35.2	TCZ - 1
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
		Moderate		>100	TCZ - 2.41	57.5	TCZ - 57.5	TCZ - 87
					ECZ - 2.22		ECZ - 43.7	ECZ - 61
					HTZ - 0.6		HTZ - 20.7	HTZ - 8
				<5	TCZ - 0.22		TCZ - 57.5	TCZ - 8
					ECZ - 0.14		ECZ - 43.7	ECZ - 4
					HTZ -0.06		HTZ - 20.7	HTZ - 1
		High		>100	TCZ - 0.36	79	TCZ - 79	TCZ - 18
					ECZ - 0.76		ECZ - 54.9	ECZ - 26
					HTZ - 0.33		HTZ - 22.3	HTZ - 5
		Very high		>100	TCZ - 0.81	72.9	TCZ - 72.9	TCZ - 37
					ECZ - 1.03		ECZ - 48.6	ECZ - 31
					HTZ - 0.3		HTZ - 27.3	HTZ - 5
Total PCT 1330								916
Total					**98.11**	-	-	**1609**

Table 15-5: Ecosystem credits for the Inland Slopes IBRA subregion

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Estimated clearing extent*(ha)	Current VI Scores	VI loss	Ecosystem credits
5	River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains	Low	No associated TEC	>100	TCZ -0.69	22.1	TCZ - 22.1	TCZ - 6
					ECZ -0.08		ECZ - 16.6	ECZ - 1
					HTZ - nil		N/A	N/A
		High		>100	TCZ -0.29	47	TCZ - 47	TCZ - 5
					ECZ - 0.99		ECZ - 33.3	ECZ - 12
					HTZ - 0.54		HTZ - 13.5	HTZ - 3
Total PCT 5								27
266	White Box grassy woodland in the upper slopes sub-region of the NSW South-Western Slopes Bioregion	Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ -21.2	3	TCZ - 3	ECZ - 0
					ECZ -1.12		ECZ - 1.4	HTZ - 0
					HTZ -0.61		HTZ - 0	TCZ - 0
		Moderate		>100	TCZ -1.6	31.7	TCZ - 31.7	ECZ - 32
					ECZ -0.16		ECZ - 25.3	HTZ - 3
					HTZ -0.4		HTZ - 0	TCZ - 1
		High		>100	TCZ -4.93	66.9	TCZ - 66.9	ECZ - 206
					ECZ -1.99		ECZ - 50.6	HTZ - 63
					HTZ -0.72		HTZ - 14.3	TCZ - 6
Total PCT 266								311
268	White Box - Blakely’s Red Gum - Long-leaved Box - Nortons Box - Red Stringybark grass-shrub woodland on shallow soils on hills	Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ -9.25	35.2	TCZ - 35.2	TCZ - 203
					ECZ -1.17		ECZ - 22.3	ECZ - 16
					HTZ -0.19		HTZ - 4.9	HTZ - 1
				<5	TCZ -nil		N/A	N/A
					ECZ -0.03		ECZ - 22.3	ECZ - 1
					HTZ -0.01		HTZ - 4.9	HTZ - 1
		Moderate		>100	TCZ -0.01	32.3	TCZ - 32.3	TCZ - 1
					ECZ -0.11		ECZ - 27.6	ECZ - 2
					HTZ -0.03		HTZ - 7.7	HTZ - 1
		High		>100	TCZ -5.03	80.8	TCZ - 80.8	TCZ - 254
					ECZ -0.74		ECZ - 61.5	ECZ - 28
					HTZ -0.31		HTZ - 7.3	HTZ - 1
Total PCT 268								509
277	Blakely’s Red Gum - Yellow Box grassy tall woodland	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ -51.39	22.5	TCZ - 22.5	TCZ - 722
					ECZ -1.35		ECZ - 18	ECZ - 15
					HTZ -0.41		HTZ - 4.1	HTZ - 1
				5 - 25	TCZ -0.1		TCZ - 22.5	TCZ - 1
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Estimated clearing extent*(ha)	Current VI Scores	VI loss	Ecosystem credits
				<5	TCZ -0.03		TCZ - 22.5	TCZ - 1
					ECZ -0.04		ECZ - 18	ECZ - 1
					HTZ -0.02		HTZ - 4.1	HTZ - 1
		Low		>100	TCZ -4.36	38.7	TCZ - 38.7	TCZ - 105
					ECZ -3.02		ECZ - 21.1	ECZ - 40
					HTZ -1.74		HTZ - 5.8	HTZ - 6
				<5	TCZ -0.75		TCZ - 38.7	TCZ - 18
					ECZ -0.44		ECZ - 21.1	ECZ - 6
					HTZ -0.02		HTZ - 5.8	HTZ - 1
		Moderate		>100	TCZ -1.23	70.6	TCZ - 70.6	TCZ - 54
					ECZ -0.65		ECZ - 40.2	ECZ - 16
					HTZ -0.41		HTZ - 14.6	HTZ - 4
		High		>100	TCZ -2.11	69.7	TCZ - 69.7	TCZ - 92
					ECZ -1.38		ECZ - 41.5	ECZ - 36
					HTZ -0.61		HTZ - 24.1	HTZ - 9
Total PCT 277								1129
278	Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ -6.65	6.2	TCZ - 6.2	TCZ - 0
					ECZ -0.22		ECZ - 5.3	ECZ - 0
					HTZ -0.12		HTZ - 4.7	HTZ - 0
		Moderate		>100	TCZ -1.16	25.6	TCZ - 25.6	TCZ - 19
					ECZ -2.12		ECZ - 20.3	ECZ - 27
					HTZ -0.94		HTZ - 16.3	HTZ - 10
				<5	TCZ -0.18		TCZ - 25.6	TCZ - 3
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
		High		>100	TCZ -0.68	68.2	TCZ - 68.2	TCZ - 29
					ECZ -1.05		ECZ - 49.5	ECZ - 32
					HTZ -0.47		HTZ - 26.9	HTZ - 8
Total PCT 278								128
280	Red Stringybark - Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ -17.65	4.2	TCZ - 4.2	TCZ - 0
					ECZ -0.89		ECZ - 1.9	ECZ - 0
					HTZ -0.2		HTZ - 0	HTZ - 0
				<5	TCZ -0.24		TCZ - 4.2	TCZ - 0
					ECZ -0.28		ECZ - 1.9	ECZ - 0
					HTZ -0.14		HTZ - 0	HTZ - 0
		Low		>100	TCZ -0.02	7.4	TCZ - 7.4	TCZ - 0
					ECZ -0.02		ECZ - 3.7	ECZ - 0

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Estimated clearing extent*(ha)	Current VI Scores	VI loss	Ecosystem credits
					HTZ -nil		N/A	N/A
		Moderate		>100	TCZ -5.55	45.1	TCZ - 45.1	TCZ - 157
					ECZ -1.41		ECZ - 32.8	ECZ - 29
					HTZ -0.65		HTZ - 12.3	HTZ - 5
				25-100	TCZ -0.74		TCZ - 45.1	TCZ - 21
					ECZ -0.43		ECZ - 32.8	ECZ - 9
					HTZ -0.16		HTZ - 12.3	HTZ - 1
		High		>100	TCZ -8.05	67.1	TCZ - 67.1	TCZ - 337
					ECZ -4.18		ECZ - 46.4	ECZ - 121
					HTZ -1.58		HTZ - 13.5	HTZ - 13
				25-100	TCZ -0.61		TCZ - 67.1	TCZ - 26
					ECZ -0.11		ECZ - 46.4	ECZ - 3
					HTZ -0.03		HTZ - 13.5	HTZ - 1
Total PCT 280								723
287	Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes	Very Low	No associated TEC	>100	TCZ -0.25	12.3	TCZ - 12.3	TCZ - 0
					ECZ -0.02		ECZ - 12.3	ECZ - 0
					HTZ -nil		N/A	N/A
		Low		>100	TCZ -0.06	26	TCZ - 26	TCZ - 1
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
		Moderate		>100	TCZ -0.49	42.1	TCZ - 42.1	TCZ - 9
					ECZ -0.32		ECZ - 33.9	ECZ - 5
					HTZ -0.02		HTZ - 24.4	HTZ - 1
Total PCT 287								16
290	Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills	Very Low	No associated TEC	>100	TCZ -1.86	18	TCZ - 18	TCZ - 15
					ECZ -0.23		ECZ - 17	ECZ - 2
					HTZ -0.01		HTZ - 16	HTZ - 1
		Low		>100	TCZ -1.18	18.4	TCZ - 18.4	TCZ - 9
					ECZ -0.58		ECZ - 14.3	ECZ - 4
					HTZ -0.15		HTZ - 3.3	HTZ - 1
				<5	TCZ -0.15		TCZ - 18.4	TCZ - 1
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
		High		>100	TCZ -0.65	76.5	TCZ - 76.5	TCZ - 22
					ECZ -0.48		ECZ - 47.8	ECZ - 10
					HTZ -0.18		HTZ - 7	HTZ - 1
Total PCT 290								66

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Estimated clearing extent*(ha)	Current VI Scores	VI loss	Ecosystem credits
294		Moderate		>100	TCZ -0.04	27.1	N/A	N/A
					ECZ -nil		ECZ - 25	ECZ - 1
					HTZ -nil		N/A	N/A
Total PCT 294								1
297	Broad-leaved Peppermint - Nortons Box - Red Stringybark tall open forest on red clay on hills	Low	No associated TEC	>100	TCZ -0.46	11.5	TCZ - 11.5	TCZ - 0
					ECZ -0.02		ECZ - 6	ECZ - 0
					HTZ -nil		N/A	N/A
		Moderate		>100	TCZ -0.42	52.7	TCZ - 52.7	TCZ - 8
					ECZ -0.16		ECZ - 32	ECZ - 2
					HTZ -0.02		HTZ - 3.1	HTZ - 1
Total PCT 297								11
299	Riparian Ribbon Gum - Robertsons Peppermint - Apple Box riverine very tall open forest	Very Low	No associated TEC	>100	TCZ -0.24	5.2	TCZ - 5.2	TCZ - 0
					ECZ -0.64		ECZ - 0	ECZ - 0
					HTZ -0.21		HTZ - 0	HTZ - 0
		Low		>100	TCZ -0.24	40.8	TCZ - 40.8	TCZ - 4
					ECZ -0.09		ECZ - 33.2	ECZ - 1
					HTZ -nil		N/A	N/A
Total PCT 299								5
301	Drooping Sheoke - Ricinocarpus bowmannii - grasstree tall open shrubland of the Coolac - Tumut Serpentinite Belt	Low	Coolac-Tumut Serpentinite Shrubby Woodland	>100	TCZ -0.63	24.3	TCZ - 24.3	TCZ - 8
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
		Moderate		>100	TCZ -0.42	37.1	TCZ - 37.1	TCZ - 8
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
		High		>100	TCZ -0.37	66.2	TCZ - 66.2	TCZ - 12
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
Total PCT 301								28
306	Red Box - Red Stringybark - Nortons Box hill heath shrub - tussock grass open forest of the Tumut region	Very Low	No associated TEC	>100	TCZ -3.08	18	TCZ - 18	TCZ - 21
					ECZ -0.03		ECZ - 17	ECZ - 1
					HTZ -0.07		HTZ - 16	HTZ - 1
				<5	TCZ -0.03		TCZ - 18	TCZ - 1
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
		Low		>100	TCZ -1.92	21.6	TCZ - 21.6	TCZ - 16
					ECZ -0.48		ECZ - 13.3	ECZ - 2

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Estimated clearing extent*(ha)	Current VI Scores	VI loss	Ecosystem credits
					HTZ -0.44		HTZ - 1.3	HTZ - 1
		High		>100	TCZ -0.64	63.6	TCZ - 63.6	TCZ - 15
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
Total PCT 306								58
314	Apple Box - Red Stringybark basalt scree open forest in the upper Murray River region	Very Low	No associated TEC	>100	TCZ -3.98	3.6	TCZ - 3.6	TCZ - 0
					ECZ -0.45		ECZ - 1.6	ECZ - 0
					HTZ -0.1		HTZ - 0	HTZ - 0
		Low		>100	TCZ -1.16	11.5	TCZ - 11.5	TCZ - 0
					ECZ -0.43		ECZ - 6	ECZ - 0
					HTZ -0.19		HTZ - 1.9	HTZ - 0
		Moderate		>100	TCZ -5.17	43.5	TCZ - 43.5	TCZ - 98
					ECZ -4.07		ECZ - 37	ECZ - 66
					HTZ -2.08		HTZ - 2.3	HTZ - 2
		Very high		>100	TCZ -4.4	100	TCZ - 100	TCZ - 193
					ECZ -0.9		ECZ - 76.4	ECZ - 30
					HTZ -0.57		HTZ - 14.7	HTZ - 4
Total PCT 314								393
316	Nortons Box - Red Box - Red Stringybark +/- Nodding Flax Lily forb-grass open forest	Low	No associated TEC	>100	TCZ -2.54	19.2	TCZ - 19.2	TCZ - 21
					ECZ -0.08		ECZ - 17.2	ECZ - 1
					HTZ -0.07		HTZ - 1.8	HTZ - 1
		Moderate		>100	TCZ -0.98	21.5	TCZ - 21.5	TCZ - 9
					ECZ -0.14		ECZ - 19.4	ECZ - 1
					HTZ -0.05		HTZ - 0	HTZ - 1
		High		>100	TCZ -0.8	66.2	TCZ - 66.2	TCZ - 23
					ECZ -0.13		ECZ - 47.9	ECZ - 3
					HTZ -0.19		HTZ - 7.3	HTZ - 1
		Very high		>100	TCZ -3.27	90.4	TCZ - 90.4	TCZ - 129
					ECZ -3.64		ECZ - 61.7	ECZ - 98
					HTZ -1.04		HTZ - 9	HTZ - 4
Total PCT 316								292
319	Tumbledown Red Gum - White Cypress Pine hill woodland	Low	No associated TEC	>100	TCZ -0.58	21.3	TCZ - 21.3	TCZ - 5
					ECZ -0.05		ECZ - 17.9	ECZ - 1
					HTZ -nil		N/A	N/A
		High		>100	TCZ -0.6	54.1	TCZ - 54.1	TCZ - 14
					ECZ -0.07		ECZ - 37.8	ECZ - 1
					HTZ -0.02		HTZ - 0.2	HTZ - 1

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Estimated clearing extent*(ha)	Current VI Scores	VI loss	Ecosystem credits
Total PCT 319								22
343	Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box grass/shrub woodland on metamorphic substrates	Very Low	No associated TEC	>100	TCZ -3.21	11.9	TCZ - 11.9	TCZ - 0
					ECZ -0.05		ECZ - 5.2	ECZ - 0
					HTZ -0.01		HTZ - 0	HTZ - 0
		Low		>100	TCZ -nil	26	N/A	N/A
					ECZ -0.04		ECZ - 17.8	ECZ - 1
					HTZ -nil		N/A	N/A
		Moderate		>100	TCZ -1.65	44.8	TCZ - 44.8	TCZ - 37
					ECZ -0.71		ECZ - 34.6	ECZ - 12
					HTZ -0.03		HTZ - 23.6	HTZ - 1
Total PCT 343								51
352	Red Stringybark - Blakely's Red Gum hillslope open forest on meta-sediments	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	>100	TCZ -3.25	7.4	TCZ - 7.4	TCZ - 0
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
		Low		>100	TCZ -0.78	17.4	TCZ - 17.4	TCZ - 8
					ECZ -0.05		ECZ - 9.4	ECZ - 1
					HTZ -0.06		HTZ - 9.3	HTZ - 1
				<25	TCZ -0.05		TCZ - 17.4	TCZ - 1
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
Total PCT 352								11
731	Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills	Very Low	No associated TEC	>100	TCZ -1.1	18.3	TCZ - 18.3	TCZ - 10
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
		Low			TCZ -0.28	17.7	TCZ - 17.7	TCZ - 2
					ECZ -0.01		ECZ - 10.5	ECZ - 1
					HTZ -0.05		HTZ - 4.5	HTZ - 1
Total PCT 731								14
1191	Snow Gum - Candle Bark woodland on broad valley flats	Moderate	Monaro Tableland Cool Temperate Grassy Woodland	>100	TCZ -0.14	38.1	TCZ - 38.1	TCZ - 3
					ECZ -nil		N/A	N/A
					HTZ -nil		N/A	N/A
Total PCT 1191								3
Total					**245.29**			**3798**

Table 15-6: Ecosystem credits for the Bondo IBRA subregion

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Score	Loss VI	Ecosystem credits
285	Broad-leaved Sally grass - sedge woodland on valley flats and swamps	Low	No associated TEC	>100	TCZ - 0.01	21.5	TCZ - 21.5	TCZ - 1
					ECZ - 0.66		ECZ - 20.8	ECZ - 7
					HTZ - 0.07		HTZ - 13.2	HTZ - 1
Total PCT 285								9
295	Robertsons Peppermint - Broad-leaved Peppermint - Nortons Box - stringybark shrub-fern open forest	Low	No associated TEC	>100	TCZ - 0.08	28	TCZ - 28	TCZ - 1
					ECZ - 0.04		ECZ - 25.1	ECZ - 1
					HTZ - nil		N/A- 27.9	N/A
		Moderate		>100	TCZ - 0.69	53.7	TCZ - 53.7	TCZ - 14
					ECZ - 0.77		ECZ - 42.1	ECZ - 12
					HTZ - 0.2		HTZ - 19.7	HTZ - 1
Total PCT 295								29
296		Low		>100	TCZ - 0.02	25.1	TCZ - 25.1	TCZ - 1
					ECZ - nil		N/A	N/A
					HTZ - nil		N/A	N/A
Total PCT 296								1
299	Riparian Ribbon Gum - Robertsons Peppermint - Apple Box riverine very tall open forest	Very Low	No associated TEC	>100	TCZ - 0.19	5.4	TCZ - 5.4	TCZ - 0
					ECZ - 0.42		ECZ - 0	ECZ - 0
					HTZ - 0.63		HTZ - 0	HTZ - 0
		Moderate		>100	TCZ - 0.77	57.6	TCZ - 57.6	TCZ - 19
					ECZ - 0.36		ECZ - 43.9	ECZ - 7
					HTZ - 0.25		HTZ - 1.5	HTZ - 1
Total PCT 299								27
953	Mountain Gum - Snow Gum - Broad-leaved Peppermint shrubby open forest of montane ranges	Very Low	Tableland Basalt Forest	>100	TCZ - 2.56	5.4	TCZ - 5.4	TCZ - 0
					ECZ - 0.23		ECZ - 0	ECZ - 0
					HTZ - 0.19		HTZ - 0	HTZ - 0
		Low		>100	TCZ - 2.1	27.9	TCZ - 27.9	TCZ - 22
					ECZ - 0.16		ECZ - 25.1	ECZ - 2
					HTZ - 0.07		HTZ - 3.3	HTZ - 1
		High		>100	TCZ - 9.63	69.6	TCZ - 69.6	TCZ - 251
					ECZ - 10.72		ECZ - 62.3	ECZ - 250
					HTZ - 7.76		HTZ - 15.8	HTZ - 46
		Very High		>100	TCZ - 0.16	90.7	TCZ - 90.7	TCZ - 5
					ECZ - 0.03		ECZ - 73.4	ECZ - 1
					HTZ - 0.07		HTZ - 25.4	HTZ - 1
Total PCT 953								579
Total					**38.84**	-	-	**645**

Table 15-7: Ecosystem credits for the Snowy Mountains IBRA subregion

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Score	VI loss	Ecosystem credits
300	Ribbon Gum - Narrow-leaved (Robertsons) Peppermint montane fern - grass tall open forest on deep clay loam soils	Low	No associated TEC	>100	TCZ - 0.23	27.6	TCZ - 27.6	TCZ - 2
					ECZ - nil		ECZ - nil	N/A
					HTZ - 0.29		HTZ - 22.3	HTZ - 2
		Moderate		>100	TCZ - 0.01	45.9	TCZ - 45.9	TCZ - 1
					ECZ - 0.11		ECZ - 43.5	ECZ - 2
					HTZ - 0.26		HTZ - 0	HTZ - 1
		High		>100	TCZ - 5.08	76.7	TCZ - 76.7	TCZ - 146
					ECZ - 6.54		ECZ - 59.1	ECZ - 145
					HTZ - 11.31		HTZ - 17.4	HTZ - 74
Total PCT 300								373
638	Alpine Ash - Mountain Gum moist shrubby tall open forest of montane areas	High	No associated TEC	>100	TCZ - 5.63	65.3	TCZ - 65.3	TCZ - 138
					ECZ - 8.29		ECZ - 48.1	ECZ - 149
					HTZ - 16.63		HTZ - 14.4	HTZ - 90
Total PCT 638								377
679	Black Sallee - Snow Gum low woodland of montane valleys	Low	Monaro Tableland Cool Temperate Grassy Woodland	>100	TCZ - 0.16	32.9	TCZ - 32.9	TCZ - 2
					ECZ - nil		ECZ- nil	N/A
					HTZ - 0.06		HTZ - 0	HTZ - 1
		High		>100	TCZ - 0.95	69.8	TCZ - 69.8	TCZ - 25
					ECZ - 1.11		ECZ - 46.5	ECZ - 19
					HTZ - 1.32		HTZ - 18.2	HTZ - 9
Total PCT 679								56
939	Montane wet heath and bog of the eastern tablelands	Very High	Montane Peatlands and Swamps	Very high	TCZ - 0.32	71	TCZ - 71	TCZ - 11
					ECZ - 0.02		ECZ - 14.5	ECZ - 1
					HTZ - 0.22		HTZ - 0	HTZ - 1
Total PCT 939								13
953	Mountain Gum - Snow Gum - Broad-leaved Peppermint shrubby open forest of montane ranges	Low	Tableland Basalt Forest	>100	TCZ - 3	24.7	TCZ - 24.7	TCZ - 28
					ECZ - 0.31		ECZ - 22.2	ECZ - 3
					HTZ - 1.12		HTZ - 2.9	HTZ - 1
		Moderate		>100	HTZ - 0.02	48.8	TCZ - 48.8	TCZ - 1
					HTZ - nil		ECZ - nil	N/A
					HTZ - nil		HTZ - nil	N/A
		High		>100	HTZ - 0.06	45.7	TCZ - 45.7	TCZ - 1
					HTZ - nil		ECZ - nil	N/A
					HTZ - nil		HTZ - nil	N/A
		Very High		>100	TCZ - 19.44	76	TCZ - 76	TCZ - 554
					ECZ - 28.35		ECZ - 60	ECZ - 638

PCT ID	PCT name	Condition	TEC	Patch size (ha)	Clearing zones (ha)	Current VI Score	VI loss	Ecosystem credits
					HTZ - 34.2		HTZ - 19.9	HTZ - 256
Total PCT 953								1482
1196	Snow Gum - Mountain Gum shrubby open forest of montane areas	Low	Tableland Basalt Forest	>100	TCZ - 0.38	35	TCZ - 35	TCZ - 5
					ECZ - 0.03		ECZ - 32.9	ECZ - 1
					HTZ - 0.27		HTZ - 0	HTZ - 1
		High		>100	TCZ - 6.38	73.4	TCZ - 73.4	TCZ - 176
					ECZ - 12.28		ECZ - 52.5	ECZ - 242
					HTZ - 12.34		HTZ - 10.5	HTZ - 48
Total PCT 1196								473
1224	Sub-alpine dry grasslands and heathlands of valley slopes	High	No associated TEC	>100	TCZ - 0.25	87.2	TCZ - 87.2	TCZ - 8
					ECZ - nil		ECZ - nil	N/A
					HTZ - nil		HTZ - nil	N/A
Total PCT 1224								8
Total					**176.97**	-	-	**2782**

15.1.2 Species credits

Table 15-8 shows the total species credit offset requirement for species either known or likely to be impacted by the project. Table 15-9 shows the total offset requirement for species credit species with limited potential to be impacted. Species have been included in this table where there is incomplete information to be able to exclude them from the BAM-C despite a limited likelihood of potential impacts and/or occurrence within the disturbance footprint.

The total species credit offset requirement, as determined using the BAM-C (version 61), is provided for each IBRA subregion in Table 15-9 to Table 15-14. The full credit reports for each subregion, including like-for-like trading options, is provided in Attachment 20.

Further consultation with the BCD is required to identify species credit requirements for threatened fauna habitat subject to clearing within Category 1 exempt lands, as documented in Attachment 21.

Table 15-8: Species credit species likely to be impacted

Scientific name	Common name	BUN		CRO		MUR		INL		BON		SNO		Total	
		Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Total clearing (ha)	Total credits
Flora															
Leucochrysum albicans var. tricolor	Hoary Sunray	11.4 (1065 count)	2130	31.8 (2978 count)	5956	32.4 (3037 count)	6074	12.2 (1140 count)	2280	30.8 (2885 count)	5770	64 (5993 count)	11986	182.6 (17098 count)	34196
Ammobium craspedioides	Yass Daisy			32.8 (202 count)	404	40.4 (272 count)	544	101.4 (672 count)	1344	1.6 (1 count)	2			176.2 (1147 count)	2294
Swainsona sericea	Silky Swainson-pea	11.2	218			46.6	505	129.3	1614					187.1	2337
Swainsona recta	Small Purple-pea					35.8	421	91.2	1146					127.0	1567
Prasophyllum sp. Wybong	Prasophyllum sp. Wybong							87.8	1574					87.8	1574
Thesium australe	Austral Toadflax	15.0	205	30.3	253	41.3	412					23.7	339	110.3	1209
Prasophyllum bagoense	Bago Leek-orchid											31.9	959	31.9	959
Prasophyllum keltonii	Kelton's Leek Orchid											31.7	943	31.7	943
Prasophyllum petilum	Tarengo Leek Orchid					11.2	210	13.3	244					24.5	454
Rutidosis leiolepis	Monaro Golden Daisy											0.3 350 (count)	700	0.3 (350 count)	700
Acacia bynoeana	Bynoe's Wattle	1.2	40	1.8	49									3.0	89
Kunzea cambagei	Cambage Kunzea	12.2	220											12.2	220
Pomaderris cotoneaster	Cotoneaster Pomaderris	11.7	215											11.7	215
Solanum armourense	Solanum armourense	0.51	21											0.51	21

Scientific name	Common name	BUN		CRO		MUR		INL		BON		SNO		Total	
		Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Total clearing (ha)	Total credits
Xerochrysum palustre	Swamp Everlasting											1.5	30	1.5	30
Pterostylis oreophila	Blue-tongued Greenhood											0.56	19	0.56	19
Prasophyllum innubum	Brandy Marys Leek-orchid											0.25	16	0.25	16
Fauna															
Phascolarctos cinereus	Koala	19.4	468	39.2	1073	41.7	1032	114.7	2504	32.9	827	170.5	3627	418.4	9531
Callocephalon fimbriatum	Gang-gang Cockatoo	14.8	370	29.7	825	28.6	741	45.4	1013	22.1	564	165.8	3500	306.4	7013
Hieraaetus morphnoides	Little Eagle	19.2	349	28.3	578	38.0	728	108.9	1831	32.9	621	170.5	2722	397.8	6829
Ninox strenua	Powerful Owl	14.8	372	27.6	787	26.4	672	4.9	90	21.4	543	121.9	2641	217.0	5105
Petroica rodinogaster	Pink Robin	12.2	229					0.3	1	30.6	783	169.9	3614	213.0	4627
Cercartetus nanus	Eastern Pygmy-possum	5.2	147	22.7	622	6.0	143	16.3	311	21.7	553	121.9	2592	193.8	4368
Petaurus norfolcensis	Squirrel Glider	14.6	361	14.4	425	12.5	259	46.7	1026	21.1	541	61.2	1415	170.5	4027
Tyto novaehollandiae	Masked Owl	14.7	369					27.8	600	20.5	525	99.5	2166	162.5	3660
Ninox connivens	Barking Owl	14.8	372					41.3	896	21.4	543	99.5	2166	177.0	3977
Keyacris scurra	Key's Matchstick Grasshopper	16.4	308	36.7	481	59.5	788	116.4	1310					229.0	2887
Phascogale tapoatafa	Brush-tailed Phascogale									21.1	541	108.8	2329	129.9	2870
Petauroides volans	Greater Glider	14.1	361	4.0	113	1.7	43	3.1	89	20.5	526	74.6	1436	118	2568

Scientific name	Common name	BUN		CRO		MUR		INL		BON		SNO		Total	
		Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Total clearing (ha)	Total credits
Lophoictinia isura	Square-tailed Kite					19.6	418	75.1	1187	29.2	564			123.9	2169
Aprasia parapulchella	Pink-tailed Legless Lizard	6.0	130	11.4	128	37.1	497	86.3	1112					140.7	1867
Delma impar	Striped Legless Lizard	16.0	226	33.5	334	54.8	551	70.1	680					174.4	1791
Calyptorhynchus lathami	Glossy Black-Cockatoo	12.2	301	23.6	666	18.8	509	11.5	218					66.1	1694
Polytelis swainsonii	Superb Parrot			7.2	192	18.0	394	34.6	701					59.8	1287
Tyto tenebricosa	Sooty Owl											21.2	511	21.2	511
Petaurus norfolcensis - endangered population	Squirrel Glider							46.7	1026					46.7	1026
Haliaeetus leucogaster	White-bellied Sea-Eagle			0.01	1	3.3	73	14.9	248	0.43	11			18.64	333
Petaurus australis - endangered population	Yellow-bellied Glider population on the Bago Plateau											19.4	311	19.4	311
Myotis macropus	Southern Myotis	2.1	68			8.1	180	2.4	34	0.96	20			13.56	302
Synemon plana	Golden Sun Moth					16.1	118	19.8	120					35.9	238
Litoria castanea	Yellow-spotted Tree Frog			0.8	42							0.56	19	1.36	61
Miniopterus orianae oceanensis	Large Bent-winged Bat					0.12	4							0.12	4

Scientific name	Common name	BUN		CRO		MUR		INL		BON		SNO		Total	
		Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Total clearing (ha)	Total credits
Total credit requirement			**7,480**		**12,929**		**15,316**		**23,199**		**12,934**		**44,041**		**115,899**

Table 15-9: Species credit species with limited potential to be impacted

Scientific name	Common name	BUN		CRO		MUR		INL		BON		SNO		Total	
		Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Total clearing (ha)	Total credits
Flora															
Eucalyptus cannonii	Capertee Stringybark							4.4 (1 count)	2					4.4 (1 count)	2
Eucalyptus alligatrix subsp. *alligatrix*	Eucalyptus alligatrix subsp. alligatrix							1.1 (1 count)	3					1.1 (1 count)	3
Eucalyptus robertsonii subsp. *hemisphaerica*	Robertson's Peppermint			0.3 (1 count)	3									0.3 (1 count)	3
Commersonia prostrata	Dwarf Kerrawang			0.75	3									0.75	3
Eucalyptus aggregata	Black Gum			1.1 (1 count)	2			0.1 (1 count)	2					1.2 (2 count)	4
Acacia phasmoides	Phantom Wattle							0.8 (2 count)	6					0.8 (2 count)	6
Calotis pubescens	Max Mueller's Burr-daisy											0.25	11	0.25	11
Thelymitra alpicola	Alpine Sun-orchid											0.56	11	0.56	11
Diuris tricolor	Pine Donkey Orchid							1.4	12					1.4	12
Grevillea iaspicula	Wee Jasper Grevillea					3.9 (9 (count)	27							3.9 (9 (count)	27

Scientific name	Common name	BUN		CRO		MUR		INL		BON		SNO		Total	
		Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Total clearing (ha)	Total credits
Diuris ochroma	Pale Golden Moths											0.25	16	0.25	16
Glycine latrobeana	Clover Glycine											0.25	16	0.25	16
Caesia parviflora var. minor	Small Pale Grass-lily							0.2	7					0.2	7
Senecio garlandii	Woolly Ragwort							1.2	13					1.2	13
Euphrasia scabra	Rough Eyebright											1.9	52	1.9	52
Eucalyptus macarthurii	Paddys River Box, Camden Woollybutt	10.2 (18 count)	36											10.2 (18 count)	36
Baloskion longipes	Dense Cord-rush	1.2	40											1.2	40
Bossiaea oligosperma	Few-seeded Bossiaea	1.2	41											1.2	41
Dillwynia glaucula	Michelago Parrot-pea	1.7	61											1.7	61
Phyllota humifusa	Dwarf Phyllota	11.4	212											11.4	212
Persoonia marginata	Clandulla Geebung							1.2	20					1.2	20
Persoonia mollis subsp. revoluta	Persoonia mollis subsp. revoluta	8.0	151											8.0	151

Scientific name	Common name	BUN		CRO		MUR		INL		BON		SNO		Total	
		Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Total clearing (ha)	Total credits
Diuris aequalis	Buttercup Doubletail	3.6	120	24.7	527									28.3	647
Pomaderris delicata	Delicate Pomaderris	8.0	225											8.0	225
Pultenaea humilis	Dwarf Bush-pea							4.2	114					4.2	114
Genoplesium superbum	Superb Midge Orchid	8.8	237											8.8	237
Acacia flocktoniae	Flockton Wattle	14.3	309											14.3	309
Acacia ausfeldii	Ausfeld's Wattle							14.6	383					14.6	383
Pomaderris pallida	Pale Pomaderris					0.77	40							0.77	40
Lepidium hyssopifolium	Aromatic Peppercress			36.4	480									36.4	480
Bossiaea fragrans	Bossiaea fragrans							6.1	175					6.1	175
Grevillea wilkinsonii	Tumut Grevillea							34.7	568					34.7	568
Caladenia tessellata	Thick Lip Spider Orchid	16.0	550											16.0	550
Pterostylis alpina	Alpine Greenhood											24.4	464	24.4	464
Irenepharsus magicus	Elusive Cress											26.5	654	26.5	654

Scientific name	Common name	BUN		CRO		MUR		INL		BON		SNO		Total	
		Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Total clearing (ha)	Total credits
Calotis glandulosa	Mauve Burr-daisy											16.0	441	16.0	441
Pterostylis foliata	Slender Greenhood											36.5	642	36.5	642
Cullen parvum	Small Scurf-pea							71.7	916					71.7	916
Zieria obcordata	Granite Zieria							43.4	1025					43.4	1025
Caladenia concolor	Crimson Spider Orchid					3.6	114	30.5	1238					34.1	1352
Euphrasia arguta	Euphrasia arguta							92.9	1518					92.9	1518
Fauna															
Litoria booroolongensis	Litoria booroolongensis									0.11	0			0.11	0
Crinia sloanei	Sloane's Froglet							2.6	27					2.6	27
Petrogale penicillata	Brush-tailed Rock-wallaby	1.1	43											1.1	43
Mastacomys fuscus	Broad-toothed Rat											2.2	50	2.2	50
Cyclodomorphus praealtus	Alpine She-oak Skink											12.2	259	12.2	259

Scientific name	Common name	BUN		CRO		MUR		INL		BON		SNO		Total	
		Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Clearing (ha)	Species credits	Total clearing (ha)	Total credits
Chalinolobus dwyeri	Large-eared Pied Bat	7.7	316											7.7	316
Mixophyes balbus	Stuttering Frog	13.8	421											13.8	421
Pseudophryne corroboree	Southern Corroboree Frog											22.2	625	22.2	625
Burhinus grallarius	Bush Stone-curlew							60.5	1222					60.5	1222
Pseudomys fumeus	Smoky Mouse									0.06	2	132.6	4227	132.66	4229
Total credit requirement			**2,762**		**1,015**		**181**		**7,251**		**2**		**7,468**		**18,679**

Table 15-10: Species credits for Bungonia IBRA subregion

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Acacia bynoeana	Bynoe's Wattle	1093_Veryhigh_TCZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100	1.2	40
Acacia flocktoniae	Flockton Wattle	870_Veryhigh_TCZ_100, 870_Veryhigh_ECZ_100, 870_Veryhigh_HTZ_100, 1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100	14.3	309
Aprasia parapulchella	Pink-tailed Legless Lizard	283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 283_low_TCZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100, 1330_Verylow_ECZ_5	6.0	130
Baloskion longipes	Dense Cord-rush	1093_Veryhigh_TCZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100	1.2	40
Bossiaea oligosperma	Few-seeded Bossiaea	1093_Veryhigh_TCZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Low_TCZ_100	1.2	41
Caladenia tessellata	Thick Lip Spider Orchid	870_Veryhigh_TCZ_100, 870_Veryhigh_ECZ_100, 870_Veryhigh_HTZ_100, 1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100	16	550
Callocephalon fimbriatum	Gang-gang Cockatoo	283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 870_Veryhigh_TCZ_100, 870_Veryhigh_ECZ_100, 870_Veryhigh_HTZ_100, 1093_Veryhigh_TCZ_100,	14.8	370

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1097_Moderate_TCZ_100, 1107_High_TCZ_100, 1107_High_HTZ_100, 1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100, 1150_Low_TCZ_100, 1150_Low_ECZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100		
Calyptorhynchus lathami	Glossy Black-Cockatoo	870_Veryhigh_TCZ_100, 870_Veryhigh_ECZ_100, 870_Veryhigh_HTZ_100, 1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1097_Moderate_TCZ_100, 1107_High_TCZ_100, 1107_High_HTZ_100, 1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100, 1150_Low_TCZ_100, 1150_Low_ECZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100	12.2	301
Cercartetus nanus	Eastern Pygmy-possum	283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100,	5.2	147

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		1093_Low_TCZ_100, 1093_Low_ECZ_100, 1107_High_TCZ_100, 1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100		
Chalinolobus dwyeri	Large-eared Pied Bat	283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1097_Moderate_TCZ_100, 1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100	7.7	316
Delma impar	Striped Legless Lizard	1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100, 1330_Verylow_ECZ_5	16	226
Dillwynia glaucula	Michelago Parrot-pea	1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Low_TCZ_100	1.7	61
Diuris aequalis	Buttercup Doubletail	1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1097_Moderate_TCZ_100, 1097_Verylow_TCZ_100, 1097_Verylow_ECZ_100, 1097_Verylow_ECZ_5	3.6	120

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Eucalyptus macarthurii	Paddys River Box, Camden Woollybutt	1097_Verylow_TCZ_100, 1330_Veryhigh_TCZ_100, 1330_Low_TCZ_100	18 (count)	36
Genoplesium superbum	Superb Midge Orchid	1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100, 1150_Low_TCZ_100, 1150_Low_ECZ_100, 1150_Verylow_TCZ_100, 1150_Verylow_ECZ_100	8.8	237
Hieraaetus morphnoides	Little Eagle	283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 870_Veryhigh_TCZ_100, 870_Veryhigh_ECZ_100, 870_Veryhigh_HTZ_100, 1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1097_Moderate_TCZ_100, 1107_High_TCZ_100, 1107_High_HTZ_100, 1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100, 1150_Low_TCZ_100, 1150_Low_ECZ_100, 1330_Veryhigh_TCZ_100 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100	19.2	349
Keyacris scurra	Key's Matchstick Grasshopper	283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 283_Low_TCZ_100, 283_Verylow_TCZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100, 1330_Verylow_ECZ_5	16.4	308
Kunzea cambagei	Cambage Kunzea	1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100, 1150_Low_TCZ_100, 1150_Low_ECZ_100, 1150_Verylow_TCZ_100,	12.2	220

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		1150_Verylow_ECZ_100		
Leucochrysum albicans var. *tricolor*	Hoary Sunray	1093_Veryhigh_TCZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Low_TCZ_100, 1097_Moderate_TCZ_100, 1097_Verylow_TCZ_100, 1097_Verylow_ECZ_100, 1097_Verylow_ECZ_5, 1330_Veryhigh_TCZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100, 1330_Verylow_ECZ_5	1065 (count)	2130
Mixophyes balbus	Stuttering Frog	870_Veryhigh_TCZ_100, 870_Veryhigh_ECZ_100, 870_Veryhigh_HTZ_100, 1097_Moderate_TCZ_100, 1107_High_TCZ_100, 1107_High_HTZ_100, 1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100, 1150_Low_TCZ_100, 1150_Low_ECZ_100	13.8	421
Myotis macropus	Southern Myotis	870_Veryhigh_TCZ_100, 870_Veryhigh_ECZ_100, 1107_High_TCZ_100, 1107_High_HTZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100	2.1	68
Ninox connivens	Barking Owl	283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 870_Veryhigh_TCZ_100, 870_Veryhigh_ECZ_100, 870_Veryhigh_HTZ_100, 1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1097_Moderate_TCZ_100, 1107_High_TCZ_100, 1107_High_HTZ_100, 1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100, 1150_Low_TCZ_100,	14.8	372

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		1150_Low_ECZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100		
Ninox strenua	Powerful Owl	283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 870_Veryhigh_TCZ_100, 870_Veryhigh_ECZ_100, 870_Veryhigh_HTZ_100, 1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1097_Moderate_TCZ_100, 1107_High_TCZ_100, 1107_High_HTZ_100, 1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100, 1150_Low_TCZ_100, 1150_Low_ECZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100	14.8	372
Persoonia mollis subsp. *revoluta*	Persoonia mollis subsp. revoluta	1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100	8	151
Petauroides volans	Greater Glider	870_Veryhigh_TCZ_100, 870_Veryhigh_ECZ_100, 870_Veryhigh_HTZ_100, 1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1097_Moderate_TCZ_100, 1107_High_TCZ_100, 1107_High_HTZ_100, 1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100,	14.1	361

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		1150_Moderate_HTZ_100, 1150_Low_TCZ_100, 1150_Low_ECZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_Low_TCZ_100		
Petaurus norfolcensis	Squirrel Glider	283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 870_Veryhigh_TCZ_100, 870_Veryhigh_ECZ_100, 870_Veryhigh_HTZ_100, 1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100, 1150_Low_TCZ_100, 1150_Low_ECZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100	14.6	361
Petrogale penicillata	Brush-tailed Rock-wallaby	283_Moderate_TCZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1107_High_TCZ_100, 1107_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100	1.1	43
Petroica rodinogaster	Pink Robin	1097_Moderate_TCZ_100, 1107_High_TCZ_100, 1107_High_HTZ_100, 1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100, 1150_Low_TCZ_100, 1150_Low_ECZ_100	12.2	229
Phascolarctos cinereus	Koala	283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 870_Veryhigh_TCZ_100, 870_Veryhigh_ECZ_100, 870_Veryhigh_HTZ_100, 1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100,	19.4	468

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1097_Moderate_TCZ_100, 1107_High_TCZ_100, 1107_High_HTZ_100, 1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100, 1150_Low_TCZ_100, 1150_Low_ECZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100		
Phyllota humifusa	Dwarf Phyllota	1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100	11.4	212
Pomaderris cotoneaster	Cotoneaster Pomaderris	1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100	11.7	215
Pomaderris delicata	Delicate Pomaderris	1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100	8	225
Solanum armourense	Solanum armourense	1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Low_TCZ_100	0.51	21
Swainsona sericea	Silky Swainson-pea	283_Moderate_TCZ_100, 283_Low_TCZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100, 1330_Verylow_ECZ_5	11.2	218
Thesium australe	Austral Toadflax	1330_Veryhigh_TCZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100, 1330_Verylow_ECZ_5	15	205
Tyto novaehollandiae	Masked Owl	870_Veryhigh_TCZ_100, 870_Veryhigh_ECZ_100, 870_Veryhigh_HTZ_100,	14.7	369

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1097_Moderate_TCZ_100, 1107_High_TCZ_100, 1107_High_HTZ_100, 1150_High_TCZ_100, 1150_High_ECZ_100, 1150_High_HTZ_100, 1150_Moderate_TCZ_100, 1150_Moderate_ECZ_100, 1150_Moderate_HTZ_100, 1150_Low_TCZ_100, 1150_Low_ECZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100		
Total				**10,242**

Table 15-11: Species credits for Crookwell IBRA subregion

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Acacia bynoeana	Bynoe's Wattle	1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_TCZ_5, 1093_Moderate_ECZ_100, 1093_Moderate_HTZ_100	1.8	49
Ammobium craspedioides	Yass Daisy	283_High_TCZ_100, 283_High_ECZ_100, 283_High_HTZ_100, 283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 283_Verylow_TCZ_100, 727_Veryhigh_TCZ_100, 727_Veryhigh_ECZ_100, 727_Moderate_TCZ_5, 727_Moderate_ECZ_100, 727_Moderate_ECZ_5, 727_Verylow_TCZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_ECZ_5, 1330_Low_HTZ_100, 1330_Verylow_TCZ_100, 1330_Verylow_TCZ_25-100, 1330_Verylow_ECZ_100	202 (count)	404
Aprasia parapulchella	Pink-tailed Legless Lizard	283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 283_Moderate_HTZ_100, 283_Low_TCZ_100, 283_Verylow_TCZ_100, 283_Verylow_ECZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Low_TCZ_100, 1330_Low_TCZ_5, 1330_Low_ECZ_100, 1330_Low_HTZ_100, 1330_Verylow_TCZ_100, 1330_Verylow_TCZ_25-100, 1330_Verylow_ECZ_100, 1330_Verylow_ECZ_25-100, 1330_Verylow_HTZ_25-100	11.4	128
Callocephalon fimbriatum	Gang-gang Cockatoo	280_Moderate_TCZ_100, 280_Moderate_ECZ_100, 280_Moderate_HTZ_100, 283_High_TCZ_100, 283_High_ECZ_100, 283_High_HTZ_100, 283_Moderate_ECZ_100, 283_Moderate_HTZ_100, 679_High_ECZ_100, 679_High_HTZ_100, 679_Moderate_ECZ_100, 679_Moderate_HTZ_100, 727_Veryhigh_TCZ_100, 727_Veryhigh_ECZ_100, 727_Veryhigh_HTZ_100, 727_Moderate_TCZ_100,	29.7	825

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		727_Moderate_ECZ_100, 731_High_TCZ_100, 731_High_ECZ_100, 731_High_HTZ_100, 731_Moderate_TCZ_100, 731_Moderate_ECZ_100, 731_Moderate_HTZ_100, 952_Moderate_ECZ_100, 952_Low_TCZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1093_Low_HTZ_100, 1151_Veryhigh_TCZ_100, 1151_Veryhigh_ECZ_100, 1151_Veryhigh_HTZ_100, 1151_High_TCZ_100, 1151_High_ECZ_100, 1151_High_HTZ_100, 1151_Moderate_TCZ_100, 1151_Moderate_ECZ_100, 1151_Moderate_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_ECZ_5, 1330_Low_HTZ_100, 1330_Low_HTZ_5		
Calyptorhynchus lathami	Glossy Black-Cockatoo	731_Moderate_TCZ_100, 731_Moderate_ECZ_100, 731_Moderate_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1093_Low_HTZ_100, 1151_Veryhigh_TCZ_100, 1151_Veryhigh_ECZ_100, 1151_Veryhigh_HTZ_100, 1151_High_TCZ_100, 1151_High_ECZ_100, 1151_High_HTZ_100, 1151_Moderate_TCZ_100, 1151_Moderate_ECZ_100, 1151_Moderate_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_ECZ_5, 1330_Low_HTZ_100, 1330_Low_HTZ_5	23.6	666
Cercartetus nanus	Eastern Pygmy-possum	280_Moderate_TCZ_100, 280_Moderate_ECZ_100, 280_Moderate_HTZ_100, 283_Moderate_TCZ_100,	22.7	622

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		283_Moderate_ECZ_100, 283_Moderate_HTZ_100, 727_Veryhigh_TCZ_100, 727_Veryhigh_ECZ_100, 727_Veryhigh_HTZ_100, 727_Moderate_TCZ_100, 727_Moderate_TCZ_5, 727_Moderate_ECZ_100, 727_Moderate_ECZ_5, 727_Moderate_HTZ_5, 731_Moderate_TCZ_100, 731_Moderate_ECZ_100, 731_Moderate_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Moderate_HTZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1093_Low_HTZ_100, 1151_Veryhigh_TCZ_100, 1151_Veryhigh_ECZ_100, 1151_Veryhigh_HTZ_100, 1151_High_TCZ_100, 1151_High_ECZ_100, 1151_High_HTZ_100, 1151_Moderate_TCZ_100, 1151_Moderate_ECZ_100, 1151_Moderate_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_5, 1330_Low_HTZ_5		
Commersonia prostrata	Dwarf Kerrawang	1191_Low_TCZ_100, 1191_Low_ECZ_100	0.75	3
Delma impar	Striped Legless Lizard	1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Low_TCZ_100, 1330_Low_TCZ_5, 1330_Low_ECZ_100, 1330_Low_ECZ_5, 1330_Low_HTZ_100, 1330_Low_HTZ_5, 1330_Verylow_TCZ_100, 1330_Verylow_TCZ_25-100, 1330_Verylow_ECZ_100, 1330_Verylow_ECZ_25-100, 1330_Verylow_HTZ_100, 1330_Verylow_HTZ_25-100	33.5	334
Diuris aequalis	Buttercup Doubletail	731_High_TCZ_100, 731_High_ECZ_100, 731_High_HTZ_100, 731_Moderate_TCZ_100, 731_Moderate_ECZ_100, 731_Moderate_HTZ_100, 731_Low_TCZ_100, 731_Low_ECZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100,	24.7	527

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		1093_Moderate_TCZ_100, 1093_Moderate_TCZ_5, 1093_Moderate_ECZ_100, 1093_Moderate_HTZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1093_Low_ECZ_5, 1093_Low_HTZ_100, 1093_Verylow_TCZ_100, 1093_Verylow_ECZ_100, 1093_Verylow_HTZ_100, 1151_Veryhigh_TCZ_100, 1151_Veryhigh_ECZ_100, 1151_Veryhigh_HTZ_100, 1151_High_TCZ_100, 1151_High_ECZ_100, 1151_High_HTZ_100, 1151_Moderate_TCZ_100, 1151_Moderate_ECZ_100, 1151_Moderate_HTZ_100, 1151_Low_TCZ_100, 1151_Low_ECZ_100, 1151_Low_HTZ_100, 1191_Low_TCZ_100, 1191_Low_ECZ_100		
Eucalyptus aggregata	Black Gum	1191_Low_TCZ_100	1 (count)	2
Eucalyptus robertsonii subsp. *hemisphaerica*	Robertson's Peppermint	727_Moderate_TCZ_5	1 (count)	3
Haliaeetus leucogaster	White-bellied Sea-Eagle	1330_Low_TCZ_5	0.01	1
Hieraaetus morphnoides	Little Eagle	280_Moderate_TCZ_100, 280_Moderate_ECZ_100, 280_Moderate_HTZ_100, 283_High_TCZ_100, 283_High_ECZ_100, 283_High_HTZ_100, 283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 283_Moderate_HTZ_100, 283_Low_TCZ_100, 679_High_ECZ_100, 679_High_HTZ_100, 679_Moderate_ECZ_100, 679_Moderate_HTZ_100, 727_Veryhigh_TCZ_100, 727_Veryhigh_ECZ_100, 727_Veryhigh_HTZ_100, 727_Moderate_TCZ_100, 727_Moderate_TCZ_5, 727_Moderate_ECZ_100, 727_Moderate_ECZ_5, 727_Moderate_HTZ_5, 731_High_TCZ_100, 731_High_ECZ_100, 731_High_HTZ_100, 731_Moderate_TCZ_100, 731_Moderate_ECZ_100, 731_Moderate_HTZ_100, 952_Moderate_ECZ_100, 952_Low_TCZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100,	28.3	578

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Moderate_HTZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1093_Low_ECZ_5, 1093_Low_HTZ_100, 1191_Low_TCZ_100, 1191_Low_ECZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_ECZ_5, 1330_Low_HTZ_100, 1330_Low_HTZ_5		
Keyacris scurra	Key's Matchstick Grasshopper	283_High_TCZ_100, 283_High_ECZ_100, 283_High_HTZ_100, 283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 283_Moderate_HTZ_100, 283_Low_TCZ_100, 283_Verylow_TCZ_100, 283_Verylow_ECZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Low_TCZ_100, 1330_Low_TCZ_5, 1330_Low_ECZ_100, 1330_Low_ECZ_5, 1330_Low_HTZ_100, 1330_Low_HTZ_5, 1330_Verylow_TCZ_100, 1330_Verylow_TCZ_25-100, 1330_Verylow_ECZ_100, 1330_Verylow_ECZ_25-100, 1330_Verylow_HTZ_100, 1330_Verylow_HTZ_25-100	36.7	481
Lepidium hyssopifolium	Aromatic Peppercress	280_Moderate_TCZ_100, 280_Moderate_ECZ_100, 280_Moderate_HTZ_100, 280_Low_TCZ_100, 280_Low_ECZ_100, 280_Low_HTZ_100, 283_High_TCZ_100, 283_High_ECZ_100, 283_High_HTZ_100, 283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 283_Moderate_HTZ_100, 283_Low_TCZ_100, 283_Verylow_TCZ_100, 283_Verylow_ECZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Low_TCZ_100, 1330_Low_TCZ_5, 1330_Low_ECZ_100, 1330_Low_ECZ_5, 1330_Low_HTZ_100, 1330_Low_HTZ_5,	36.4	480

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		1330_Verylow_TCZ_100, 1330_Verylow_TCZ_25-100, 1330_Verylow_ECZ_100, 1330_Verylow_ECZ_25-100, 1330_Verylow_HTZ_100, 1330_Verylow_HTZ_25-100		
Leucochrysum albicans var. *tricolor*	Hoary Sunray	679_Moderate_ECZ_100, 679_Moderate_HTZ_100, 679_Low_TCZ_100, 679_Low_ECZ_100, 727_Veryhigh_TCZ_100, 727_Moderate_TCZ_100, 727_Moderate_TCZ_5, 727_Moderate_ECZ_5, 727_Moderate_HTZ_5, 727_Verylow_TCZ_100, 731_High_TCZ_100, 731_High_HTZ_100, 731_Moderate_TCZ_100, 731_Moderate_ECZ_100, 731_Moderate_HTZ_100, 731_Low_TCZ_100, 952_Moderate_ECZ_100, 952_Verylow_TCZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_TCZ_5, 1093_Moderate_ECZ_100, 1093_Moderate_HTZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1093_Verylow_TCZ_100, 1093_Verylow_ECZ_100, 1191_Low_TCZ_100, 1191_Low_ECZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Low_TCZ_100, 1330_Low_TCZ_5, 1330_Low_ECZ_100, 1330_Low_HTZ_100, 1330_Verylow_TCZ_100, 1330_Verylow_TCZ_25-100, 1330_Verylow_ECZ_100, 1330_Verylow_HTZ_100	2978 (count)	5956
Litoria castanea	Yellow-spotted Tree Frog	335_High_TCZ_100, 1256_Low_TCZ_100, 1256_Low_ECZ_100	0.8	42
Ninox strenua	Powerful Owl	283_High_TCZ_100, 283_High_ECZ_100, 283_High_HTZ_100, 283_Moderate_ECZ_100, 283_Moderate_HTZ_100, 727_Veryhigh_TCZ_100, 727_Veryhigh_ECZ_100, 727_Veryhigh_HTZ_100, 727_Moderate_TCZ_100, 727_Moderate_ECZ_100, 731_High_TCZ_100, 731_High_ECZ_100, 731_High_HTZ_100, 731_Moderate_TCZ_100,	27.6	787

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		731_Moderate_ECZ_100, 731_Moderate_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1093_Low_HTZ_100, 1151_Veryhigh_TCZ_100, 1151_Veryhigh_ECZ_100, 1151_Veryhigh_HTZ_100, 1151_High_TCZ_100, 1151_High_ECZ_100, 1151_High_HTZ_100, 1151_Moderate_TCZ_100, 1151_Moderate_ECZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100		
Petauroides volans	Greater Glider	731_Moderate_TCZ_100, 731_Moderate_ECZ_100, 731_Moderate_HTZ_100, 1093_Moderate_TCZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100	4.0	113
Petaurus norfolcensis	Squirrel Glider	283_High_TCZ_100, 283_High_ECZ_100, 283_High_HTZ_100, 283_Moderate_ECZ_100, 283_Moderate_HTZ_100, 731_Moderate_TCZ_100, 731_Moderate_ECZ_100, 731_Moderate_HTZ_100, 1093_Moderate_ECZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1093_Low_HTZ_100, 1151_Veryhigh_TCZ_100, 1151_Veryhigh_ECZ_100, 1151_Veryhigh_HTZ_100, 1151_High_TCZ_100, 1151_High_ECZ_100, 1151_High_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_ECZ_5, 1330_Low_HTZ_100, 1330_Low_HTZ_5	14.4	425
Phascolarctos cinereus	Koala	280_Moderate_TCZ_100, 280_Moderate_ECZ_100, 280_Moderate_HTZ_100, 283_High_TCZ_100, 283_High_ECZ_100,	39.2	1073

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		283_High_HTZ_100, 283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 283_Moderate_HTZ_100, 283_Low_TCZ_100, 679_High_ECZ_100, 679_High_HTZ_100, 679_Moderate_ECZ_100, 679_Moderate_HTZ_100, 727_Veryhigh_TCZ_100, 727_Veryhigh_ECZ_100, 727_Veryhigh_HTZ_100, 727_Moderate_TCZ_100, 727_Moderate_TCZ_5, 727_Moderate_ECZ_100, 727_Moderate_ECZ_5, 727_Moderate_HTZ_5, 731_High_TCZ_100, 731_High_ECZ_100, 731_High_HTZ_100, 731_Moderate_TCZ_100, 731_Moderate_ECZ_100, 731_Moderate_HTZ_100, 952_Moderate_TCZ_100, 952_Moderate_ECZ_100, 952_Low_TCZ_100, 952_Low_ECZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_TCZ_5, 1093_Moderate_ECZ_100, 1093_Moderate_HTZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1093_Low_ECZ_5, 1093_Low_HTZ_100, 1151_Veryhigh_TCZ_100, 1151_Veryhigh_ECZ_100, 1151_Veryhigh_HTZ_100, 1151_High_TCZ_100, 1151_High_ECZ_100, 1151_High_HTZ_100, 1151_Moderate_TCZ_100, 1151_Moderate_ECZ_100, 1151_Moderate_HTZ_100, 1191_Low_TCZ_100, 1191_Low_ECZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Low_TCZ_100, 1330_Low_TCZ_5, 1330_Low_ECZ_100, 1330_Low_ECZ_5, 1330_Low_HTZ_100, 1330_Low_HTZ_5		
Polytelis swainsonii	Superb Parrot	280_Moderate_TCZ_100, 280_Moderate_ECZ_100, 280_Moderate_HTZ_100, 283_High_TCZ_100, 283_High_ECZ_100, 283_High_HTZ_100, 283_Moderate_ECZ_100,	7.2	192

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		283_Moderate_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_ECZ_5, 1330_Low_HTZ_100, 1330_Low_HTZ_5		
Thesium australe	Austral Toadflax	679_High_ECZ_100, 679_High_HTZ_100, 679_Moderate_ECZ_100, 679_Moderate_HTZ_100, 679_Low_TCZ_100, 679_Low_ECZ_100, 1191_Low_TCZ_100, 1191_Low_ECZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Low_TCZ_100, 1330_Low_TCZ_5, 1330_Low_ECZ_100, 1330_Low_HTZ_100, 1330_Verylow_TCZ_100, 1330_Verylow_TCZ_25-100, 1330_Verylow_ECZ_100, 1330_Verylow_ECZ_25-100, 1330_Verylow_HTZ_100, 1330_Verylow_HTZ_25-100	30.3	253
Total				**13,944**

Table 15-12: Species credits for Murrumbateman IBRA subregion

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Ammobium craspedioides	Yass Daisy	266_Low_TCZ_100, 266_Low_ECZ_100, 283_High_TCZ_100, 283_High_ECZ_100, 287_High_TCZ_100, 287_Low_TCZ_100, 287_Verylow_TCZ_100, 352_Moderate_TCZ_100, 352_Moderate_ECZ_100, 352_Low_TCZ_100, 352_Low_ECZ_100, 352_Verylow_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_TCZ_5, 1330_Moderate_ECZ_5, 1330_Moderate_HTZ_5, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100, 1330_Verylow_TCZ_100, 1330_Verylow_ECZ_100, 1330_Verylow_HTZ_100	272 (count)	544
Aprasia parapulchella	Pink-tailed Legless Lizard	266_Low_TCZ_100, 278_Verylow_TCZ_100, 280_High_TCZ_100, 280_High_ECZ_100, 280_High_HTZ_100, 280_Moderate_TCZ_100, 280_Moderate_TCZ_5, 280_Low_TCZ_100, 280_Low_ECZ_100, 322_High_TCZ_100, 322_High_ECZ_100, 322_High_HTZ_100, 322_Verylow_TCZ_100, 351_Moderate_TCZ_100, 351_Moderate_ECZ_100, 351_Moderate_HTZ_100, 351_Low_TCZ_100, 351_Low_ECZ_100, 351_Verylow_TCZ_100, 731_High_TCZ_100, 731_High_ECZ_100, 731_High_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_TCZ_5, 1330_Moderate_ECZ_100, 1330_Moderate_ECZ_5, 1330_Moderate_HTZ_100, 1330_Moderate_HTZ_5, 1330_Low_TCZ_100, 1330_Low_TCZ_5, 1330_Low_ECZ_100, 1330_Low_HTZ_100, 1330_Verylow_TCZ_100, 1330_Verylow_ECZ_100, 1330_Verylow_HTZ_100	37.1	497

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Caladenia concolor	Crimson Spider Orchid	280_High_TCZ_100, 280_High_ECZ_100, 280_High_HTZ_100, 280_Moderate_TCZ_100, 280_Moderate_TCZ_5, 280_Moderate_ECZ_100, 280_Moderate_HTZ_100	3.6	114
Callocephalon fimbriatum	Gang-gang Cockatoo	266_Moderate_TCZ_100, 266_Moderate_ECZ_100, 280_High_TCZ_100, 280_High_ECZ_100, 280_High_HTZ_100, 280_Moderate_TCZ_100, 280_Moderate_ECZ_100, 283_Veryhigh_TCZ_100, 283_Veryhigh_ECZ_100, 283_Veryhigh_HTZ_100, 283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 287_High_TCZ_100, 287_High_ECZ_100, 287_Low_TCZ_100, 287_Low_TCZ_5, 322_High_TCZ_100, 322_High_ECZ_100, 322_High_HTZ_100, 349_High_TCZ_100, 349_High_ECZ_100, 349_High_HTZ_100, 351_Moderate_TCZ_100, 351_Moderate_ECZ_100, 351_Moderate_HTZ_100, 351_Low_TCZ_100, 352_Moderate_TCZ_100, 352_Moderate_ECZ_100, 352_Moderate_HTZ_100, 352_Low_TCZ_100, 352_Low_ECZ_100, 731_High_TCZ_100, 1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Moderate_HTZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_ECZ_100, 1330_Moderate_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100	28.6	741
Calyptorhynchus lathami	Glossy Black-Cockatoo	322_High_TCZ_100, 322_High_ECZ_100, 322_High_HTZ_100,	18.8	509

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Moderate_HTZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_ECZ_100, 1330_Moderate_ECZ_5, 1330_Moderate_HTZ_100, 1330_Moderate_HTZ_5, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100		
Cercartetus nanus	Eastern Pygmy-possum	283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 287_High_TCZ_100, 287_High_ECZ_100, 287_Low_TCZ_100, 287_Low_TCZ_5, 287_Low_ECZ_100, 352_Moderate_TCZ_100, 352_Moderate_ECZ_100, 352_Moderate_HTZ_100, 352_Low_TCZ_100, 352_Low_ECZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Moderate_HTZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_ECZ_100, 1330_Moderate_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100	6.0	143
Delma impar	Striped Legless Lizard	1330_Very high_FCZ_100, 1330_Very high_ECZ_100, 1330_Very high_HTZ_100, 1330_High_FCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_FCZ_100, 1330_Moderate_FCZ_5, 1330_Moderate_ECZ_100, 1330_Moderate_ECZ_5, 1330_Moderate_HTZ_100, 1330_Moderate_HTZ_5, 1330_Low_FCZ_100, 1330_Low_FCZ_5, 1330_Low_ECZ_100, 1330_Low_HTZ_100, 1330_Very low_FCZ_100, 1330_Very low_ECZ_100, 1330_Very low_HTZ_100,	54.8	551

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Grevillea iaspicula	Wee Jasper Grevillea	266_Low_TCZ_100, 1330_Moderate_TCZ_5, 1330_Moderate_ECZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100	9 (count)	27
Haliaeetus leucogaster	White-bellied Sea-Eagle	283_High_TCZ_100, 283_High_ECZ_100, 283_High_HTZ_100, 283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 287_High_TCZ_100, 287_High_ECZ_100, 287_Low_TCZ_100, 287_Low_TCZ_5, 287_Low_ECZ_100, 352_Low_TCZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_ECZ_100, 1330_Moderate_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100	3.3	73
Hieraaetus morphnoides	Little Eagle	266_Moderate_TCZ_100, 266_Moderate_ECZ_100, 280_High_TCZ_100, 280_High_ECZ_100, 280_High_HTZ_100, 280_Moderate_TCZ_100, 280_Moderate_ECZ_100, 283_Veryhigh_TCZ_100, 283_Veryhigh_ECZ_100, 283_Veryhigh_HTZ_100, 283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 287_High_TCZ_100, 287_High_ECZ_100, 287_Low_TCZ_100, 287_Low_TCZ_5, 287_Low_ECZ_100, 322_High_TCZ_100, 322_High_ECZ_100, 322_High_HTZ_100, 349_High_TCZ_100, 349_High_ECZ_100, 349_High_HTZ_100, 349_Moderate_TCZ_100, 349_Low_TCZ_100, 351_Moderate_TCZ_100, 351_Moderate_ECZ_100, 351_Moderate_HTZ_100, 351_Low_TCZ_100, 351_Low_ECZ_100, 352_Moderate_TCZ_100, 352_Moderate_ECZ_100, 352_Moderate_HTZ_100, 352_Low_TCZ_100, 352_Low_ECZ_100, 731_High_TCZ_100, 731_High_ECZ_100, 731_High_HTZ_100, 1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100,	38.0	728

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Moderate_HTZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1093_Low_HTZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_ECZ_100, 1330_Moderate_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100		
Keyacris scurra	Key's Matchstick Grasshopper	266_Moderate_TCZ_100, 266_Moderate_ECZ_100, 266_Low_TCZ_100, 266_Low_TCZ_5, 266_Low_ECZ_100, 266_Low_ECZ_5, 278_Verylow_TCZ_100, 283_Veryhigh_TCZ_100, 283_Veryhigh_ECZ_100, 283_Veryhigh_HTZ_100, 283_High_TCZ_100, 283_High_ECZ_100, 283_High_HTZ_100, 283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_TCZ_5, 1330_Moderate_ECZ_100, 1330_Moderate_ECZ_5, 1330_Moderate_HTZ_100, 1330_Moderate_HTZ_5, 1330_Low_TCZ_100, 1330_Low_TCZ_5, 1330_Low_ECZ_100, 1330_Low_HTZ_100, 1330_Verylow_TCZ_100, 1330_Verylow_ECZ_100, 1330_Verylow_HTZ_100	59.5	788
Leucochrysum albicans var. *tricolor*	Hoary Sunray	349_Moderate_TCZ_100, 349_Low_TCZ_100, 351_Moderate_TCZ_100, 351_Moderate_ECZ_100, 351_Moderate_HTZ_100, 351_Low_TCZ_100, 351_Low_ECZ_100, 351_Verylow_TCZ_100, 352_Moderate_TCZ_100, 352_Moderate_ECZ_100, 352_Moderate_HTZ_100, 352_Low_TCZ_100,	3037 (count)	6074

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		352_Low_ECZ_100, 352_Verylow_TCZ_100, 352_Verylow_ECZ_100, 352_Verylow_HTZ_101, 731_High_ECZ_100, 731_High_HTZ_100, 1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Moderate_HTZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1093_Verylow_TCZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_TCZ_5, 1330_Moderate_ECZ_100, 1330_Moderate_ECZ_5, 1330_Moderate_HTZ_100, 1330_Moderate_HTZ_5, 1330_Low_TCZ_100, 1330_Low_TCZ_5, 1330_Low_ECZ_100, 1330_Low_HTZ_100, 1330_Verylow_TCZ_100, 1330_Verylow_ECZ_100, 1330_Verylow_HTZ_100		
Lophoictinia isura	Square-tailed Kite	266_Moderate_TCZ_100, 266_Moderate_ECZ_100, 280_High_TCZ_100, 280_High_ECZ_100, 280_High_HTZ_100, 280_Moderate_TCZ_100, 280_Moderate_ECZ_100, 283_Veryhigh_TCZ_100, 283_Veryhigh_ECZ_100, 283_Veryhigh_HTZ_100, 283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 287_High_TCZ_100, 287_High_ECZ_100, 287_Low_TCZ_100, 287_Low_TCZ_5, 287_Low_ECZ_100, 322_High_TCZ_100, 322_High_ECZ_100, 322_High_HTZ_100, 352_Moderate_TCZ_100, 352_Moderate_ECZ_100, 352_Moderate_HTZ_100, 352_Low_TCZ_100, 352_Low_ECZ_100, 731_High_TCZ_100, 731_High_ECZ_100, 731_High_HTZ_100, 1093_Veryhigh_TCZ_100,	19.6	418

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Moderate_HTZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1093_Low_HTZ_100		
Miniopterus orianae oceanensis	Large Bent-winged Bat	351_Moderate_ECZ_100, 351_Moderate_HTZ_100	0.1	4
Myotis macropus	Southern Myotis	349_Moderate_TCZ_100, 349_Moderate_TCZ_5-25, 349_Low_TCZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_ECZ_100, 1330_Moderate_ECZ_5, 1330_Moderate_HTZ_100, 1330_Moderate_HTZ_5, 1330_Low_TCZ_100, 1330_Low_TCZ_5, 1330_Low_ECZ_100, 1330_Low_HTZ_100	8.1	180
Ninox strenua	Powerful Owl	283_Veryhigh_TCZ_100, 283_Veryhigh_ECZ_100, 283_Veryhigh_HTZ_100, 283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 287_High_TCZ_100, 287_High_ECZ_100, 287_Low_TCZ_100, 287_Low_TCZ_5, 351_Moderate_TCZ_100, 351_Moderate_ECZ_100, 351_Moderate_HTZ_100, 351_Low_TCZ_100, 352_Moderate_TCZ_100, 352_Moderate_ECZ_100, 352_Moderate_HTZ_100, 352_Low_TCZ_100, 352_Low_ECZ_100, 731_High_TCZ_100, 1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Moderate_HTZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1093_Low_HTZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100,	26.4	672

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		1330_Veryhigh_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_ECZ_100, 1330_Moderate_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100		
Petauroides volans	Greater Glider	351_Moderate_TCZ_100, 351_Moderate_ECZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100	1.7	43
Petaurus norfolcensis	Squirrel Glider	266_Moderate_TCZ_100, 266_Moderate_ECZ_100, 280_High_TCZ_100, 280_High_ECZ_100, 280_High_HTZ_100, 283_High_TCZ_100, 283_High_ECZ_100, 283_High_HTZ_100, 283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 287_High_TCZ_100, 287_High_ECZ_100, 287_Low_TCZ_100, 287_Low_TCZ_5, 322_High_TCZ_100, 322_High_ECZ_100, 322_High_HTZ_100, 351_Moderate_TCZ_100, 351_Moderate_ECZ_100, 351_Moderate_HTZ_100, 351_Low_TCZ_100, 352_Moderate_TCZ_100, 352_Moderate_ECZ_100, 352_Moderate_HTZ_100, 352_Low_TCZ_100, 352_Low_ECZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_ECZ_100, 1330_Moderate_ECZ_5, 1330_Moderate_HTZ_100, 1330_Moderate_HTZ_5, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Low_HTZ_100	12.5	259
Phascolarctos cinereus	Koala	266_Moderate_TCZ_100, 266_Moderate_ECZ_100, 266_Low_TCZ_5, 266_Low_ECZ_5, 280_High_TCZ_100, 280_High_ECZ_100, 280_High_HTZ_100, 280_Moderate_TCZ_100, 280_Moderate_TCZ_5, 280_Moderate_ECZ_100,	41.7	1032

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		283_Veryhigh_TCZ_100, 283_Veryhigh_ECZ_100, 283_Veryhigh_HTZ_100, 283_High_TCZ_100, 283_High_ECZ_100, 283_High_HTZ_100, 283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 287_High_TCZ_100, 287_High_ECZ_100, 287_Low_TCZ_100, 287_Low_TCZ_5, 287_Low_ECZ_100, 322_High_TCZ_100, 322_High_ECZ_100, 322_High_HTZ_100, 349_High_TCZ_100, 349_High_ECZ_100, 349_High_HTZ_100, 349_Moderate_TCZ_100, 349_Moderate_TCZ_5-25, 349_Moderate_ECZ_5-25, 349_Moderate_HTZ_5-25, 349_Low_TCZ_100, 351_Moderate_TCZ_100, 351_Moderate_ECZ_100, 351_Moderate_HTZ_100, 351_Low_TCZ_100, 351_Low_ECZ_100, 352_Moderate_TCZ_100, 352_Moderate_ECZ_100, 352_Moderate_HTZ_100, 352_Low_TCZ_100, 352_Low_ECZ_100, 731_High_TCZ_100, 731_High_ECZ_100, 731_High_HTZ_100, 1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_Veryhigh_HTZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Moderate_HTZ_100, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1093_Low_HTZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_TCZ_5, 1330_Moderate_ECZ_100, 1330_Moderate_ECZ_5, 1330_Moderate_HTZ_100, 1330_Moderate_HTZ_5, 1330_Low_TCZ_100, 1330_Low_TCZ_5, 1330_Low_ECZ_100, 1330_Low_HTZ_100		

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Polytelis swainsonii	Superb Parrot	266_Moderate_TCZ_100, 266_Moderate_ECZ_100, 280_High_TCZ_100, 280_High_ECZ_100, 280_High_HTZ_100, 280_Moderate_TCZ_100, 280_Moderate_ECZ_100, 283_Veryhigh_TCZ_100, 283_Veryhigh_ECZ_100, 283_Veryhigh_HTZ_100, 283_High_TCZ_100, 283_High_ECZ_100, 283_High_HTZ_100, 283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 322_High_TCZ_100, 322_High_ECZ_100, 322_High_HTZ_100, 349_High_TCZ_100, 349_High_ECZ_100, 349_High_HTZ_100, 352_Moderate_TCZ_100, 352_Moderate_ECZ_100, 352_Moderate_HTZ_100, 352_Low_TCZ_100, 352_Low_ECZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_TCZ_5, 1330_Moderate_ECZ_100, 1330_Moderate_ECZ_5, 1330_Moderate_HTZ_100, 1330_Moderate_HTZ_5, 1330_Low_TCZ_100, 1330_Low_TCZ_5, 1330_Low_ECZ_100, 1330_Low_HTZ_100	18.0	394
Pomaderris pallida	Pale Pomaderris	1093_Veryhigh_TCZ_100, 1093_Veryhigh_ECZ_100, 1093_High_TCZ_100, 1093_High_ECZ_100, 1093_High_HTZ_100, 1093_Moderate_TCZ_100, 1093_Moderate_ECZ_100, 1093_Moderate_HTZ_100	0.77	40
Prasophyllum petilum	Tarengo Leek Orchid	1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_TCZ_5, 1330_Moderate_ECZ_100, 1330_Moderate_ECZ_5, 1330_Moderate_HTZ_100, 1330_Moderate_HTZ_5, 1330_Low_TCZ_100, 1330_Low_TCZ_5, 1330_Low_ECZ_100,	11.2	210

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		1330_Low_HTZ_100		
Swainsona recta	Small Purple-pea	266_Moderate_TCZ_100, 266_Low_TCZ_100, 266_Low_TCZ_5, 266_Low_ECZ_100, 266_Low_ECZ_5, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_TCZ_5, 1330_Moderate_ECZ_100, 1330_Moderate_ECZ_5, 1330_Moderate_HTZ_100, 1330_Moderate_HTZ_5, 1330_Low_TCZ_100, 1330_Low_TCZ_5, 1330_Low_ECZ_100, 1330_Low_HTZ_100, 1330_Verylow_TCZ_100, 1330_Verylow_ECZ_100, 1330_Verylow_HTZ_100	35.8	421
Swainsona sericea	Silky Swainson-pea	266_Moderate_TCZ_100, 266_Low_TCZ_100, 266_Low_TCZ_5, 266_Low_ECZ_100, 266_Low_ECZ_5, 280_High_TCZ_100, 280_High_ECZ_100, 280_High_HTZ_100, 280_Moderate_TCZ_100, 280_Moderate_TCZ_5, 280_Moderate_ECZ_100, 280_Moderate_HTZ_100, 280_Low_TCZ_100, 280_Verylow_TCZ_100, 283_Veryhigh_TCZ_100, 283_High_TCZ_100, 283_High_ECZ_100, 283_High_HTZ_100, 283_Moderate_TCZ_100, 283_Moderate_ECZ_100, 1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_TCZ_5, 1330_Moderate_ECZ_100, 1330_Moderate_ECZ_5, 1330_Moderate_HTZ_100, 1330_Moderate_HTZ_5, 1330_Low_TCZ_100, 1330_Low_TCZ_5, 1330_Low_ECZ_100, 1330_Low_HTZ_100, 1330_Verylow_TCZ_100, 1330_Verylow_ECZ_100, 1330_Verylow_HTZ_100, 280_Low_ECZ_100	46.6	505

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Synemon plana	Golden Sun Moth	280_High_TCZ_100, 280_High_HTZ_100, 280_Moderate_TCZ_100, 280_Moderate_TCZ_5, 280_Moderate_ECZ_100, 280_Moderate_HTZ_100, 280_Low_TCZ_100, 280_Verylow_TCZ_100, 287_High_TCZ_100, 287_High_ECZ_100, 287_Low_TCZ_100, 349_Moderate_TCZ_5-25, 349_Low_ECZ_100, 352_Verylow_TCZ_100, 352_Verylow_ECZ_100, 352_Verylow_HTZ_101, 1093_Low_TCZ_100, 1093_Low_ECZ_100, 1093_Verylow_TCZ_100, 1330_Moderate_TCZ_100, 1330_Low_TCZ_100, 1330_Low_ECZ_100, 1330_Verylow_TCZ_100, 1330_Verylow_ECZ_100, 1330_Verylow_HTZ_100	16.1	118
Thesium australe	Austral Toadflax	1330_Veryhigh_TCZ_100, 1330_Veryhigh_ECZ_100, 1330_Veryhigh_HTZ_100, 1330_High_TCZ_100, 1330_High_ECZ_100, 1330_High_HTZ_100, 1330_Moderate_TCZ_100, 1330_Moderate_TCZ_5, 1330_Moderate_ECZ_100, 1330_Moderate_ECZ_5, 1330_Moderate_HTZ_100, 1330_Moderate_HTZ_5, 1330_Low_TCZ_100, 1330_Low_TCZ_5, 1330_Low_ECZ_100, 1330_Low_HTZ_100, 1330_Verylow_TCZ_100, 1330_Verylow_ECZ_100, 1330_Verylow_HTZ_100	41.3	412
Total				**15,497**

Table 15-13: Species credits for Inland Slopes IBRA subregion

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Acacia ausfeldii	Ausfeld's Wattle	266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100,	14.6	383
Acacia phasmoides	Phantom Wattle	287_Moderate_FCZ_100, 287_Moderate_ECZ_100, 287_Moderate_HTZ_100,	2 (count)	6
Ammobium craspedioides	Yass Daisy	266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 268_High_FCZ_100, 268_High_ECZ_100, 268_High_HTZ_100, 268_Moderate_FCZ_100, 268_Moderate_ECZ_100, 268_Moderate_HTZ_100, 268_Low_FCZ_100, 268_Low_ECZ_100, 268_Low_ECZ_5, 268_Low_HTZ_100, 268_Low_HTZ_5, 268_Very low_HTZ_100, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100, 277_Low_FCZ_5-25, 277_Low_FCZ_5, 277_Low_ECZ_100, 277_Low_ECZ_5, 277_Low_HTZ_100, 277_Low_HTZ_5, 277_Very low_FCZ_100, 277_Very low_FCZ_5-25, 277_Very low_FCZ_5, 277_Very low_ECZ_100, 277_Very low_ECZ_5, 277_Very low_HTZ_100, 277_Very low_HTZ_5, 287_Moderate_FCZ_100, 287_Moderate_ECZ_100, 287_Moderate_HTZ_100, 287_Very low_FCZ_100, 287_Very low_ECZ_100, 287_Very low_HTZ_100, 290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100,	672 (count)	1344

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		290_Low_FCZ_100, 290_Low_FCZ_5, 290_Low_ECZ_100, 290_Low_HTZ_100, 290_Very low_FCZ_100, 290_Very low_ECZ_100, 290_Very low_HTZ_100, 294_Moderate_FCZ_100, 294_Moderate_ECZ_100, 294_Moderate_HTZ_100, 294_Low_FCZ_100, 294_Low_ECZ_100, 294_Low_HTZ_100, 343_Moderate_FCZ_100, 343_Moderate_ECZ_100, 343_Moderate_HTZ_100, 343_Low_FCZ_100, 343_Low_ECZ_100, 343_Low_HTZ_100, 343_Very low_FCZ_100, 343_Very low_ECZ_100, 343_Very low_HTZ_100, 352_Low_FCZ_100, 352_Low_FCZ_5-25, 352_Low_ECZ_100, 352_Low_HTZ_100, 352_Very low_FCZ_100, 1330_Moderate_FCZ_100,		
Aprasia parapulchella	Pink-tailed Legless Lizard	266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 277_High_FCZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100, 277_Low_ECZ_100, 277_Low_HTZ_100, 277_Very low_FCZ_100, 277_Very low_FCZ_5-25, 277_Very low_ECZ_100, 277_Very low_HTZ_100, 278_High_FCZ_100, 278_High_ECZ_100, 278_High_HTZ_100, 278_Moderate_FCZ_100, 278_Moderate_FCZ_5, 278_Moderate_ECZ_100, 278_Moderate_HTZ_100, 278_Very low_FCZ_100, 278_Very low_ECZ_100, 278_Very low_HTZ_100, 280_High_FCZ_100, 280_High_FCZ_25-100, 280_High_ECZ_100, 280_High_ECZ_25-100, 280_High_HTZ_100, 280_High_HTZ_25-100, 280_Moderate_FCZ_100, 280_Moderate_FCZ_25-100, 280_Moderate_ECZ_100, 280_Moderate_ECZ_25-100,	86.3	1112

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		280_Moderate_HTZ_100, 280_Moderate_HTZ_25-100, 280_Very low_FCZ_100, 280_Very low_ECZ_100, 280_Very low_HTZ_100, 290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100, 290_Low_FCZ_100, 290_Low_FCZ_5, 290_Low_ECZ_100, 290_Low_HTZ_100, 290_Very low_FCZ_100, 290_Very low_ECZ_100, 290_Very low_HTZ_100, 294_Moderate_FCZ_100, 294_Moderate_ECZ_100, 294_Moderate_HTZ_100, 294_Low_FCZ_100, 294_Low_ECZ_100, 294_Low_HTZ_100, 319_High_FCZ_100, 319_High_ECZ_100, 319_High_HTZ_100, 319_Low_FCZ_100, 319_Low_ECZ_100, 319_Low_HTZ_100, 731_Low_FCZ_100, 731_Low_ECZ_100, 731_Low_HTZ_100, 731_Very low_FCZ_100, 1191_Moderate_FCZ_100, 1191_Moderate_ECZ_100, 1191_Moderate_HTZ_100, 1330_Moderate_FCZ_100,		
Bossiaea fragrans	Bossiaea fragrans	268_High_FCZ_100, 268_High_ECZ_100, 268_High_HTZ_100, 268_Moderate_FCZ_100, 268_Moderate_ECZ_100, 268_Moderate_HTZ_100, 268_Low_FCZ_100, 268_Low_ECZ_100, 268_Low_ECZ_5, 268_Low_HTZ_100, 268_Low_HTZ_5, 268_Very low_HTZ_100,	6.1	175
Burhinus grallarius	Bush Stone-curlew	5_High_FCZ_100, 5_High_ECZ_100, 5_High_HTZ_100, 5_Low_FCZ_100, 266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100,	60.5	1222

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		277_Low_FCZ_100, 277_Low_FCZ_5, 277_Low_ECZ_100, 277_Low_ECZ_5, 277_Low_HTZ_100, 277_Low_HTZ_5, 280_High_FCZ_100, 280_High_FCZ_25-100, 280_High_ECZ_100, 280_High_ECZ_25-100, 280_High_HTZ_100, 280_High_HTZ_25-100, 280_Moderate_FCZ_100, 280_Moderate_FCZ_25-100, 280_Moderate_ECZ_100, 280_Moderate_ECZ_25-100, 280_Moderate_HTZ_100, 280_Moderate_HTZ_25-100, 280_Low_FCZ_100, 280_Low_ECZ_100, 287_Moderate_FCZ_100, 287_Moderate_ECZ_100, 287_Moderate_HTZ_100, 290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100, 290_Low_FCZ_100, 290_Low_FCZ_5, 290_Low_ECZ_100, 290_Low_HTZ_100, 343_Moderate_FCZ_100, 343_Moderate_ECZ_100, 343_Moderate_HTZ_100, 343_Low_FCZ_100, 343_Low_ECZ_100, 343_Low_HTZ_100, 352_Low_FCZ_100, 352_Low_ECZ_100, 352_Low_HTZ_100, 1330_Moderate_FCZ_100,		
Caesia parviflora var. minor	Small Pale Grass-lily	297_Moderate_FCZ_100, 297_Moderate_ECZ_100, 297_Moderate_HTZ_100, 297_Low_FCZ_100, 297_Low_ECZ_100, 297_Low_HTZ_100,	0.2	7
Caladenia concolor	Crimson Spider Orchid	268_High_FCZ_100, 268_High_ECZ_100, 268_High_HTZ_100, 268_Moderate_FCZ_100, 268_Moderate_ECZ_100, 268_Moderate_HTZ_100, 280_High_FCZ_100, 280_High_FCZ_25-100, 280_High_ECZ_100, 280_High_ECZ_25-100, 280_High_HTZ_100, 280_High_HTZ_25-100, 280_Moderate_FCZ_100, 280_Moderate_FCZ_25-100, 280_Moderate_ECZ_100, 280_Moderate_ECZ_25-100, 280_Moderate_HTZ_100, 280_Moderate_HTZ_25-100, 290_High_FCZ_100,	30.5	1238

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		290_High_ECZ_100, 290_High_HTZ_100,		
Callocephalon fimbriatum	Gang-gang Cockatoo	5_High_FCZ_100, 5_High_ECZ_100, 5_High_HTZ_100, 5_Low_FCZ_100, 266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 268_High_FCZ_100, 268_High_ECZ_100, 268_High_HTZ_100, 268_Moderate_FCZ_100, 268_Moderate_ECZ_100, 268_Moderate_HTZ_100, 268_Low_FCZ_100, 268_Low_ECZ_100, 268_Low_HTZ_100, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100, 277_Low_ECZ_100, 277_Low_HTZ_100, 278_High_FCZ_100, 278_High_ECZ_100, 278_High_HTZ_100, 278_Moderate_FCZ_100, 278_Moderate_ECZ_100, 278_Moderate_HTZ_100, 280_High_FCZ_100, 280_High_FCZ_25-100, 280_High_ECZ_100, 280_High_ECZ_25-100, 280_High_HTZ_100, 280_High_HTZ_25-100, 280_Moderate_FCZ_100, 280_Moderate_FCZ_25-100, 280_Moderate_ECZ_100, 280_Moderate_ECZ_25-100, 280_Moderate_HTZ_100, 280_Moderate_HTZ_25-100, 290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100, 290_Low_FCZ_100, 290_Low_ECZ_100, 290_Low_HTZ_100, 294_Moderate_FCZ_100, 294_Moderate_ECZ_100, 294_Moderate_HTZ_100, 294_Low_FCZ_100, 294_Low_ECZ_100, 294_Low_HTZ_100, 314_Moderate_FCZ_100, 314_Moderate_ECZ_100,	45.4	1013

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		314_Moderate_HTZ_100, 314_Low_FCZ_100, 316_Very high_FCZ_100, 316_Very high_ECZ_100, 316_Very high_HTZ_100, 316_High_FCZ_100, 316_High_ECZ_100, 316_High_HTZ_100, 316_Moderate_FCZ_100, 316_Moderate_ECZ_100, 316_Moderate_HTZ_100, 316_Low_FCZ_100, 343_Moderate_FCZ_100, 343_Moderate_ECZ_100, 343_Moderate_HTZ_100, 343_Low_FCZ_100, 343_Low_ECZ_100, 343_Low_HTZ_100, 1330_Moderate_FCZ_100,		
Calyptorhynchus lathami	Glossy Black-Cockatoo	266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 290_Low_FCZ_100, 290_Low_ECZ_100, 290_Low_HTZ_100, 343_Moderate_FCZ_100, 343_Moderate_ECZ_100, 343_Moderate_HTZ_100, 343_Low_FCZ_100, 343_Low_ECZ_100, 343_Low_HTZ_100, 1330_Moderate_FCZ_100,	11.5	218
Cercartetus nanus	Eastern Pygmy-possum	268_Moderate_FCZ_100, 268_Moderate_ECZ_100, 268_Moderate_HTZ_100, 268_Low_FCZ_100, 268_Low_ECZ_100, 268_Low_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100, 277_Low_ECZ_100, 277_Low_HTZ_100, 280_High_FCZ_100, 280_High_ECZ_100, 280_High_HTZ_100, 280_Moderate_FCZ_100, 280_Moderate_ECZ_100, 280_Moderate_HTZ_100, 287_Moderate_FCZ_100, 287_Moderate_ECZ_100, 287_Moderate_HTZ_100, 294_Moderate_FCZ_100, 294_Moderate_ECZ_100, 294_Moderate_HTZ_100, 294_Low_ECZ_100, 294_Low_HTZ_100, 314_Very high_FCZ_100,	16.3	311

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		314_Moderate_FCZ_100, 314_Moderate_ECZ_100, 314_Moderate_HTZ_100, 314_Low_FCZ_100, 314_Low_ECZ_100, 314_Low_HTZ_100,		
Crinia sloanei	Sloane's Froglet	5_High_FCZ_100, 5_High_ECZ_100, 5_High_HTZ_100, 5_Low_FCZ_100, 5_Low_ECZ_100, 5_Low_HTZ_100,	2.6	27
Cullen parvum	Small Scurf-pea	5_High_FCZ_100, 5_High_ECZ_100, 5_High_HTZ_100, 5_Low_FCZ_100, 5_Low_ECZ_100, 5_Low_HTZ_100, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100, 277_Low_FCZ_5-25, 277_Low_FCZ_5, 277_Low_ECZ_100, 277_Low_ECZ_5, 277_Low_HTZ_100, 277_Low_HTZ_5, 277_Very low_FCZ_100, 277_Very low_FCZ_5-25, 277_Very low_FCZ_5, 277_Very low_ECZ_100, 277_Very low_ECZ_5, 277_Very low_HTZ_100, 277_Very low_HTZ_5,	71.7	916
Delma impar	Striped Legless Lizard	277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100, 277_Low_FCZ_5-25, 277_Low_FCZ_5, 277_Low_ECZ_100, 277_Low_ECZ_5, 277_Low_HTZ_100, 277_Low_HTZ_5, 277_Very low_FCZ_100, 277_Very low_FCZ_5-25, 277_Very low_FCZ_5, 277_Very low_ECZ_100, 277_Very low_ECZ_5, 277_Very low_HTZ_100, 277_Very low_HTZ_5, 1330_Moderate_FCZ_100, 731_Low_FCZ_100, 731_Low_ECZ_100, 731_Low_HTZ_100, 731_Very low_FCZ_100,	70.1	680
Diuris tricolor	Pine Donkey Orchid	731_Low_FCZ_100, 731_Low_ECZ_100, 731_Low_HTZ_100, 731_Very low_FCZ_100,	1.4	12

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Eucalyptus aggregata	Black Gum	1191_Moderate_FCZ_100, 1191_Moderate_ECZ_100, 1191_Moderate_HTZ_100,	1 (count)	2
Eucalyptus alligatrix subsp. alligatrix	Eucalyptus alligatrix subsp. alligatrix	287_Moderate_FCZ_100, 287_Moderate_ECZ_100, 287_Moderate_HTZ_100, 290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100	1 (count)	3
Eucalyptus cannonii	Capertee Stringybark	290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100, 290_Low_FCZ_100, 290_Low_FCZ_5, 290_Low_ECZ_100, 290_Low_HTZ_100, 290_Very low_FCZ_100, 290_Very low_ECZ_100, 290_Very low_HTZ_100,	1 (count)	2
Euphrasia arguta	Euphrasia arguta	266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100, 277_Low_FCZ_5-25, 277_Low_FCZ_5, 277_Low_ECZ_100, 277_Low_ECZ_5, 277_Low_HTZ_100, 277_Low_HTZ_5, 277_Very low_FCZ_100, 277_Very low_FCZ_5-25, 277_Very low_FCZ_5, 277_Very low_ECZ_100, 277_Very low_ECZ_5, 277_Very low_HTZ_100, 277_Very low_HTZ_5, 287_Moderate_FCZ_100, 287_Moderate_ECZ_100, 287_Moderate_HTZ_100, 287_Low_FCZ_100, 287_Very low_FCZ_100, 287_Very low_ECZ_100, 287_Very low_HTZ_100, 290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100, 290_Low_FCZ_100, 290_Low_FCZ_5, 290_Low_ECZ_100, 290_Low_HTZ_100, 290_Very low_FCZ_100, 290_Very low_ECZ_100, 290_Very low_HTZ_100,	92.9	1518

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Grevillea wilkinsonii	Tumut Grevillea	266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 278_High_FCZ_100, 278_High_ECZ_100, 278_High_HTZ_100, 278_Moderate_FCZ_100, 278_Moderate_FCZ_5, 278_Moderate_ECZ_100, 278_Moderate_HTZ_100, 301_High_FCZ_100, 301_Moderate_FCZ_100, 301_Low_FCZ_100,	34.7	568
Haliaeetus leucogaster	White-bellied Sea-Eagle	5_High_FCZ_100, 5_High_ECZ_100, 5_High_HTZ_100, 5_Low_FCZ_100, 5_Low_ECZ_100, 5_Low_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 268_Low_FCZ_100, 268_Low_ECZ_100, 268_Low_HTZ_100, 277_Low_FCZ_100, 277_Low_FCZ_5, 277_Low_ECZ_100, 277_Low_ECZ_5, 277_Low_HTZ_100, 277_Low_HTZ_5, 278_High_FCZ_100, 278_High_ECZ_100, 278_High_HTZ_100, 278_Moderate_FCZ_100, 278_Moderate_ECZ_100, 278_Moderate_HTZ_100, 280_High_FCZ_100, 280_High_ECZ_100, 280_High_HTZ_100, 280_Moderate_FCZ_100, 280_Moderate_ECZ_100, 280_Moderate_HTZ_100, 280_Low_FCZ_100, 280_Low_ECZ_100, 290_High_ECZ_100, 314_Very high_FCZ_100, 314_Very high_ECZ_100, 314_Very high_HTZ_100, 316_Very high_FCZ_100, 316_Very high_ECZ_100, 316_Very high_HTZ_100, 316_Moderate_FCZ_100, 316_Moderate_ECZ_100, 316_Moderate_HTZ_100, 316_Low_FCZ_100,	14.9	248
Hieraaetus morphnoides	Little Eagle	5_High_FCZ_100, 5_High_ECZ_100, 5_High_HTZ_100, 5_Low_FCZ_100,	108.9	1831

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 268_High_FCZ_100, 268_High_ECZ_100, 268_High_HTZ_100, 268_Moderate_FCZ_100, 268_Moderate_ECZ_100, 268_Moderate_HTZ_100, 268_Low_FCZ_100, 268_Low_ECZ_100, 268_Low_ECZ_5, 268_Low_HTZ_100, 268_Low_HTZ_5, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100, 277_Low_FCZ_5, 277_Low_ECZ_100, 277_Low_ECZ_5, 277_Low_HTZ_100, 277_Low_HTZ_5, 278_High_FCZ_100, 278_High_ECZ_100, 278_High_HTZ_100, 278_Moderate_FCZ_100, 278_Moderate_FCZ_5, 278_Moderate_ECZ_100, 278_Moderate_HTZ_100, 280_High_FCZ_100, 280_High_FCZ_25-100, 280_High_ECZ_100, 280_High_ECZ_25-100, 280_High_HTZ_100, 280_High_HTZ_25-100, 280_Moderate_FCZ_100, 280_Moderate_FCZ_25-100, 280_Moderate_ECZ_100, 280_Moderate_ECZ_25-100, 280_Moderate_HTZ_100, 280_Moderate_HTZ_25-100, 280_Low_FCZ_100, 280_Low_ECZ_100, 287_Moderate_FCZ_100, 287_Moderate_ECZ_100, 287_Moderate_HTZ_100, 290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100, 290_Low_FCZ_100, 290_Low_FCZ_5, 290_Low_ECZ_100, 290_Low_HTZ_100, 294_Moderate_FCZ_100, 294_Moderate_ECZ_100,		

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		294_Moderate_HTZ_100, 294_Low_FCZ_100, 294_Low_ECZ_100, 294_Low_HTZ_100, 297_Moderate_FCZ_100, 297_Moderate_ECZ_100, 297_Moderate_HTZ_100, 297_Low_FCZ_100, 299_Low_FCZ_100, 299_Low_ECZ_100, 299_Low_HTZ_100, 301_High_FCZ_100, 301_Low_FCZ_100, 306_High_FCZ_100, 306_Low_FCZ_100, 306_Low_ECZ_100, 306_Low_HTZ_100, 314_Very high_FCZ_100, 314_Very high_ECZ_100, 314_Very high_HTZ_100, 314_Moderate_FCZ_100, 314_Moderate_ECZ_100, 314_Moderate_HTZ_100, 314_Low_FCZ_100, 314_Low_ECZ_100, 314_Low_HTZ_100, 316_Very high_FCZ_100, 316_Very high_ECZ_100, 316_Very high_HTZ_100, 316_High_FCZ_100, 316_High_ECZ_100, 316_High_HTZ_100, 316_Moderate_FCZ_100, 316_Moderate_ECZ_100, 316_Moderate_HTZ_100, 316_Low_FCZ_100, 343_Moderate_FCZ_100, 343_Moderate_ECZ_100, 343_Moderate_HTZ_100, 343_Low_FCZ_100, 343_Low_ECZ_100, 343_Low_HTZ_100, 352_Low_FCZ_100, 352_Low_ECZ_100, 352_Low_HTZ_100, 731_Low_FCZ_100, 731_Low_ECZ_100, 731_Low_HTZ_100, 1330_Moderate_FCZ_100,		
Keyacris scurra	Key's Matchstick Grasshopper	266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100,	116.4	1310

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		277_Low_FCZ_5-25, 277_Low_FCZ_5, 277_Low_ECZ_100, 277_Low_ECZ_5, 277_Low_HTZ_100, 277_Low_HTZ_5, 277_Very low_FCZ_100, 277_Very low_FCZ_5-25, 277_Very low_FCZ_5, 277_Very low_ECZ_100, 277_Very low_ECZ_5, 277_Very low_HTZ_100, 277_Very low_HTZ_5, 278_High_FCZ_100, 278_High_ECZ_100, 278_High_HTZ_100, 278_Moderate_FCZ_100, 278_Moderate_FCZ_5, 278_Moderate_ECZ_100, 278_Moderate_HTZ_100, 278_Very low_FCZ_100, 278_Very low_ECZ_100, 278_Very low_HTZ_100, 1330_Moderate_FCZ_100,		
Leucochrysum albicans var. tricolor	Hoary Sunray	268_High_FCZ_100, 268_High_ECZ_100, 268_High_HTZ_100, 268_Moderate_FCZ_100, 268_Moderate_ECZ_100, 268_Moderate_HTZ_100, 268_Low_FCZ_100, 268_Low_ECZ_100, 268_Low_ECZ_5, 268_Low_HTZ_100, 268_Low_HTZ_5, 268_Very low_HTZ_100, 352_Low_FCZ_100, 352_Low_FCZ_5-25, 352_Low_ECZ_100, 352_Low_HTZ_100, 352_Very low_FCZ_100, 731_Low_FCZ_100, 731_Low_ECZ_100, 731_Low_HTZ_100, 731_Very low_FCZ_100, 1191_Moderate_FCZ_100, 1191_Moderate_ECZ_100, 1191_Moderate_HTZ_100, 1330_Moderate_FCZ_100,	1140 (count)	2280
Lophoictinia isura	Square-tailed Kite	5_High_FCZ_100, 5_High_ECZ_100, 5_High_HTZ_100, 5_Low_FCZ_100, 266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 268_High_FCZ_100, 268_High_ECZ_100, 268_High_HTZ_100, 268_Moderate_FCZ_100, 268_Moderate_ECZ_100, 268_Moderate_HTZ_100,	75.1	1187

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		268_Low_FCZ_100, 268_Low_ECZ_100, 268_Low_ECZ_5, 268_Low_HTZ_100, 268_Low_HTZ_5, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100, 277_Low_FCZ_5, 277_Low_ECZ_100, 277_Low_ECZ_5, 277_Low_HTZ_100, 277_Low_HTZ_5, 278_High_FCZ_100, 278_High_ECZ_100, 278_High_HTZ_100, 278_Moderate_FCZ_100, 278_Moderate_FCZ_5, 278_Moderate_ECZ_100, 278_Moderate_HTZ_100, 280_High_FCZ_100, 280_High_FCZ_25-100, 280_High_ECZ_100, 280_High_ECZ_25-100, 280_High_HTZ_100, 280_High_HTZ_25-100, 280_Moderate_FCZ_100, 280_Moderate_FCZ_25-100, 280_Moderate_ECZ_100, 280_Moderate_ECZ_25-100, 280_Moderate_HTZ_100, 280_Moderate_HTZ_25-100, 280_Low_FCZ_100, 280_Low_ECZ_100, 287_Moderate_FCZ_100, 287_Moderate_ECZ_100, 287_Moderate_HTZ_100, 290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100, 290_Low_FCZ_100, 290_Low_FCZ_5, 290_Low_ECZ_100, 290_Low_HTZ_100, 294_Moderate_FCZ_100, 294_Moderate_ECZ_100, 294_Moderate_HTZ_100, 294_Low_FCZ_100, 294_Low_ECZ_100, 294_Low_HTZ_100, 352_Low_FCZ_100, 352_Low_ECZ_100, 352_Low_HTZ_100, 731_Low_FCZ_100, 731_Low_ECZ_100, 731_Low_HTZ_100,		
Myotis macropus	Southern Myotis	5_High_FCZ_100, 5_High_ECZ_100, 5_High_HTZ_100, 5_Low_FCZ_100, 5_Low_ECZ_100,	2.4	34

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		5_Low_HTZ_100, 1330_Moderate_FCZ_100,		
Ninox connivens	Barking Owl	5_High_FCZ_100, 5_High_ECZ_100, 5_High_HTZ_100, 5_Low_FCZ_100, 266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 268_High_FCZ_100, 268_High_ECZ_100, 268_High_HTZ_100, 268_Moderate_FCZ_100, 268_Moderate_ECZ_100, 268_Moderate_HTZ_100, 268_Low_FCZ_100, 268_Low_ECZ_100, 268_Low_HTZ_100, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100, 277_Low_ECZ_100, 277_Low_HTZ_100, 278_High_FCZ_100, 278_High_ECZ_100, 278_High_HTZ_100, 278_Moderate_FCZ_100, 278_Moderate_ECZ_100, 278_Moderate_HTZ_100, 280_High_FCZ_100, 280_High_FCZ_25-100, 280_High_ECZ_100, 280_High_ECZ_25-100, 280_High_HTZ_100, 280_High_HTZ_25-100, 280_Moderate_FCZ_100, 280_Moderate_FCZ_25-100, 280_Moderate_ECZ_100, 280_Moderate_ECZ_25-100, 280_Moderate_HTZ_100, 280_Moderate_HTZ_25-100, 290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100, 290_Low_FCZ_100, 290_Low_ECZ_100, 290_Low_HTZ_100, 314_Moderate_FCZ_100, 314_Moderate_ECZ_100, 314_Moderate_HTZ_100, 314_Low_FCZ_100, 343_Moderate_FCZ_100, 343_Moderate_ECZ_100, 343_Moderate_HTZ_100, 343_Low_FCZ_100,	41.3	896

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		343_Low_ECZ_100, 343_Low_HTZ_100, 1330_Moderate_FCZ_100,		
Ninox strenua	Powerful Owl	5_High_FCZ_100, 5_High_ECZ_100, 5_High_HTZ_100, 5_Low_FCZ_100, 290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100, 290_Low_FCZ_100, 290_Low_ECZ_100, 290_Low_HTZ_100, 314_Moderate_FCZ_100, 314_Moderate_ECZ_100, 314_Moderate_HTZ_100, 314_Low_FCZ_100, 1330_Moderate_FCZ_100,	4.9	90
Persoonia marginata	Clandulla Geebung	287_Moderate_FCZ_100, 287_Moderate_ECZ_100, 287_Moderate_HTZ_100, 287_Low_FCZ_100, 287_Very low_FCZ_100, 287_Very low_ECZ_100, 287_Very low_HTZ_100,	1.2	20
Petauroides volans	Greater Glider	316_Very high_FCZ_100, 316_Very high_ECZ_100, 316_Very high_HTZ_100, 316_High_FCZ_100, 316_High_ECZ_100, 316_High_HTZ_100, 316_Moderate_FCZ_100, 316_Moderate_ECZ_100, 316_Moderate_HTZ_100, 316_Low_FCZ_100,	3.1	89
Petaurus norfolcensis	Squirrel Glider	5_High_FCZ_100, 5_High_ECZ_100, 5_High_HTZ_100, 5_Low_FCZ_100, 5_Low_ECZ_100, 5_Low_HTZ_100, 266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 268_High_FCZ_100, 268_High_ECZ_100, 268_High_HTZ_100, 268_Moderate_FCZ_100, 268_Moderate_ECZ_100, 268_Moderate_HTZ_100, 268_Low_FCZ_100, 268_Low_ECZ_100, 268_Low_HTZ_100, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100,	46.7	1026

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		277_Low_ECZ_100, 277_Low_HTZ_100, 278_High_FCZ_100, 278_High_ECZ_100, 278_High_HTZ_100, 278_Moderate_FCZ_100, 278_Moderate_ECZ_100, 278_Moderate_HTZ_100, 280_High_FCZ_100, 280_High_FCZ_25-100, 280_High_ECZ_100, 280_High_ECZ_25-100, 280_High_HTZ_100, 280_High_HTZ_25-100, 280_Moderate_FCZ_100, 280_Moderate_FCZ_25-100, 280_Moderate_ECZ_25-100, 280_Moderate_HTZ_100, 280_Moderate_HTZ_25-100, 290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100, 290_Low_FCZ_100, 290_Low_ECZ_100, 290_Low_HTZ_100, 294_Moderate_FCZ_100, 294_Moderate_ECZ_100, 294_Moderate_HTZ_100, 294_Low_FCZ_100, 294_Low_ECZ_100, 294_Low_HTZ_100, 314_Moderate_FCZ_100, 314_Moderate_ECZ_100, 314_Moderate_HTZ_100, 314_Low_FCZ_100, 316_Very high_FCZ_100, 316_Very high_ECZ_100, 316_Very high_HTZ_100, 316_High_FCZ_100, 316_High_ECZ_100, 316_High_HTZ_100, 316_Moderate_FCZ_100, 316_Moderate_ECZ_100, 316_Moderate_HTZ_100, 316_Low_FCZ_100, 343_Moderate_FCZ_100, 343_Moderate_ECZ_100, 343_Moderate_HTZ_100, 343_Low_FCZ_100, 343_Low_ECZ_100, 343_Low_HTZ_100, 1330_Moderate_FCZ_100,		
Petaurus norfolcensis - endangered population	Squirrel Glider	5_High_FCZ_100, 5_High_ECZ_100, 5_High_HTZ_100, 5_Low_FCZ_100, 5_Low_ECZ_100, 5_Low_HTZ_100, 266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100,	46.7	1026

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		266_Low_HTZ_100, 268_High_FCZ_100, 268_High_ECZ_100, 268_High_HTZ_100, 268_Moderate_FCZ_100, 268_Moderate_ECZ_100, 268_Moderate_HTZ_100, 268_Low_FCZ_100, 268_Low_ECZ_100, 268_Low_HTZ_100, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100, 277_Low_ECZ_100, 277_Low_HTZ_100, 278_High_FCZ_100, 278_High_ECZ_100, 278_High_HTZ_100, 278_Moderate_FCZ_100, 278_Moderate_ECZ_100, 278_Moderate_HTZ_100, 280_High_FCZ_100, 280_High_FCZ_25-100, 280_High_ECZ_100, 280_High_ECZ_25-100, 280_High_HTZ_100, 280_High_HTZ_25-100, 280_Moderate_FCZ_100, 280_Moderate_FCZ_25-100, 280_Moderate_ECZ_25-100, 280_Moderate_HTZ_100, 280_Moderate_HTZ_25-100, 290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100, 290_Low_FCZ_100, 290_Low_ECZ_100, 290_Low_HTZ_100, 294_Moderate_FCZ_100, 294_Moderate_ECZ_100, 294_Moderate_HTZ_100, 294_Low_FCZ_100, 294_Low_ECZ_100, 294_Low_HTZ_100, 314_Moderate_FCZ_100, 314_Moderate_ECZ_100, 314_Moderate_HTZ_100, 314_Low_FCZ_100, 316_Very high_FCZ_100, 316_Very high_ECZ_100, 316_Very high_HTZ_100, 316_High_FCZ_100, 316_High_ECZ_100, 316_High_HTZ_100, 316_Moderate_FCZ_100, 316_Moderate_ECZ_100, 316_Moderate_HTZ_100, 316_Low_FCZ_100, 343_Moderate_FCZ_100, 343_Moderate_ECZ_100, 343_Moderate_HTZ_100,		

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		343_Low_FCZ_100, 343_Low_ECZ_100, 343_Low_HTZ_100, 1330_Moderate_FCZ_100,		
Petroica rodinogaster	Pink Robin	299_Low_FCZ_100, 299_Low_ECZ_100, 299_Low_HTZ_100,	0.3	1
Phascolarctos cinereus	Koala	5_High_FCZ_100, 5_High_ECZ_100, 5_High_HTZ_100, 5_Low_FCZ_100, 5_Low_ECZ_100, 5_Low_HTZ_100, 266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 268_High_FCZ_100, 268_High_ECZ_100, 268_High_HTZ_100, 268_Moderate_FCZ_100, 268_Moderate_ECZ_100, 268_Moderate_HTZ_100, 268_Low_FCZ_100, 268_Low_ECZ_100, 268_Low_ECZ_5, 268_Low_HTZ_100, 268_Low_HTZ_5, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100, 277_Low_FCZ_5-25, 277_Low_FCZ_5, 277_Low_ECZ_100, 277_Low_ECZ_5, 277_Low_HTZ_100, 277_Low_HTZ_5, 278_High_FCZ_100, 278_High_ECZ_100, 278_High_HTZ_100, 278_Moderate_FCZ_100, 278_Moderate_FCZ_5, 278_Moderate_ECZ_100, 278_Moderate_HTZ_100, 280_High_FCZ_100, 280_High_FCZ_25-100, 280_High_ECZ_100, 280_High_ECZ_25-100, 280_High_HTZ_100, 280_High_HTZ_25-100, 280_Moderate_FCZ_100, 280_Moderate_FCZ_25-100, 280_Moderate_ECZ_100, 280_Moderate_ECZ_25-100, 280_Moderate_HTZ_100, 280_Moderate_HTZ_25-100, 280_Low_FCZ_100,	114.7	2504

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		280_Low_ECZ_100, 287_Moderate_FCZ_100, 287_Moderate_ECZ_100, 287_Moderate_HTZ_100, 290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100, 290_Low_FCZ_100, 290_Low_FCZ_5, 290_Low_ECZ_100, 290_Low_HTZ_100, 294_Moderate_FCZ_100, 294_Moderate_ECZ_100, 294_Moderate_HTZ_100, 294_Low_FCZ_100, 294_Low_ECZ_100, 294_Low_HTZ_100, 297_Moderate_FCZ_100, 297_Moderate_ECZ_100, 297_Moderate_HTZ_100, 297_Low_FCZ_100, 299_Low_FCZ_100, 299_Low_ECZ_100, 299_Low_HTZ_100, 301_High_FCZ_100, 301_Low_FCZ_100, 306_High_FCZ_100, 306_Low_FCZ_100, 306_Low_ECZ_100, 306_Low_HTZ_100, 314_Very high_FCZ_100, 314_Very high_ECZ_100, 314_Very high_HTZ_100, 314_Moderate_FCZ_100, 314_Moderate_ECZ_100, 314_Moderate_HTZ_100, 314_Low_FCZ_100, 314_Low_ECZ_100, 314_Low_HTZ_100, 316_Very high_FCZ_100, 316_Very high_ECZ_100, 316_Very high_HTZ_100, 316_High_FCZ_100, 316_High_ECZ_100, 316_High_HTZ_100, 316_Moderate_FCZ_100, 316_Moderate_ECZ_100, 316_Moderate_HTZ_100, 316_Low_FCZ_100, 343_Moderate_FCZ_100, 343_Moderate_ECZ_100, 343_Moderate_HTZ_100, 343_Low_FCZ_100, 343_Low_ECZ_100, 343_Low_HTZ_100, 352_Low_FCZ_100, 352_Low_FCZ_5-25, 352_Low_ECZ_100, 352_Low_HTZ_100, 731_Low_FCZ_100, 731_Low_ECZ_100, 731_Low_HTZ_100, 1330_Moderate_FCZ_100,		
Polytelis swainsonii	Superb Parrot	5_High_FCZ_100, 5_High_ECZ_100,	34.6	701

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		5_High_HTZ_100, 5_Low_FCZ_100, 5_Low_ECZ_100, 5_Low_HTZ_100, 266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100, 277_Low_ECZ_100, 277_Low_HTZ_100, 278_High_FCZ_100, 278_High_ECZ_100, 278_High_HTZ_100, 278_Moderate_FCZ_100, 278_Moderate_ECZ_100, 278_Moderate_HTZ_100, 280_High_FCZ_100, 280_High_FCZ_25-100, 280_High_ECZ_100, 280_High_ECZ_25-100, 280_High_HTZ_100, 280_High_HTZ_25-100, 280_Moderate_FCZ_100, 280_Moderate_FCZ_25-100, 280_Moderate_ECZ_100, 280_Moderate_ECZ_25-100, 280_Moderate_HTZ_100, 280_Moderate_HTZ_25-100, 343_Moderate_FCZ_100, 343_Moderate_ECZ_100, 343_Moderate_HTZ_100, 343_Low_FCZ_100, 343_Low_ECZ_100, 343_Low_HTZ_100, 1330_Moderate_FCZ_100,		
Prasophyllum petilum	Tarengo Leek Orchid	277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100, 277_Low_FCZ_5-25, 277_Low_FCZ_5, 277_Low_ECZ_100, 277_Low_ECZ_5, 277_Low_HTZ_100, 277_Low_HTZ_5, 278_High_FCZ_100, 278_High_ECZ_100, 278_High_HTZ_100, 278_Moderate_FCZ_100, 278_Moderate_FCZ_5, 278_Moderate_ECZ_100,	13.3	244

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		278_Moderate_HTZ_100, 1191_Moderate_FCZ_100, 1191_Moderate_ECZ_100, 1191_Moderate_HTZ_100, 1330_Moderate_FCZ_100,		
Prasophyllum sp. *Wybong*	Prasophyllum sp. Wybong	266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100, 277_Low_FCZ_5-25, 277_Low_FCZ_5, 277_Low_ECZ_100, 277_Low_ECZ_5, 277_Low_HTZ_100, 277_Low_HTZ_5, 277_Very low_FCZ_100, 277_Very low_FCZ_5-25, 277_Very low_FCZ_5, 277_Very low_ECZ_100, 277_Very low_ECZ_5, 277_Very low_HTZ_100, 277_Very low_HTZ_5,	87.8	1574
Pultenaea humilis	Dwarf Bush-pea	268_High_FCZ_100, 268_High_ECZ_100, 268_High_HTZ_100, 268_Moderate_FCZ_100, 268_Moderate_ECZ_100, 268_Moderate_HTZ_100, 287_Moderate_FCZ_100, 287_Moderate_ECZ_100, 287_Moderate_HTZ_100, 290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100, 294_Moderate_FCZ_100, 294_Moderate_ECZ_100, 294_Moderate_HTZ_100, 306_High_FCZ_100, 343_Moderate_FCZ_100, 343_Moderate_ECZ_100, 343_Moderate_HTZ_100,	4.2	114
Senecio garlandii	Woolly Ragwort	287_Moderate_FCZ_100, 287_Moderate_ECZ_100, 287_Low_FCZ_100, 287_Very low_FCZ_100, 290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100, 290_Low_FCZ_100, 290_Low_ECZ_100, 290_Low_HTZ_100, 290_Very low_FCZ_100, 290_Very low_ECZ_100, 290_Very low_HTZ_100,	1.2	13

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		343_Moderate_ECZ_100, 343_Moderate_HTZ_100,		
Swainsona recta	Small Purple-pea	266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 268_High_FCZ_100, 268_High_ECZ_100, 268_High_HTZ_100, 268_Moderate_FCZ_100, 268_Moderate_ECZ_100, 268_Moderate_HTZ_100, 268_Low_FCZ_100, 268_Low_ECZ_100, 268_Low_ECZ_5, 268_Low_HTZ_100, 268_Low_HTZ_5, 268_Very low_HTZ_100, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100, 277_Low_FCZ_5-25, 277_Low_FCZ_5, 277_Low_ECZ_100, 277_Low_ECZ_5, 277_Low_HTZ_100, 277_Low_HTZ_5, 277_Very low_FCZ_100, 277_Very low_FCZ_5-25, 277_Very low_FCZ_5, 277_Very low_ECZ_100, 277_Very low_ECZ_5, 277_Very low_HTZ_100, 277_Very low_HTZ_5, 294_Moderate_FCZ_100, 294_Moderate_ECZ_100, 294_Moderate_HTZ_100, 294_Low_FCZ_100, 294_Low_ECZ_100, 294_Low_HTZ_100, 1330_Moderate_FCZ_100,	91.2	1146
Swainsona sericea	Silky Swainson-pea	266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100, 266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100,	129.3	1614

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		277_Low_FCZ_5-25, 277_Low_FCZ_5, 277_Low_ECZ_100, 277_Low_ECZ_5, 277_Low_HTZ_100, 277_Low_HTZ_5, 277_Very low_FCZ_100, 277_Very low_FCZ_5-25, 277_Very low_FCZ_5, 277_Very low_ECZ_100, 277_Very low_ECZ_5, 277_Very low_HTZ_100, 277_Very low_HTZ_5, 280_High_FCZ_100, 280_High_FCZ_25-100, 280_High_ECZ_100, 280_High_ECZ_25-100, 280_High_HTZ_100, 280_High_HTZ_25-100, 280_Moderate_FCZ_100, 280_Moderate_FCZ_25-100, 280_Moderate_ECZ_100, 280_Moderate_ECZ_25-100, 280_Moderate_HTZ_100, 280_Moderate_HTZ_25-100, 280_Low_FCZ_100, 280_Low_ECZ_100, 280_Very low_FCZ_100, 280_Very low_FCZ_5, 280_Very low_ECZ_100, 280_Very low_ECZ_5, 280_Very low_HTZ_100, 280_Very low_HTZ_5, 290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100, 290_Low_FCZ_100, 290_Low_FCZ_5, 290_Low_ECZ_100, 290_Low_HTZ_100, 290_Very low_FCZ_100, 290_Very low_ECZ_100, 290_Very low_HTZ_100, 1191_Moderate_FCZ_100, 1191_Moderate_ECZ_100, 1191_Moderate_HTZ_100, 1330_Moderate_FCZ_100,		
Synemon plana	Golden Sun Moth	5_Low_TCZ_100, 266_Moderate_TCZ_100, 266_Moderate_ECZ_100, 266_Low_TCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 268_Moderate_TCZ_100, 268_Moderate_ECZ_100, 268_Low_TCZ_100, 268_Low_ECZ_100, 277_Verylow_TCZ_100, 277_Verylow_ECZ_100, 278_Moderate_TCZ_100, 278_Verylow_TCZ_100, 280_Moderate_TCZ_100, 352_Verylow_TCZ_100	19.8	120
Tyto novaehollandiae	Masked Owl	266_High_FCZ_100, 266_High_ECZ_100, 266_High_HTZ_100, 266_Moderate_FCZ_100,	27.8	600

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		266_Moderate_ECZ_100, 266_Moderate_HTZ_100, 266_Low_FCZ_100, 266_Low_ECZ_100, 266_Low_HTZ_100, 277_High_FCZ_100, 277_High_ECZ_100, 277_High_HTZ_100, 277_Moderate_FCZ_100, 277_Moderate_ECZ_100, 277_Moderate_HTZ_100, 277_Low_FCZ_100, 277_Low_ECZ_100, 277_Low_HTZ_100, 280_High_FCZ_100, 280_High_FCZ_25-100, 280_High_ECZ_100, 280_High_ECZ_25-100, 280_High_HTZ_100, 280_High_HTZ_25-100, 280_Moderate_FCZ_100, 280_Moderate_FCZ_25-100, 280_Moderate_ECZ_100, 280_Moderate_ECZ_25-100, 280_Moderate_HTZ_100, 280_Moderate_HTZ_25-100, 290_High_FCZ_100, 290_High_ECZ_100, 290_High_HTZ_100, 290_Low_FCZ_100, 290_Low_ECZ_100, 290_Low_HTZ_100, 294_Moderate_FCZ_100, 294_Moderate_ECZ_100, 294_Moderate_HTZ_100, 294_Low_FCZ_100, 294_Low_ECZ_100, 294_Low_HTZ_100, 1330_Moderate_FCZ_100,		
Zieria obcordata	Granite Zieria	268_High_FCZ_100, 268_High_ECZ_100, 268_High_HTZ_100, 268_Moderate_FCZ_100, 268_Moderate_ECZ_100, 268_Moderate_HTZ_100, 268_Low_FCZ_100, 268_Low_ECZ_100, 268_Low_HTZ_100, 268_Very low_HTZ_100, 280_High_FCZ_100, 280_High_FCZ_25-100, 280_High_ECZ_100, 280_High_ECZ_25-100, 280_High_HTZ_100, 280_High_HTZ_25-100, 280_Moderate_FCZ_100, 280_Moderate_FCZ_25-100, 280_Moderate_ECZ_100, 280_Moderate_ECZ_25-100, 280_Moderate_HTZ_100, 280_Moderate_HTZ_25-100, 280_Very low_FCZ_100, 280_Very low_ECZ_100, 280_Very low_HTZ_100, 287_Moderate_FCZ_100, 287_Moderate_ECZ_100,	43.4	1025

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		287_Moderate_HTZ_100, 287_Low_FCZ_100, 287_Very low_FCZ_100, 287_Very low_ECZ_100, 287_Very low_HTZ_100,		
Total				**30450**

Table 15-14: Species credits for Bondo IBRA subregion

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Ammobium craspedioides	Yass Daisy	299_Moderate_TCZ_100	1 (count)	2
Callocephalon fimbriatum	Gang-gang Cockatoo	295_Moderate_TCZ_100, 295_Moderate_ECZ_100, 295_Moderate_HTZ_100, 299_Moderate_TCZ_100, 299_Moderate_ECZ_100, 299_Moderate_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 953_High_ECZ_100, 953_High_HTZ_100	22.1	564
Cercartetus nanus	Eastern Pygmy-possum	295_Moderate_TCZ_100, 299_Moderate_TCZ_100, 299_Moderate_ECZ_100, 299_Moderate_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 953_High_ECZ_100, 953_High_HTZ_100	21.7	553
Haliaeetus leucogaster	White-bellied Sea-Eagle	299_Moderate_TCZ_100, 953_High_TCZ_100, 953_Low_TCZ_100	0.43	11
Hieraaetus morphnoides	Little Eagle	285_Low_ECZ_100, 285_Low_HTZ_100, 295_Moderate_TCZ_100, 295_Moderate_ECZ_100, 295_Moderate_HTZ_100, 296_Low_TCZ_100, 299_Moderate_TCZ_100, 299_Moderate_ECZ_100, 299_Moderate_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 953_High_ECZ_100, 953_High_HTZ_100, 953_Low_TCZ_100, 953_Low_ECZ_100, 953_Low_HTZ_100	32.9	621
Leucochrysum albicans var. tricolor	Hoary Sunray	953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 953_High_ECZ_100, 953_High_HTZ_100, 953_Low_TCZ_100, 953_Low_ECZ_100, 953_Low_HTZ_100, 953_Verylow_TCZ_100, 953_Verylow_ECZ_100, 953_Verylow_HTZ_100	2885 (count)	5770
Litoria booroolongensis	Litoria booroolongensis	299_Verylow_HTZ_100	0.11	0
Lophoictinia isura	Square-tailed Kite	953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100,	29.2	564

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		953_High_ECZ_100, 953_High_HTZ_100, 953_Low_TCZ_100, 953_Low_ECZ_100, 953_Low_HTZ_100		
Myotis macropus	Southern Myotis	299_Moderate_TCZ_100, 299_Moderate_ECZ_100, 299_Moderate_HTZ_100	0.96	20
Ninox connivens	Barking Owl	295_Moderate_TCZ_100, 295_Moderate_ECZ_100, 295_Moderate_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 953_High_ECZ_100, 953_High_HTZ_100	21.4	543
Ninox strenua	Powerful Owl	295_Moderate_TCZ_100, 295_Moderate_ECZ_100, 295_Moderate_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 953_High_ECZ_100, 953_High_HTZ_100	21.4	543
Petauroides volans	Greater Glider	299_Moderate_TCZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 953_High_ECZ_100, 953_High_HTZ_100	20.5	526
Petaurus norfolcensis	Squirrel Glider	953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 953_High_ECZ_100, 953_High_HTZ_100	21.1	541
Petroica rodinogaster	Pink Robin	299_Moderate_TCZ_100, 299_Moderate_ECZ_100, 299_Moderate_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 953_High_ECZ_100, 953_High_HTZ_100, 953_Low_TCZ_100, 953_Low_ECZ_100, 953_Low_HTZ_100	30.6	783
Phascogale tapoatafa	Brush-tailed Phascogale	953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 953_High_ECZ_100, 953_High_HTZ_100	21.1	541
Phascolarctos cinereus	Koala	285_Low_ECZ_100, 285_Low_HTZ_100, 295_Moderate_TCZ_100, 295_Moderate_ECZ_100, 295_Moderate_HTZ_100, 296_Low_TCZ_100, 299_Moderate_TCZ_100,	32.9	827

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
		299_Moderate_ECZ_100, 299_Moderate_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 953_High_ECZ_100, 953_High_HTZ_100, 953_Low_TCZ_100, 953_Low_ECZ_100, 953_Low_HTZ_100		
Pseudomys fumeus	Smoky Mouse	953_High_TCZ_100, 953_Low_TCZ_100	0.06	2
Tyto novaehollandiae	Masked Owl	953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 953_High_ECZ_100, 953_High_HTZ_100	20.5	525
Total				**12,936**

Table 15-15: Species credits for Snowy Mountains IBRA subregion

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Callocephalon fimbriatum	Gang-gang Cockatoo	300_High_TCZ_100, 300_High_ECZ_100, 300_High_HTZ_100, 638_High_TCZ_100, 638_High_ECZ_100, 638_High_HTZ_100, 679_High_TCZ_100, 679_High_ECZ_100, 679_High_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 1196_High_TCZ_100, 1196_High_ECZ_100, 1196_High_HTZ_100	165.8	3500
Calotis glandulosa	Mauve Burr-daisy	679_High_TCZ_100, 679_High_ECZ_100, 679_High_HTZ_100, 679_Low_TCZ_100, 679_Low_HTZ_100, 1196_High_TCZ_100, 1196_High_ECZ_100, 1196_High_HTZ_100, 1196_Low_TCZ_100, 1196_Low_HTZ_100, 1224_High_TCZ_100	16	441
Calotis pubescens	Max Mueller's Burr-daisy	1224_High_TCZ_100	0.25	11
Cercartetus nanus	Eastern Pygmy-possum	300_High_TCZ_100, 300_High_ECZ_100, 300_High_HTZ_100, 638_High_TCZ_100, 638_High_ECZ_100, 638_High_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100	121.9	2592
Cyclodomorphus praealtus	Alpine She-oak Skink	679_High_TCZ_100, 679_High_ECZ_100, 679_High_HTZ_100, 1196_High_TCZ_100, 1196_High_ECZ_100, 1196_High_HTZ_100	12.2	259
Diuris ochroma	Pale Golden Moths	1224_High_TCZ_100	0.25	16
Euphrasia scabra	Rough Eyebright	679_High_TCZ_100, 679_High_ECZ_100, 679_High_HTZ_100, 679_Low_TCZ_100, 679_Low_HTZ_100	1.9	52
Glycine latrobeana	Clover Glycine	1224_High_TCZ_100	0.25	16

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Hieraaetus morphnoides	Little Eagle	300_High_TCZ_100, 300_High_ECZ_100, 300_High_HTZ_100, 638_High_TCZ_100, 638_High_ECZ_100, 638_High_HTZ_100, 679_High_TCZ_100, 679_High_ECZ_100, 679_High_HTZ_100, 939_Veryhigh_TCZ_100, 939_Veryhigh_ECZ_100, 939_Veryhigh_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 953_Moderate_TCZ_100, 1196_High_TCZ_100, 1196_High_ECZ_100, 1196_High_HTZ_100	170.5	2722
Irenepharsus magicus	Elusive Cress	638_High_TCZ_100, 638_High_ECZ_100, 638_High_HTZ_100	26.5	654
Leucochrysum albicans var. *tricolor*	Hoary Sunray	679_High_TCZ_100, 679_High_ECZ_100, 679_High_HTZ_100, 679_Low_TCZ_100, 679_Low_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 953_Low_TCZ_100, 953_Low_ECZ_100, 953_Low_HTZ_100, 1196_High_TCZ_100, 1196_High_ECZ_100, 1196_High_HTZ_100, 1196_Low_TCZ_100, 1196_Low_HTZ_100	5993 (count)	11986
Litoria castanea	Yellow-spotted Tree Frog	939_Veryhigh_TCZ_100, 939_Veryhigh_ECZ_100, 939_Veryhigh_HTZ_100	0.56	19
Mastacomys fuscus	Broad-toothed Rat	679_High_TCZ_100, 679_High_ECZ_100, 679_High_HTZ_100	2.2	50
Ninox connivens	Barking Owl	638_High_TCZ_100, 638_High_ECZ_100, 638_High_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100	99.5	2166

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Ninox strenua	Powerful Owl	300_High_TCZ_100, 300_High_ECZ_100, 300_High_HTZ_100, 638_High_TCZ_100, 638_High_ECZ_100, 638_High_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100	121.9	2641
Petauroides volans	Greater Glider	300_High_TCZ_100, 300_High_ECZ_100, 300_High_HTZ_100, 638_High_TCZ_100, 638_High_ECZ_100, 638_High_HTZ_100, 1196_High_TCZ_100, 1196_High_ECZ_100, 1196_High_HTZ_100	74.6	1436
Petaurus australis - endangered population	Yellow-bellied Glider population on the Bago Plateau	638_High_TCZ_100, 638_High_ECZ_100, 638_High_HTZ_100	19.4	311
Petaurus norfolcensis	Squirrel Glider	953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100	61.2	1415
Petroica rodinogaster	Pink Robin	300_High_TCZ_100, 300_High_ECZ_100, 300_High_HTZ_100, 638_High_TCZ_100, 638_High_ECZ_100, 638_High_HTZ_100, 679_High_TCZ_100, 679_High_ECZ_100, 679_High_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 953_Moderate_TCZ_100, 1196_High_TCZ_100, 1196_High_ECZ_100, 1196_High_HTZ_100	169.9	3614
Phascogale tapoatafa	Brush-tailed Phascogale	638_High_TCZ_100, 638_High_ECZ_100, 638_High_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100	108.8	2329

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Phascolarctos cinereus	Koala	300_High_TCZ_100, 300_High_ECZ_100, 300_High_HTZ_100, 638_High_TCZ_100, 638_High_ECZ_100, 638_High_HTZ_100, 679_High_TCZ_100, 679_High_ECZ_100, 679_High_HTZ_100, 939_Veryhigh_TCZ_100, 939_Veryhigh_ECZ_100, 939_Veryhigh_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 953_Moderate_TCZ_100, 1196_High_TCZ_100, 1196_High_ECZ_100, 1196_High_HTZ_100	170.5	3627
Prasophyllum bagoense	Bago Leek-orchid	1196_High_TCZ_100, 1196_High_ECZ_100, 1196_High_HTZ_100, 1196_Low_TCZ_100, 1196_Low_ECZ_100, 1196_Low_HTZ_100, 1224_High_TCZ_100	31.9	959
Prasophyllum innubum	Brandy Marys Leek-orchid	1224_High_TCZ_100	0.25	16
Prasophyllum keltonii	Kelton's Leek Orchid	1196_High_TCZ_100, 1196_High_ECZ_100, 1196_High_HTZ_100, 1196_Low_TCZ_100, 1196_Low_ECZ_100, 1196_Low_HTZ_100	31.7	943
Pseudomys fumeus	Smoky Mouse	638_High_TCZ_100, 638_High_ECZ_100, 638_High_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100, 953_Moderate_TCZ_100, 1196_High_TCZ_100, 1196_High_ECZ_100, 1196_High_HTZ_100	132.6	4227
Pseudophryne corroboree	Southern Corroboree Frog	679_High_TCZ_100, 679_High_ECZ_100, 679_High_HTZ_100, 1196_High_TCZ_100, 1196_High_ECZ_100, 1196_High_HTZ_100	22.2	625

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Pterostylis alpina	Alpine Greenhood	679_High_TCZ_100, 679_High_ECZ_100, 679_High_HTZ_100, 679_Low_TCZ_100, 679_Low_HTZ_100, 1196_High_TCZ_100, 1196_High_ECZ_100, 1196_High_HTZ_100, 1196_Low_TCZ_100, 1196_Low_ECZ_100, 1196_Low_HTZ_100	24.4	464
Pterostylis foliata	Slender Greenhood	638_High_TCZ_100, 638_High_ECZ_100, 638_High_HTZ_100, 679_High_TCZ_100, 679_High_ECZ_100, 679_High_HTZ_100, 679_Low_TCZ_100, 679_Low_HTZ_100, 1196_High_TCZ_100, 1196_High_ECZ_100, 1196_High_HTZ_100, 1196_Low_TCZ_100, 1196_Low_HTZ_100	36.5	642
Pterostylis oreophila	Blue-tongued Greenhood	939_Veryhigh_TCZ_100, 939_Veryhigh_ECZ_100, 939_Veryhigh_HTZ_100	0.56	19
Rutidosis leiolepis	Monaro Golden Daisy	1224_High_TCZ_100	350 (count)	700
Thelymitra alpicola	Alpine Sun-orchid	939_Veryhigh_TCZ_100, 939_Veryhigh_ECZ_100, 939_Veryhigh_HTZ_100	0.56	11
Thesium australe	Austral Toadflax	679_High_TCZ_100, 679_High_ECZ_100, 679_High_HTZ_100, 679_Low_TCZ_100, 679_Low_HTZ_100, 1196_High_TCZ_100, 1196_High_ECZ_100, 1196_High_HTZ_100, 1196_Low_TCZ_100, 1196_Low_ECZ_100, 1196_Low_HTZ_100, 1224_High_TCZ_100	23.7	339
Tyto novaehollandiae	Masked Owl	638_High_TCZ_100, 638_High_ECZ_100, 638_High_HTZ_100, 953_Veryhigh_TCZ_100, 953_Veryhigh_ECZ_100, 953_Veryhigh_HTZ_100, 953_High_TCZ_100	99.5	2166
Tyto tenebricosa	Sooty Owl	638_High_TCZ_100, 638_High_ECZ_100, 638_High_HTZ_100	21.2	511

Scientific name	Common name	Vegetation zones	Total clearing (ha)	Total species credit requirement
Xerochrysum palustre	Swamp Everlasting	679_High_TCZ_100, 679_High_ECZ_100, 679_High_HTZ_100, 679_Low_TCZ_100, 679_Low_HTZ_100, 939_Veryhigh_TCZ_100, 939_Veryhigh_ECZ_100, 939_Veryhigh_HTZ_100	1.5	30
Total				**51,509**

15.2 Offsets for indirect and prescribed impacts

As stated in the BAM (DPIE, 2020a) the '*retirement of biodiversity credits may be used with other conservation measures to mitigate prescribed impacts or the indirect impacts of a proposal on areas of native vegetation, TECs and/or threatened species, or their habitat adjacent to the Subject Land. Where part or all of the indirect or prescribed impacts cannot be avoided, minimised or mitigated, the assessor can propose offsets or other measures that benefit threatened entities and their habitat. The approach to calculating any proposed offsets should be documented and justified*.'

A biodiversity offset may need to be applied to threatened biodiversity that may sustain a potential significant loss to habitat associated with prescribed or indirect impacts. The threatened biodiversity assessed in Section 13.4 and 13.5 as experiencing a potential loss to habitat include:

- Reptile species with a small home range (Pink-tailed Legless Lizard and Striped Legless Lizard), Golden Sun Moth and terrestrial and arboreal mammals for residual impacts to habitat connectivity.
- Remnants of *Coolac-Tumut Serpentinite Shrubby Woodland, and Monaro Tableland Cool Temperate Grassy Woodland* impacted by fragmentation.
- Grey-headed Flying-fox, for residual collision risk impacts.
- Pink-tailed Legless Lizard, Striped Legless Lizard, Large Bent-winged Bat and Little Bent-winged Bat for residual impacts to rocky habitat.
- Pink-tailed Legless Lizard and Striped Legless Lizard, for residual impacts to 197.91 ha of exotic grassland habitat, where species presence is confirmed during future survey work.
- Golden Sun Moth, for residual impacts to exotic grassland habitat, where recorded during future survey work within inaccessible lands.

Further consultation with the BCD is required to confirm any offset requirements for these indirect and prescribed impacts.

15.3 Offsets for aquatic species and environments

General policy seven in the *Guidelines for fish habitat conservation and management* (Fairfull, 2013) identify that:

"No net loss of Key Fish Habitat – Significant environmental impacts (direct and indirect) are to be offset by environmental compensation."

It is considered that the project would not result in significant environmental impacts to aquatic systems within the project footprint. This is in consideration that:

- No significant impacts to any threatened aquatic biota listed under the FM Act or EPBC Act are likely to occur.
- The construction methodology for transmission line structures avoids direct impacts to streams and would be constructed at a minimum of 40 metres from the top of bank, thereby avoiding impacts in many cases, especially for major streams and KFH.
- No trenching or under boring of aquatic habitats are proposed.
- The assessment of proposed access track crossings within identified KFH has identified typically small streams with poor riparian and aquatic habitats throughout the construction footprint, and where available "Very Poor" freshwater fish community status grades. The scale of potential impacts in this context is not considered significant and would not significantly increase the operation of any KTP's.

- A standard construction methodology for access tracks and waterway crossings has been developed, aligning with relevant guidelines, to construct the waterway crossings in an environmentally sensitive manner.
- The potential for direct and indirect impacts during construction of waterway crossings and access tracks is further managed through the provision of a comprehensive suite of mitigation measures specific to aquatic habitats, including the avoidance of sensitive habitat features, erosion and sediment control, and the reinstatement of bank forms following work.

In light of the factors listed above, no net loss of KFH, or significant impacts to threatened aquatic species are anticipated to occur as a result of the project. As such, no offsets for aquatic species or KFH under the FM Act are proposed.

Any impacts to native riparian vegetation will be offset in accordance with the BAM by means of the project ecosystem credit obligation.

15.4 Commonwealth offset liability

The project is assessed under the Bilateral Agreement, and as such, the retirement of biodiversity credits as per the NSW Biodiversity Offset Scheme is an acceptable offsetting mechanism for Commonwealth entities.

Offsets are only required for significant residual impacts to MNES, once all measures to avoid, minimise and mitigate impacts have been considered. Therefore, if impacts to MNES can be avoided or minimised to the extent that a significant impact can be avoided, offsets are not required.

The retirement of biodiversity credits is required for the following Commonwealth listed threatened biodiversity that have been assessed as potentially significantly impacted by the project:

- White Box Yellow Box Blakely’s Red Gum Woodland and Alpine Bogs and Associated Fens TECs
- Ten threatened flora species and their habitats, as follows: *Acacia bynoeana, Ammobium craspedioides, Kunzea cambagei, Leucochrysum albicans var. tricolor, Pomaderris cotoneaster, Prasophyllum bagoense, Prasophyllum keltonii, Pterostylis oreophila, Thesium australe and Xerochrysum palustre.*
- 16 threatened fauna species and their habitats, as follows: Regent Honeyeater, Gang-gang Cockatoo, Glossy Black-Cockatoo, Painted Honeyeater, Swift Parrot, Superb Parrot, Pilotbird, Spotted-tailed Quoll, Golden Sun Moth, Key’s Matchstick Grasshopper, Grey-headed Flying-fox, Greater Glider, Yellow-bellied Glider, Koala, Pink-tailed Legless Lizard and Striped Legless Lizard.

No other Commonwealth listed threatened biodiversity was deemed to be significantly impacted via the Commonwealth Significant Impact Criteria (Attachment 18).

The biodiversity credits required for the above threatened species and ecological communities are detailed in Section 15.1.

16. Biodiversity Offset Strategy

The project requires a biodiversity offset for both BC Act and EPBC Act listed threatened entities as detailed in Chapter 15. The ecosystem and species credit requirement for the project is detailed in Section 15.1 and summarised in Table 15-1 and Table 15-8. The biodiversity offset would require the retirement of the biodiversity credit obligation as per the Biodiversity Offset Scheme. Similar to other recent major projects of this nature, it is proposed that the offset liability for the project would be revised once detailed design is finalised and additional surveys carried out, particularly within currently inaccessible lands and for species credits which often have restricted seasonal survey requirements. The revised species credit requirement is likely to be significantly lower than that presented here based on further avoidance measures (during detailed design) and targeted surveys for threatened species ruling out their presence at particular locations.

In relation to satisfying offsets for State and Commonwealth matters, the Australian Government has formally endorsed the NSW Biodiversity Offsets Scheme (and use of the BAM [DPIE, 2020a] as the methodology for calculating biodiversity credit requirements) through the EPBC Act Condition-setting Policy (DAWE, 2020), which allows the NSW Biodiversity Offsets Scheme to be applied to assess and meet biodiversity offset requirements for a project.

The biodiversity offset for each entity would be met according to the rules as detailed in Division 6.2 of the BC Regulation which sets out the offset rules under the Biodiversity Offsets Scheme. The rules include retiring like-for-like credits, funding conservation actions that directly benefit the species or community impacted, paying into the Biodiversity Conservation Fund (BCF) the value of the credits and application of variation rules, which allow for suitable offsets to be determined where it can be demonstrated that like-for-like offsets cannot be obtained. However, the Commonwealth does not support application of the variation rules to satisfy an offset obligation for MNES in relation to a controlled action (Division 6.6A of the BC Regulation).

As such, the offset obligation for each MNES would be addressed via one, or a combination of the following:

- retire biodiversity credits based on the like-for-like provisions in the BC Regulation
- fund biodiversity conservation actions that are listed in the Ancillary rules: Biodiversity conservation actions and directly benefit the threatened entity impacted
- pay into the BCF.

As per the BAM (DPIE, 2020a), the biodiversity credit obligation for this project is required to be discharged through one of the three options as provided by the Biodiversity Offsets Scheme:

- establishment of a Biodiversity Stewardship Site and retirement of required credits
- purchase and retirement of credits from the market
- payment into the BCF for the value of the credits.

Transgrid are investigating the following options to formally satisfy the offset obligation for both State and Commonwealth, which include the following:

- establishment of a Biodiversity Stewardship Site(s) with the required biodiversity values and formally retire the credits
- retire credits from existing Transgrid BioBanking/Biodiversity Stewardship Sites
- purchase biodiversity credits from the credit market and formally retire the credits
- payment of the biodiversity offset obligation into the BCF.

Transgrid would reserve the right to discharge their offset obligation through any of these options upon project approval.

16.1 Existing biodiversity credits

The purchase and retirement of existing biodiversity credits is required to be undertaken based on like-for-like trading rules as outlined under the BC Regulation and as identified by the BAM-C output for the project (see Attachment 20).

16.2 Impacts not requiring offsets

Impacts not requiring offset in accordance with BAM subsection 9.2.1(3.) are as detailed in Table 15-16.

Table 15-1: Impacts not requiring offset

PCT ID	PCT name	Condition	Corresponding TEC	Current VI Scores	Justification
Bondo					
953	Mountain Gum - Snow Gum - Broad-leaved Peppermint shrubby open forest of montane ranges	Very Low	No associated TEC	5.4	Low VI score (less than 17).
299	Riparian Ribbon Gum - Robertson's Peppermint - Apple Box riverine very tall open forest	Very Low	No associated TEC	5.4	Low VI score (less than 17).
Bungonia					
1097	Ribbon Gum - Narrow-leaved Peppermint grassy open forest on basalt plateaux	Very Low	No associated TEC	13.4	Low VI score (less than 17).
1150	Silvertop Ash - Blue-leaved Stringybark shrubby open forest on ridges	Very Low	No associated TEC	4.8	Low VI score (less than 17).
1330	Yellow Box - Blakely's Red Gum grassy woodland on the tablelands	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	1.1	Low VI score (less than 15).
Crookwell					

PCT ID	PCT name	Condition	Corresponding TEC	Current VI Scores	Justification
283	Apple Box - Blakely's Red Gum moist valley and footslopes grass-forb open forest	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	2.2	Low VI score (less than 15).
727	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest	Very Low	No associated TEC	10.4	Low VI score (less than 17).
952	Mountain Gum - Narrow-leaved Peppermint - Snow Gum dry shrubby open forest on undulating tablelands	Very Low	Tableland Basalt Forest	5.7	Low VI score (less than 15).
280	Red Stringybark - Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland	Low	White Box Yellow Box Blakely's Red Gum Woodland	10.4	Low VI score (less than 15).
1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest	Very Low	No associated TEC	5.2	Low VI score (less than 17).
1151	Silvertop Ash - Broad-leaved Peppermint dry shrub forest	Very Low	No associated TEC	4.6	Low VI score (less than 17).
1330	Yellow Box - Blakely's Red Gum grassy woodland on the tablelands	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	1.1	Low VI score (less than 15).
Inland Slopes					
314	Apple Box - Red Stringybark basalt scree open forest in the upper Murray River region	Low	No associated TEC	11.5	Low VI score (less than 17).
314	Apple Box - Red Stringybark basalt scree open forest in the upper Murray River region	Very Low	No associated TEC	3.6	Low VI score (less than 17).
297	Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills	Low	No associated TEC	11.5	Low VI score (less than 17).
287	Long-leaved Box - Red Box - Red Stringybark mixed open forest	Very Low	No associated TEC	12.3	Low VI score (less than 17).
343	Mugga Ironbark - Red Box - Red Stringybark - Western Grey Box	Very Low	No associated TEC	11.9	Low VI score (less than 17).

PCT ID	PCT name	Condition	Corresponding TEC	Current VI Scores	Justification
	grass/shrub woodland on metamorphic substrates				
280	Red Stringybark - Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland	Low	White Box Yellow Box Blakely's Red Gum Woodland	7.4	Low VI score (less than 15).
280	Red Stringybark - Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	4.2	Low VI score (less than 15).
352	Red Stringybark - Blakely's Red Gum hillslope open forest on meta-sediments in the Yass - Boorowa - Crookwell region	Very Low	No associated TEC	7.4	Low VI score (less than 17).
278	White Box grassy woodland	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	6.2	Low VI score (less than 15).
299	Riparian Ribbon Gum - Robertson's Peppermint - Apple Box riverine very tall open forest	Very Low	No associated TEC	5.2	Low VI score (less than 17).
266	White Box grassy woodland	Low	White Box Yellow Box Blakely's Red Gum Woodland	3.0	Low VI score (less than 15).
Murrumbateman					
266	White Box grassy woodland	Low	White Box Yellow Box Blakely's Red Gum Woodland	4.3	Low VI score (less than 15).
278	White Box grassy woodland	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	2.2	Low VI score (less than 15).
280	Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest	Low	White Box Yellow Box Blakely's Red Gum Woodland	7.9	Low VI score (less than 15).
280	Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	5.2	Low VI score (less than 15).
287	Long-leaved Box - Red Box - Red Stringybark mixed open forest	Very Low	No associated TEC	14.3	Low VI score (less than 17).
322	Inland Scribbly Gum - Red Stringybark - Black Cypress Pine hillslope shrub-tussock grass open forest	Very Low	No associated TEC	3.3	Low VI score (less than 17).

PCT ID	PCT name	Condition	Corresponding TEC	Current VI Scores	Justification
349	Inland Scribbly Gum - Red Stringybark open forest on hills composed of silicous substrates	Low	No associated TEC	10.4	Low VI score (less than 17).
351	Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest	Very Low	No associated TEC	10.8	Low VI score (less than 17).
352	Red Stringybark - Blakely's Red Gum hillslope open forest on meta-sediments in the Yass - Boorowa - Crookwell region	Very Low	White Box Yellow Box Blakely's Red Gum Woodland	8.2	Low VI score (less than 15).
1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest	Very Low	No associated TEC	5.2	Low VI score (less than 17).

16.2.1 Ecosystem credit options – like-for-like

Like-for-like ecosystem credit trading rules differ between TECs and other ecosystem credits (refer to Section 6.3 of the BC Regulation 2017).

In the case of impacts on threatened ecological communities, like-for-like biodiversity credits represent:

- the same threatened ecological community located in:
  - the same or an adjoining Interim Biogeographic Regionalisation of Australia subregion as the impacted site
  - any subregion that is within 100 kilometres of the outer edge of the impacted site
- vegetation that contains hollow bearing trees - if the threatened ecological community contains hollow bearing trees.

In the case of impacts on the habitat of threatened species that are ecosystem credit species or other native vegetation (other than impacts on threatened ecological communities), like-for-like biodiversity credits represent:

- the same class of native vegetation located in:
  - the same or an adjoining Interim Biogeographic Regionalisation of Australia subregion as the impacted site
  - any subregion that is within 100 kilometres of the outer edge of the impacted site
- the same or a higher offset trading group
- vegetation that contains hollow bearing trees - if the impacted habitat contains hollow bearing trees.

In circumstances where like-for-like ecosystem credits options are not available, variations rules may be applied for BC Act listed entities only, as outlined in Section 6.4 of the BC Regulation.

The like-for-like ecosystem credit class options for the project's biodiversity offset credit obligation is summarised for each IBRA subregion in Attachment 20.

A review of public registers indicates that there is generally a good current supply (registered sites) of the required ecosystem credits for the project, from within the required trading areas (Table 16-1 and Table 16-2), with the exception of the Snowy IBRA subregion. The analysis did not take into account sites where expressions of interest have been lodged or where a stewardship site is currently under development.

Table 16-2: Proportion of required BAM credits for TEC trade groups currently available at registered sites

IBRA subregion	TEC	Proportion of credits available on market
Bondo	White Box Yellow Box Blakely's Red Gum Woodland	614%
Bungonia	White Box Yellow Box Blakely's Red Gum Woodland	902%
Crookwell	Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions	126%
Snowy Mountains	White Box Yellow Box Blakely's Red Gum Woodland	83%
Inland Slopes	White Box Yellow Box Blakely's Red Gum Woodland	54%
Murrumbateman	White Box Yellow Box Blakely's Red Gum Woodland	19%

Table 16-3: Proportion of required BAM credits for non-TEC trade groups currently available at registered sites

IBRA subregion	Demand PCT #	Demand PCT name	Proportion of credits available on market
Bondo	299	Riparian Ribbon Gum - Robertson's Peppermint - Apple Box riverine very tall open forest of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion	913%
Bungonia	870	Grey Gum - Thin-leaved Stringybark grassy woodland of the southern Blue Mountains gorges, Sydney Basin Bioregion	300%
	1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	251%
	1150	Silvertop Ash - Blue-leaved Stringybark shrubby open forest on ridges, north east South Eastern Highlands Bioregion	124%
Crookwell	727	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands Bioregion	393%
	731	Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion	24%
	1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	85%
Inland Slopes	5	River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.	218%
	85	River Oak forest and woodland wetland of the NSW South Western Slopes and South Eastern Highlands Bioregion	6133%

IBRA subregion	Demand PCT #	Demand PCT name	Proportion of credits available on market
	217	Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion	3200%
	287	Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes in the NSW South Western Slopes Bioregion	366%
	290	Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills in the southern part of the NSW South Western Slopes Bioregion	255%
	297	Broad-leaved Peppermint - Norton's Box - Red Stringybark tall open forest on red clay on hills in the southern part of the NSW South Western Slopes Bioregion	429%
	299	Riparian Ribbon Gum - Robertson's Peppermint - Apple Box riverine very tall open forest of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion	1345%
	301	Drooping Sheoke - Ricinocarpus bowmannii - grasstree tall open shrubland of the Coolac - Tumut Serpentinite Belt	49%
	306	Red Box - Red Stringybark - Norton's Box hill heath shrub - tussock grass open forest of the Tumut region	365%
	314	Apple Box - Red Stringybark basalt scree open forest in the upper Murray River region	66%
Murrumbateman	287	Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes in the NSW South Western Slopes Bioregion	392%
	322	Inland Scribbly Gum - Red Stringybark - Black Cypress Pine hillslope shrub-tussock grass open forest on mainly sandstone ranges in the NSW central western slopes	6%
	349	Inland Scribbly Gum - Red Stringybark open forest on hills composed of silicous substrates in the mid-Murrumbidgee and upper Lachlan catchments mainly in the western South Eastern Highlands Bioregion	163%
	351	Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	54%
	731	Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion	85%
	1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	24%

16.2.2 Species credit options – like-for-like

In the case of impacts on threatened species that are species credit species, like-for-like biodiversity credits represent the same threatened species (section 6.3 of the BC Regulation). Like for like species may be sourced from anywhere in NSW.

A review of public registers indicates that there is limited supply of species credits within currently stewardship sites. Sites with relevant ecosystem credits may be a target for sourcing species credits given their compatibility at the ecosystem credit level.

16.2.3 Variation rules

Following reasonable steps to obtain like-for-like credits, Transgrid may seek to retire credits under the variation rules for BC Act entities. The variation rules may not be applied for EPBC Act listed biodiversity as detailed above. It is not expected that variations rules would be invoked for a significant portion of the credit requirement.

Under the variation rules (section 6.4 of the BC Regulation), for ecosystem credits, impacts on native vegetation must be offset with vegetation that is:

- in the same vegetation formation
- in the same or a higher offset trading group
- in a location that is in
  - the same Interim Biogeographic Regionalisation of Australia region as the impacted site
  - a subregion that is within 100 kilometres of the outer edge of the impacted site
- if the impacted habitat contains hollow bearing trees—they represent vegetation that contains hollow bearing trees or artificial hollows.

For species credits:

- impacts on threatened plants must be offset with a threatened plant that is the same or more threatened under the BC Act
- impacts on threatened animals must be offset with a threatened animal that is the same or more threatened under the BC Act
- in a location that is in:
  - the same Interim Biogeographic Regionalisation of Australia region as the impacted site
  - a subregion that is within 100 kilometres of the outer edge of the impacted site.

16.3 Establishing Biodiversity Stewardship Sites

Transgrid propose to develop Biodiversity Stewardship Agreements (BSAs) on suitable sites to generate credits to meet the offset needs of the project and are investigating possible Biodiversity Stewardship sites within the locality. The potential for co-location of BSAs on properties that would be affected by the project, would also be reviewed in light of the potential benefits to local landowners.

Potential properties that support the ecosystem and species credits required to offset impacts of the project are in the process of being identified and investigations are ongoing. Preliminary investigations would be undertaken to map PCTs within the sites and confirm credit type and yield. Further, detailed investigations of these sites, including targeted threatened species surveys, would also be required.

Subject to agreements with landowners, Transgrid intends to develop BSAs over sites deemed suitable and supporting the biodiversity values needed to offset the impacts arising from the project.

16.4 Payment into the Biodiversity Conservation Fund

Under the BC Act, development proponents may choose to pay into the BCF (the fund) as an alternative to retiring biodiversity credits. As of October 2022, the BCF Charge system was introduced, where proponents are required to obtain a Charge Quote from the Biodiversity Conservation Trust (BCT) prior to making a payment into the fund. Charge Quotes are valid for up to three years.

Proponents may seek a Charge Quote once an application that requires the retirement of credits has been submitted to a consent authority and may pay into the fund once a consent authority has issued conditions of consent that specify the number and type of credits to be retired. Paying into the fund is available as an option as soon as a development has been approved and a legal requirement to retire credits exists.

Payment into the fund may be required for ecosystem and species credits that cannot be sourced from the market or created as part of a Biodiversity Stewardship Site.

16.5 Offsets for impacts to Matters of National Environmental Significance

Offsets for significant impacts to these MNES (Section 13.8) would be delivered under the NSW Biodiversity Offsets Scheme (BOS) where relevant. Any significant residual impacts to MNES not addressed under the BOS would be addressed in accordance with the EPBC Act Environmental Offsets Policy (Commonwealth of Australia 2021).

16.6 Timing of Biodiversity Offset Provision

As the design for the project has not yet been finalised, the calculations in this BDAR are based on the indicative disturbance area only. The final offset liability and the timing with respect to discharging the offset obligation will be determined on finalisation of the project design.

It is considered likely that the biodiversity offsets would be delivered using a combination of the available mechanisms ie through establishment of a series of BSAs, purchase of existing credits from the market or payment into the fund.

Under the BC Act/BC Regulation, biodiversity offset obligations are required to be discharged prior to construction. Pending approval, the project is scheduled to begin construction in 2024. Due to the time required to finalise BSAs and establish biodiversity stewardship sites (12-24 months), Transgrid may not be in a position to retire the full offset credit liability for the project prior to the commencement of construction. As such, subject to approval, Transgrid would seek to apply to the DPE to provide a security/ bond for the biodiversity credit liability. The security would reflect HumeLink liability to be used by the DPE to address any residual credit liabilities if Transgrid does not implement the proposed biodiversity offset measures within approved timeframes.

17. Conclusion

Transgrid proposes to increase the energy network capacity in southern NSW through the development of around 360 kilometres of new 500 kV high-voltage transmission lines and associated infrastructure between Wagga Wagga, Bannaby and Maragle. The project would involve construction of a new substation east of Wagga Wagga (proposed Gugaa 500 kV substation) as well as connection to existing substations at Wagga Wagga and Bannaby and a future substation at Maragle in the Snowy Mountains.

This report provides an assessment of significance on threatened species, ecological communities or their habitats listed under applicable legislation. It specifically:

- provides an assessment of biodiversity values within the project footprint and indicative disturbance area as it is currently understood for the project
- demonstrates the project's effort to avoid and minimise impacts on biodiversity values
- provides mitigation and management of impacts on biodiversity values
- calculates the offset requirement for impacts on biodiversity values that are unable to be avoided
- provides an assessment of significance on threatened species, ecological communities or their habitats listed under the FM Act and EPBC Act.

17.1 Avoidance and minimisation

The project has been designed to avoid and minimise potential impacts on biodiversity values through:

- co-location with existing transmission lines or areas of disturbance to avoid and minimise additional clearance or fragmentation of vegetation wherever possible
- corridor refinement during the options assessment phase of the project, leading to a reduced total length of transmission line, particularly when the additional 'arm' of the project was removed when the decision was made to choose a double-circuit option
- targeting narrow crossing points of waterways (and their associated riparian habitats)
- use of existing access tracks and roads to minimise additional disturbance to the transmission line easement wherever possible
- inclusion of a partial clearing methodology, thereby retaining vegetation beneath the easement during the operational maintenance phase of the project, ie Transgrid are not adopting full continuous clearance of the easement, which would have been the 'easier' maintenance option.

Ongoing commitment to avoid and minimise impacts on biodiversity values would be further achieved through micro-siting new transmission line structures, brake and winch sites and access tracks during the detailed design phase, where practicable.

17.2 Impact summary

The impact assessment is based on the current understanding of design and construction methodology and the indicative disturbance area for these items. The disturbance area is identified based on realistic project component locations and areas however it is indicative at this stage. The area would be confirmed during finalisation of design and construction methodology and would be developed as part of the consideration of avoidance and impact minimisation.

Potential impacts on biodiversity values resulting from the project include:

- direct impacts to 42 native PCTs, including five TECs listed under the BC Act and two TECs listed under the EPBC Act
- direct impacts on native vegetation because of the project including:
  - removal of 670.21 hectares of native vegetation (excluding Category 1 exempt lands)
  - removal of up to 353.07 hectares of TECs listed under the BC Act (excluding Category 1 exempt lands) in the form of:
    - 0.75 hectares of Montane Peatlands and Swamps listed as endangered under the BC Act
      - 0.56 hectares aligns to Alpine Sphagnum Bogs and Associated Fens (endangered under the EPBC Act)
    - 1.7 hectares of Monaro Tableland Cool Temperate Grassy Woodland listed as critically endangered under the BC Act
    - 1.42 hectares of Coolac Tumut Serpentine Shrubby Woodland listed as endangered under the BC Act
    - 37.42 hectares of Tableland Basalt Forest listed as endangered under the BC Act
    - 311.78 hectares of White Box Yellow Box Blakely’s Red Gum grassy woodland and derived native grassland listed as critically endangered under the BC Act
      - 111.47 hectares aligns to White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (critically endangered under the EPBC Act)
- loss of habitat for 50 threatened fauna species identified and/or predicted as ecosystem credit species, 14 of which were recorded and 36 assumed present
- impacts to 58 threatened flora species credit species (detailed in Table 17-1)
- impacts to 33 threatened fauna species credit species and two endangered fauna populations (detailed in Table 17-2).

Table 17-1: Impacts to threatened flora species credit species

Species	Common name	BC Act status	Area of impact (ha)	Recorded/assumed present
Acacia ausfeldii	Ausfeld's Wattle	V	14.6	Assumed present
Acacia bynoeana	Bynoe's Wattle	E	3.0	Assumed present
Acacia flocktoniae	Flockton Wattle	V	14.3	Assumed present
Acacia phasmoides	Phantom Wattle	V	2.0	Assumed present
Ammobium craspedioides	Yass Daisy	V	1147 (count)	Recorded
Baloskion longipes	Dense Cord-rush	V	1.2	Assumed present
Bossiaea fragrans	Bossiaea fragrans	CE	6.1	Assumed present
Bossiaea oligosperma	Few-seeded Bossiaea	V	1.2	Assumed present
Caesia parviflora var. *minor*	Small Pale Grass-lily	E	0.2	Assumed present
Caladenia concolor	Crimson Spider Orchid	E	34.1	Assumed present
Caladenia tessellata	Thick Lip Spider Orchid	E	16.0	Assumed present
Calotis glandulosa	Mauve Burr-daisy	V	16.0	Assumed present

Species	Common name	BC Act status	Area of impact (ha)	Recorded/assumed present
Calotis pubescens	Max Mueller's Burr-daisy	E	0.25	Assumed present
Commersonia prostrata	Dwarf Kerrawang	E	0.75	Assumed present
Cullen parvum	Small Scurf-pea	E	71.7	Assumed present
Dillwynia glaucula	Michelago Parrot-pea	E	1.7	Assumed present
Diuris aequalis	Buttercup Doubletail	E	28.3	Assumed present
Diuris ochroma	Pale Golden Moths	E	0.25	Assumed present
Diuris tricolor	Pine Donkey Orchid	V	1.4	Assumed present
Eucalyptus aggregata	Black Gum	V	2 (count)	Assumed present
Eucalyptus alligatrix subsp. *alligatrix*	Eucalyptus alligatrix subsp. alligatrix	V	1 (count)	Assumed present
Eucalyptus cannonii	Capertee Stringybark	V	1 (count)	Assumed present
Eucalyptus macarthurii	Paddys River Box, Camden Woollybutt	E	18 (count)	Assumed present
Eucalyptus robertsonii subsp. *hemisphaerica*	Robertson's Peppermint	V	1 (count)	Assumed present
Euphrasia arguta	Clover Glycine	V	92.9	Assumed present
Euphrasia scabra	Rough Eyebright	E	1.9	Assumed present
Genoplesium superbum	Superb Midge Orchid	E	8.8	Assumed present
Glycine latrobeana	Glycine latrobeana	CE	0.25	Assumed present
Grevillea iaspicula	Wee Jasper Grevillea	CE	9 (count)	Assumed present
Grevillea wilkinsonii	Tumut Grevillea	CE	34.7	Assumed present
Irenepharsus magicus	Elusive Cress	E	26.5	Assumed present
Kunzea cambagei	Cambage Kunzea	V	12.2	Assumed present
Lepidium hyssopifolium	Aromatic Peppercress	E	36.4	Assumed present
Leucochrysum albicans var. *tricolor*	Hoary Sunray	E	17098 (count)	Recorded
Persoonia marginata	Clandulla Geebung	V	1.2	Assumed present
Persoonia mollis subsp. *revoluta*	Persoonia mollis subsp. revoluta	V	8.0	Assumed present
Phyllota humifusa	Dwarf Phyllota	V	11.4	Assumed present
Pomaderris cotoneaster	Cotoneaster Pomaderris	E	11.7	Assumed present
Pomaderris delicata	Delicate Pomaderris	CE	8.0	Assumed present
Pomaderris pallida	Pale Pomaderris	V	0.77	Assumed present
Prasophyllum bagoense	Bago Leek-orchid	CE	31.9	Assumed present
Prasophyllum innubum	Brandy Marys Leek-orchid	CE	0.25	Assumed present
Prasophyllum keltonii	Kelton's Leek Orchid	CE	31.7	Assumed present

Species	Common name	BC Act status	Area of impact (ha)	Recorded/assumed present
Prasophyllum petilum	Tarengo Leek Orchid	E	24.5	Assumed present
Prasophyllum sp. *Wybong*	Prasophyllum sp. Wybong	E	87.8	Assumed present
Pterostylis alpina	Alpine Greenhood	V	24.4	Assumed present
Pterostylis foliata	Slender Greenhood	V	36.5	Assumed present
Pterostylis oreophila	Blue-tongued Greenhood	CE	0.56	Assumed present
Pultenaea humilis	Dwarf Bush-pea	V	4.2	Assumed present
Rutidosis leiolepis	Monaro Golden Daisy	V	350 (count)	Assumed present
Senecio garlandii	Woolly Ragwort	V	1.2	Assumed present
Solanum armourense	Solanum armourense	V	0.51	Assumed present
Swainsona recta	Small Purple-pea	E	127.0	Assumed present
Swainsona sericea	Silky Swainson-pea	V	187.1	Assumed present
Thelymitra alpicola	Alpine Sun-orchid	V	0.56	Assumed present
Thesium australe	Austral Toadflax	V	110.3	Assumed present
Xerochrysum palustre	Swamp Everlasting	-	1.5	Recorded
Zieria obcordata	Granite Zieria	E	43.4	Assumed present

Table 17-2: Impacts to threatened fauna species credit species

Scientific name	Common name	BC Act status	Area of impact (ha)	Recorded/assumed present
Aprasia parapulchella	Pink-tailed Legless Lizard	V	140.7	Recorded
Burhinus grallarius	Bush Stone-curlew	E	60.5	Assumed present
Callocephalon fimbriatum	Gang-gang Cockatoo	V	306.4	Recorded
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	66.1	Recorded
Cercartetus nanus	Eastern Pygmy-possum	V	193.8	Recorded
Chalinolobus dwyeri	Large-eared Pied Bat	V	7.7	Assumed present
Crinia sloanei	Sloane's Froglet	V	2.6	Assumed present
Cyclodomorphus praealtus	Alpine She-oak Skink	E	12.2	Assumed present
Delma impar	Striped Legless Lizard	V	174.4	Assumed present
Haliaeetus leucogaster	White-bellied Sea-eagle	V	18.64	Recorded
Hieraaetus morphnoides	Little Eagle	V	397.8	Recorded
Keyacris scurra	Key's Matchstick Grasshopper	E	229.0	Recorded
Litoria booroolongensis	Booroolong Frog	E	0.11	Assumed present
Litoria castanea	Yellow-spotted Tree Frog	CE	1.36	Assumed present
Lophoictinia isura	Square-tailed Kite	V	123.9	Assumed present

Scientific name	Common name	BC Act status	Area of impact (ha)	Recorded/assumed present
Mastacomys fuscus	Broad-toothed Rat	V	2.2	Assumed present
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	0.12	Recorded
Mixophyes balbus	Stuttering Frog	E	13.8	Assumed present
Myotis macropus	Southern Myotis	V	13.56	Recorded
Ninox connivens	Barking Owl	V	177.0	Recorded
Ninox strenua	Powerful Owl	V	217.0	Recorded
Petauroides volans	Greater Glider	E	118.0	Recorded
Petaurus norfolcensis	Squirrel Glider	V	170.5	Recorded
Petaurus norfolcensis - endangered population	Squirrel Glider in the Wagga Wagga City Local Government Area	EP	46.7	Assumed present
Petrogale penicillata	Brush-tailed Rock-wallaby	E	1.1	Assumed present
Petroica rodinogaster	Pink Robin	V	213.0	Assumed present
Phascogale tapoatafa	Brush-tailed Phascogale	V	129.9	Assumed present
Phascolarctos cinereus	Koala	E	418.4	Assumed present
Polytelis swainsonii	Superb Parrot	V	59.8	Recorded
Pseudomys fumeus	Smoky Mouse	CE	132.66	Assumed present
Pseudophryne corroboree	Southern Corroboree Frog	CE	22.2	Assumed present
Petaurus australis - endangered population	Yellow-bellied Glider population on the Bago Plateau	EP	19.4	Recorded
Synemon plana	Golden Sun Moth	V	35.9	Assumed present
Tyto novaehollandiae	Masked Owl	V	162.5	Assumed present
Tyto tenebricosa	Sooty Owl	V	21.2	Assumed present

Prescribed impacts relevant to the project include:

- karst, caves, crevices, cliffs, rocks, and other geological features of significance
- human-made structures
- non-native vegetation offering habitat for threatened species
- habitat connectivity, including injury or mortality from transmission line collision, entanglement, or electrocution
- waterbodies, water quality and hydrological processes
- vehicle strikes.

The project would result in minor impacts on groundwater during construction and negligible impacts on groundwater during operation. Therefore, the project is considered unlikely to lead to any adverse impact on the groundwater availability or status for groundwater dependent ecosystems.

Indirect impacts to avifauna and flying mammals from the project are likely due to the potential for increased risk of collision with transmission lines and electric and magnetic fields associated with the new infrastructure.

The project is considered unlikely to lead to a significant impact on any threatened aquatic species, ecological communities or their habitats.

In terms of impacts on MNES under the EPBC Act, the project would:

- impact on two TECs
- impact on known or assumed habitat for 12 threatened flora species listed under the EPBC Act
- impact on known or potential habitat for 23 threatened fauna species
- impact on potential habitat or indirect impacts for ten migratory species listed under the EPBC Act.

The impact assessment outcomes for MNES concluded that:

- The project has the potential to lead to a significant impact on two threatened ecological communities, 26 threatened species and/or their habitats and six migratory species and listed under the EPBC Act.
- For two threatened fauna, six threatened flora and one TEC conclusions of potentially significant impacts are driven by a precautionary approach given survey limitations and without being able to state with certainty that impacts could be avoided during detailed design for the project. Once additional survey is completed and avoidance measures undertaken the risk of a significant impact would be substantially reduced.
- The project would not impact on any wetlands of national or international importance.

17.3 Mitigation and management

The specific performance outcomes for the project regarding biodiversity include:

- avoid and minimise impacts to threatened flora and fauna species, and ecological communities listed under the BC Act and EPBC Act through the design refinement and construction methodology refinement processes
- offset impacts to threatened ecological communities and species.

Proposed mitigation measures to minimise residual indirect impacts to native vegetation and threatened species include:

- development and implementation of a Biodiversity Management Plan to minimise and monitor impacts of construction and operation of biodiversity.
- development and implementation of a Connectivity Strategy to minimise impacts of fragmentation on biodiversity development and implementation of a SWMP, ESCP and WQMP as part of the CEMP to manage water quality impacts during construction of the project.
- avoidance of areas of high biodiversity values through the establishment of biodiversity exclusion zones and micro-siting of infrastructure to during detailed design phase of the project.

17.4 Offsetting biodiversity impacts

Residual impacts that are not able to be managed through mitigation would be offset in accordance with BAM calculations for both ecosystem and species credits. The project offset obligation based on the indicative disturbance area (including 18 species recorded and 77 species assumed present) has been calculated to require the following biodiversity credits:

- Bungonia:
    - 701 ecosystem credits
    - 10,242 species credits
- Crookwell:
    - 1,462 ecosystem credits
    - 13,944 species credits
- Murrumbateman:
    - 1,609 ecosystem credits
    - 15,497 species credits
- Inland Slopes:
    - 3,798 ecosystem credits
    - 30,450 species credits
- Bondo:
    - 645 ecosystem credits
    - 12,936 species credits
- Snowy Mountains:
    - 2,782 ecosystem credits
    - 51,509 species credits.

The calculations in this BDAR are based on current indicative disturbance areas only, as design refinement for the project has not yet been completed. Accordingly, the final biodiversity offset liability is subject to the timing of design and construction methodology refinements and would be determined at that stage.

Further, calculations in the BDAR are based on assumed presence for some species. Additional survey is planned to fill data gaps prior to project approval and post-approval.

The project offset obligations would be met through implementing a combination of the following offset delivery options, being:

- establishing biodiversity stewardship site(s) on lands with like for like biodiversity values to those impacted by the project
- the purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register
- making a payment into the BCF for residual credits not sourced from the preferred approach to established BSAs.

18. References

ACT Government (2017), *Nature Conservation (Pink-tailed Worm lizard) Action Plan 2017*. Australian Capital Territory, Canberra.

Altringham, J., and Kerth, G. (2016), *Chapter 3: Bats and Roads,* Bats in the Anthropocene: Conservation of Bats in a Changing World, Christian C. Voigt, C.C., and Kingston, T. Eds, pp. 35-62, Springer International Publishing AG Switzerland.

Armstrong R.C., Turner K.D., McDougall K.L., Rehwinkel R., Crooks J.I., (2013), Plant communities of the upper Murrumbidgee catchment in New South Wales and the Australian Capital Territory, *Cunninghamia*, 13, pp. 125–265.

Arthur, W., and Pyke, G. (2008), Green and Golden Bell Frogs in New South Wales: Current status and future prospects, *Australian Zoologist,* 34, pp. 319-333, DOI:10.7882/AZ.2008.010.

Atlas of Living Australia (2022), *Agrotis infusa (Boisduval, 1832).* Accessed 10 Nov 2022 from: https://bie.ala.org.au/species/https://biodiversity.org.au/afd/taxa/54b867e9-2d2c-49fb-bcb1-647a6a6a64e8

Augusteyn, J., Matthews, D. and Richards, S., (2021), Monitoring bent-wing bats at Bat Cleft in Central Queensland, *Australian Mammalogy*, 44(2), pp. 236-242.

Auld, T.D., Mackenzie, B.D.E., Breton, T.L., Keith, D.A., Ooi, M., Allen, S. and Gallagher, R. (2020), *A preliminary assessment of the impact of the 2019/2020 fires on NSW plants of national significance,* Technical Report. DOI: 10.13140/RG.2.2.33750.68167. Accessed from: https://www.researchgate.net/publication/342765224.

Aurecon (2023a), *HumeLink Environmental Impact Statement. EIS Technical Report 13 – Bushfire Risk Assessment.* Prepared for Transgrid. Reference: 507179.

Aurecon (2023b), *HumeLink Environmental Impact Statement. EIS Technical Report 11 –Hydrology and Flooding Assessment.* Prepared for Transgrid. Reference: 507179.

Aurecon (2023c), *HumeLink Environmental Impact Statement. EIS Technical Report 12 –Surface and Groundwater Assessment.* Prepared for Transgrid. Reference: 507179.

Austin, M.P., Cawsey, E.M., Baker, B.L., Yialeloglou, M.M., Grice, D.J. and Briggs, S.V. (2000), *Predicted vegetation cover in the Central Lachlan Region*, CSIRO Wildlife & Ecology Final Report for Natural Heritage Trust Project AA 1368.97.

Australian Museum (2022), *Bogong Moth factsheet*. Accessed 10 Nov 2022 from: https://australian.museum/learn/animals/insects/bogong-moth/

Baker, J., Goldingay, R. L., and Whelan, R. J. (1998), Powerline easements through forests: a case study of impacts on avifauna, *Pacific Conservation Biology*, 4(1), pp. 79-89.

Balmori, A. (2009), Electromagnetic pollution from phone masts. Effects on wildlife*, Pathophysiology* 16(2-3), pp. 191-9.

Banks, S.C, Knight, E.J., McBurney, L., Blair, D., and Lindenmayer, D.B (2011), The Effects of Wildfire on Mortality and Resources for an Arboreal Marsupial: Resilience to Fire Events but Susceptibility to Fire Regime Change*, PLoS ONE*, 6(8), e22952.

Barrett, G.W., Silcocks, A.F., Cunningham, R., Oliver, D.L., Weston, M.A., Baker, J., (2007), Comparison of atlas data to determine the conservation status of bird species in New South Wales, with an emphasis on woodland-dependent species*, Australian Zoologist*, 34, pp. 37-77.

Bennett, E.M., Florent, S.N., Venosta, M., Gibson, M., Jackson, A., and Stark, E. (2022), Curtailment as a successful method for reducing bat mortality at a southern Australian wind farm*, Austral Ecology*, 47(6), pp. 1329-1339.

Benson, D., and McDougall, L. (1988), Ecology of Sydney plant species. Part 6 Dicotyledon family Myrtaceae, *Cunninghamia,* 5: 862.

Benson, J.S., Richards, P.G., Waller, S., Allen, C.B., (2010), New South Wales Vegetation classification and Assessment: Part 3 Plant communities of the NSW Brigalow Belt South, Nandewar and west New England Bioregions and update of NSW Western Plains and South-western Slopes plant communities, Version 3 of the NSWVCA database*, Cunninghamia*, 11, pp. 457–579.

BoM (2022), *Average annual & monthly maximum, minimum, & mean temperature*, Australian Government Bureau of Meteorology, Accessed 2021 from: http://www.bom.gov.au/jsp/ncc/climate_averages/temperature/index.jsp

Booth, T.H (2017), Going nowhere fast: a review of seed dispersal in eucalypts, *Australian Journal of Botany,* 65, PP.401-410.

Bray, C., (2008), *Conservation status of Grevillea iaspicula McGillivray (Proteaceae) in New South Wales,* Report to the NSW Scientific Committee, Sydney.

Bray, D.J. and Thompson, V.J. (2019), *Maccullochella macquariensis in Fishes of Australia*. Accessed 25 Aug 2022 from: https://fishesofaustralia.net.au/home/species/4654.

Bray, D.J. and Thompson, V.J. (2021), *Bidyanus bidyanus in Fishes of Australia*. Accessed 25 Aug 2022 from: https://fishesofaustralia.net.au/home/species/689.

Bray, D.J. and Thompson, V.J. (2022), *Nannoperca australis in Fishes of Australia*. Accessed 24 Aug 2022 from: https://fishesofaustralia.net.au/home/species/1828.

Briggs, J.D., Leigh, J.H. (1990), *Delineation of important habitats of threatened plant species in south-eastern New South Wales*, Australian Heritage Commission, Canberra.

Butler, G., Richardson, M. and Ganter, W. (1991), *Recovery plan for Grevillea iaspicula McGillivray (Wee Jasper Grevillea)* – 1991–2000, Australian National Botanic Gardens, Canberra.

Caccamo, G., Bradstock, R., Collins, L., Penman, T. and Watson, P. (2015), Using MODIS data to analyse post-fire vegetation recovery in Australian eucalypt forests, *Journal of Spatial Science*, 60(2), pp. 341-352.

Cameron, M., Loyn, R. H., Oliver, D. and Garnett, S. T. (2021), *Gang-gang Cockatoo Callocephalon fimbriatum*. The Action Plan for Australian Birds 2020, CSIRO Publishing, pp. 410-413.

Campbell, S. (2009), So long as it's near water: variable roosting behaviour of the large-footed myotis (*Myotis macropus*), *Australian Journal of Zoology*, 57, pp. 89-98.

Carter, O and Sutter, G. (2010), *National Recovery Plan for Clover Glycine Glycine latrobeana*, Department of Sustainability and Environment, Melbourne.

Carter, O. and Walsh, N. (2011), *National Recovery Plan for the Swamp Everlasting Xerochrysum palustre*, Department of Sustainability and Environment, Melbourne. Accessed from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-swamp-everlasting-xerochrysum-palustre

Clancy, G. P. (2010), Causes of Mortality in the Black-necked Stork *Ephippiorhynchus asiaticus australis* in New South Wales, *Australian Field Ornithology,* 27(2), pp. 65-75.

Clancy, N., and Land for Wildlife (2011), *Note G4 Wildlife Friendly Fencing and Netting*, Land for Wildlife Queensland, Brisbane. Accessed 10 Nov 2022 from: http://www.lfwseq.org.au/wp-content/uploads/2017/02/Wildlife-Friendly-Fencing-and-Netting.pdf

Clarke P.J. (2000), *Plant population processes in temperate woodlands in eastern Australia – premises for management*, Temperate eucalypt woodlands in Australia: biology, conservation, management and restoration, Hobbs, R.J. and Yates, C.J. Eds, pp. 248-270, Surrey Beatty and Sons Pty Ltd, Australia.

Clarke, G.M. and O'Dwyer, C. (2000), Genetic variability and population structure of the endangered golden sun moth, *Synemon plana*. *Biological Conservation,* 92, pp. 371-381.

Coates, F., Jeanes, J. and Pritchard, A. (2002), *Recovery Plan for Twenty- five Threatened Orchids of Victoria, South Australia and New South Wales 2003 – 2007.* Department of Sustainability and Environment, Melbourne.

Cockburn, A. (1981), Population regulation and dispersion of the smoky mouse, *Pseudomys fumeus*. Spring decline, breeding success and habitat heterogeneity. *Australian Journal of Ecology*, 6, pp. 255-266.

Collins, L. (2000), *Impact of periods of food shortage on the body weight of Grey-headed Flying-foxes*, Proceedings of a Workshop to Assess the Status of the Greyheaded Flying-fox in New South Wales, Richard, G. Ed., pp. 99 – 101, Australasian Bat Society, Canberra.

Commander, L.E., Coates, D., Broadhurst, L., Offord, C.A., Makinson, R.O. and Matthes, M. (2018), *Guidelines for the translocation of threatened plants in Australia Third Edition*, Australian Network for Plant Conservation, Canberra.

Commonwealth of Australia (2008), *Approved Conservation Advice for Calotis glandulosa (*Mauve Burr-daisy). Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/7842-conservation-advice.pdf

Commonwealth of Australia (2015), *Approved Conservation Advice for Eucalyptus aggregata (Black gum).* Available from: https://www.environment.gov.au/biodiversity/threatened/species/pubs/20890-conservation-advice-171115.pdf

Commonwealth of Australia (2017), *Threat Abatement Plan for competition and land degradation by rabbits (2016).* Available from: https://www.legislation.gov.au/Details/F2017L00031

Commonwealth of Australia (2021), *Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Environmental Offsets Policy*, Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Commonwealth of Australia (2021a), *National Recovery Plan for the Painted Honeyeater (Grantiella picta).* Available from https://www.dcceew.gov.au/sites/default/files/documents/recovery-plan-painted-honeyeater.pdf

Commonwealth Threatened Species Scientific Committee (2008), *Conservation Advice - Pomaderris delicata*. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/67208-conservation-advice-11052018.pdf

Cook, B., Bunn, S., and Hughes, J. (2007), Molecular genetic and stable isotope signatures reveal complementary patterns of population connectivity in the regionally vulnerable southern pygmy perch *(Nannoperca australis)*, *Biological Conservation*, 138(1–2), pp. 60-72.

Cotterell, E. (1998), *Fish Passage in Streams – Fisheries Guidelines for Design of Stream Crossings*. Fisheries Group, Queensland Department of Primary Industries, Brisbane.

Davis, GL., (1952), Revision of the genus *Calotis* R.Br, *Proceedings of the Linnean Society of NSW*, 77, pp. 146-188.

Department of Agriculture Water and the Environment (DAWE) (2022a), *Galaxias rostratus in Species Profile and Threats Database, Department of the Environment*, Canberra. Accessed 2022: https://www.environment.gov.au/sprat.

Department of Agriculture Water and the Environment (DAWE) (2022b), *Nannoperca australis Murray-Darling Basin lineage — Southern Pygmy Perch (Murray-Darling Basin lineage).* Species Profile and Threats Database, Department of the Environment, Canberra. Accessed 2022: https://www.environment.gov.au/sprat.

Department of Agriculture Water and the Environment (DAWE) (2022c), *Caladenia rosella in Species Profile and Threats Database,* Department of the Environment, Canberra. Accessed 2022: http://www.environment.gov.au/sprat.

Department of Agriculture, Water and the Environment (DAWE) (2009), *Background Paper to EPBC Act Policy Statement 3.12 – Nationally Threatened Species and Ecological Communities - Significant Impact*

Guidelines for the Critically Endangered Golden Sun Moth (Synemon plana), Canberra. Accessed 2022: https://www.agriculture.gov.au/sites/default/files/documents/background-paper-golden-sun-moth.pdf

Department of Agriculture, Water and the Environment (DAWE) (2021c), *Conservation Advice for Chalinolobus dwyeri*, Canberra Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/183-conservation-advice-23112021.pdf

Department of Agriculture, Water and the Environment (DAWE) (2021c), *Conservation Advice for Pomaderris cotoneaster (Cotoneaster Pomaderris),* Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/2043-conservation-advice-23112021.pdf

Department of Agriculture, Water and the Environment (DAWE) (2021a), *Conservation Advice for Mixophyes balbus (Stuttering Frog, Southern Barred Frog in Victoria),* Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1942-conservation-advice-23112021.pdf

Department of Agriculture, Water and the Environment (DAWE) (2021a), *Conservation Advice for Xerochrysum palustre (Swamp Everlasting).* Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/76215-conservation-advice-23112021.pdf

Department of Agriculture, Water and the Environment (DAWE) (2021b), *Conservation Advice for Leucochrysum albicans* subsp. *tricolor (Hoary Sunray).* Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/89104-conservation-advice-20122021.pdf

Department of Agriculture, Water and the Environment (DAWE) (2021d), *National Recovery Plan for the Painted Honeyeater (Grantiella picta).* Canberra. Available from: http://www.dcceew.gov.au/environment/biodiversity/threatened/publications/recovery/painted-honeyeater-2022

Department of Agriculture, Water and the Environment (DAWE) (2021e), *National Recovery Plan for the Superb Parrot Polytelis swainsonii*. Department of Agriculture, Water and the Environment, Canberra. Available from: http://www.dcceew.gov.au/environment/biodiversity/threatened/publications/recovery/superb-parrot-2022

Department of Agriculture, Water and the Environment (DAWE) (2021f), *Conservation Advice for Synemon plana (Golden Sun Moth).* Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/25234-conservation-advice-07122021.pdf

Department of Agriculture, Water and the Environment (DAWE) (2021g), *Conservation Advice for Chalinolobus dwyeri (Large-eared Pied Bat).* Canberra. Available from:

http://www.environment.gov.au/biodiversity/threatened/species/pubs/183-conservation-advice-23112021.pdf

Department of Agriculture, Water and the Environment (DAWE) (2021h), *National Recovery Plan for the Grey-headed Flying-fox Pteropus poliocephalus.* Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/recovery/grey-headed-flying-fox

Department of Agriculture, Water and the Environment (DAWE) (2021b), *Conservation Advice for Synemon plana (Golden Sun Moth).* Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/25234-conservation-advice-07122021.pdf

Department of Agriculture, Water and the Environment (DAWE) (2021c), *Conservation advice for Acacia phasmoides (Phantom Wattle),* Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/2784-conservation-advice-29092021.pdf

Department of Agriculture, Water and the Environment (DAWE) (2022d), *Conservation Advice for Petaurus australis australis (yellow-bellied glider (south-eastern)).* Canberra. Accessed from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/87600-conservation-advice-02032022.pdf

Department of Agriculture, Water and the Environment (DAWE) (2022a), *Conservation Advice for Callocephalon fimbriatum (Gang-gang Cockatoo).* Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/768-conservation-advice-02032022.pdf

Department of Agriculture, Water and the Environment (DAWE) (2022b), *Conservation Advice for Pycnoptilus floccosus (Pilotbird).* Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/525-conservation-advice-02032022.pdf

Department of Agriculture, Water and the Environment (DAWE) (2022c), *Conservation Advice for Petaurus australis australis (yellow-bellied glider (south-eastern)).* Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/87600-conservation-advice-02032022.pdf

Department of Agriculture, Water and the Environment (DAWE) (2022d), *Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory.* Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/85104-conservation-advice-12022022.pdf

Department of Agriculture, Water and the Environment (DAWE) (2022e), *National Recovery Plan for the Koala Phascolarctos cinereus (combined populations of Queensland, New South Wales and the Australian Capital Territory).* Canberra. Available from: http://www.dcceew.gov.au/environment/biodiversity/threatened/publications/recovery/koala-2022

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022), National Flying-fox monitoring viewer. Accessed 10 Nov 2022 from: https://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022n), *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – SPRAT profile.* Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=43

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022o), *Alpine Sphagnum Bogs and Associated Fens – SPRAT profile*. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=29

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022p), *Acacia bynoeana – Bynoe's Wattle – SPRAT profile.* Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=8575

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022q), *Ammobium craspedioides - Yass Daisy – SPRAT profile.* Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=20758

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022r), *Eucalyptus aggregate - Black Gum – SPRAT profile.* Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=20890

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022s), *Leuchochrysum albicans* subsp. *tricolor - Hoary Sunray – SPRAT profile.* Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=56204

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022b), *Conservation Advice for Calyptorhynchus lathami lathami (South-eastern Glossy Black Cockatoo).* Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/67036-conservation-advice-10082022.pdf

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022t), *Polytelis swainsonii - Superb Parrot – SPRAT profile.* Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=738

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022c), *Petauroides Volans - Greater Glider – SPRAT profile.* Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=254

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022d), *Conservation Advice for Petauroides volans (greater glider (southern and central))*. Canberra. Available from: https://www.environment.gov.au/biodiversity/threatened/species/pubs/254-conservation-advice-05072022.pdf

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022e), *Petaurus australis australis - Yellow-bellied Glider (south-eastern) – SPRAT profile.* Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=87600

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022v), *Aprasia parapulchella - Pink-tailed Legless Lizard – SPRAT profile.* Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1665

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022f), *Apus pacificus - Fork-tailed Swift – SPRAT profile.* Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=678

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022g), *Calidris acuminata - Sharp-tailed Sandpiper – SPRAT profile.* Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=874

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022h), *Calidris ruficollis - Red-necked Stint – SPRAT profile.* Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=860

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022i), *Gallinago hardwickii - Latham's Snipe – SPRAT profile.* Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=863

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022j), *Tringa nebularia - Common Greenshank – profile.* Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=832

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022k), *Tringa stagnatilis - Marsh Sandpiper – SPRAT profile.* Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=833

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022l), *Hirundapus caudacutus - White-throated Needletail – SPRAT profile.* Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=682

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022m), *Anthochaera Phrygia - Regent Honeyeater – SPRAT profile.* Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=82338

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022w), *Kunzea cambagei – Cambage Kunzea – SPRAT profile.* Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=11420

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022x), *Pomaderris cotoneaster – Cotoneaster Pomaderris – SPRAT profile.* Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=2043

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022y), *Xerochrysum palustre – Swamp Everlasting – SPRAT profile.* Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=76215

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022z), *Prasophyllum innubum – Brandy Marys Leek-orchid - SPRAT profile.* Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=83603

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022aa), *Prasophyllum keltonii – Keltons Leek-orchid – SPRAT profile.* Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=83604

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022ab), *Prasophyllum bagoense – Bagos Leek-orchid – SPRAT profile.* Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=84276

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022ac), *Pterostylis oreophila – Blue-tongued Greenhood - SPRAT profile.* Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=22903

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022ad), *Thesium australe – Austral Toadflax – SPRAT profile.* Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=15202

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022ae), *Crinia sloanei – Sloane's Froglet – SPRAT profile*. Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=59151

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022af), *Litoria booroolongensis – Booroolong Frog – SPRAT profile.* Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1844

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022ag), *Litoria castanea – Yellow Spotted Tree Frog – SPRAT profile.* Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1848

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022ah), *Litoria aurea – Green and Golden Bell Frog – SPRAT profile.* Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1870

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022ai), *Lathamus discolor – Swift Parrot – SPRAT profile.* Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=744

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022aj), *Kayacris scurra – Key's Matchstick Grasshopper – SPRAT profile.* Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=89739

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022ak), *Chalinolobus dwyeri – Large-eared Pied Bat – SPRAT profile.* Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=183

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022al), *Delma impar – Striped Legless Lizard – SPRAT profile.* Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1649

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022am), *Galaxis rostratus – Flathead Galaxias – SPRAT profile.* Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=84745

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022an), *Hirundapus caudacutus – White-throated Needletail – SPRAT profile.* Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=682

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022), *Species Profile and Threats Database – Rhizanthella slateri – Eastern Underground Orchid – SPRAT Profile.* Canberra. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=11768

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2013), *Threat Abatement Guidelines for the Key Threatening Process 'Novel biota and their impact on biodiversity'*. Accessed 2022: https://www.dcceew.gov.au/environment/biodiversity/threatened/key-threatening-processes/novel-biota-impact-on-biodiversity

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2014a), *Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants - Threat abatement actions*. Accessed 2022: https://www.dcceew.gov.au/environment/biodiversity/threatened/threat-abatement-advices/escaped-garden-plants-threat-abatement-actions

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2014b), *Aggressive exclusion of birds from potential woodland and forest habitat by over-abundant noisy miners (Manorina melanocephala).* Accessed 2022: https://www.dcceew.gov.au/environment/biodiversity/threatened/key-threatening-processes/overabundant-noisy-miners

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022), *Species Profile and Threats Database, Department of Climate Change, Energy, the Environment and Water*, Canberra. Accessed 2022: https://www.environment.gov.au/sprat.

Department of Environment & Conservation (DEC) (2007), *Draft NSW and National Recovery Plan for the Golden Sun Moth Synemon plana.* Department of Environment and Conservation, Queanbeyan, NSW.

Department of Environment and Climate Change (DECC) (2002), *Descriptions for NSW (Mitchell) Landscapes, Version 2,* NSW Government, Sydney. Accessed 2022: https://www.environment.nsw.gov.au/resources/conservation/LandscapesDescriptions.pdf.

Department of Environment and Climate Change (DECC) (2008a), *Managing Urban Stormwater: Soils and construction - Volume 2A*, NSW Government, Sydney. ISBN 978-1-74122-577-8.

Department of Environment and Climate Change (DECC) (2008b), *Managing Urban Stormwater: Soils and construction - Volume 2C, Unsealed roads*, NSW Government, Sydney. ISBN 978 1 74122 578 5.

Department of Environment and Conservation (DEC) (2004), *Threatened biodiversity survey and assessment, Guidelines for developments and activities (2004 working draft),* NSW Government, Canberra. Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/draft-threatened-biodiversity-survey-guide.pdf

Department of Environment and Conservation (DEC) (2004), *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities.* Available from: http://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/draft-threatened-biodiversity-survey-guide.pdf

Department of Environment and Conservation (DEC) (2007), *Zieria obcordata Approved Recovery Plan.* Sydney, NSW. Accessed from: https://www.dcceew.gov.au/sites/default/files/documents/zieria-obcordata.pdf

Department of Environment and Conservation (DEC) (2012). Approved National Recovery Plan for Small Purple-pea (Swainsona recta). Hurstville, NSW. Accessed from: https://www.dcceew.gov.au/sites/default/files/documents/swainsona-recta.pdf

Department of Environment and Conservation NSW (DEC) (2006), *Recovery Plan for the Large Forest Owls: Powerful Owl (Ninox stenua), Sooty Owl (Tyto tenebricosa) and Masked Owl (Tyto novaehollandiae).* DEC, Hurstville.

Department of Environment and Heritage (DEH) (2000), Revision of the Interim Biogeographic Regionalisation of Australia (IBRA) and the Development of Version 5.1. - Summary Report. Department of Environment and Heritage, Canberra.

Department of Environment and Resource Management (DERM) (2011), *National recovery plan for the Large-eared Pied Bat Chalinolobus dwyeri.* Qld Government, Brisbane QLD 4001. Accessed from: *https://www.dcceew.gov.au/sites/default/files/documents/large-eared-pied-bat.pdf.*

Department of Environment and Resource Management (DERM) (2011), *National recovery plan for the large-eared pied bat Chalinolobus dwyeri.* Report to the Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Department of Environment, Climate Change and Water (DECCW) (1996), *Golden Sun Moth – endangered species listing.* NSW Scientific Committee – final determination. Available from: http://www.environment.nsw.gov.au/determinations/GoldenSunMothEndSpListing.htm.

Department of Environment, Climate Change and Water (DECCW) (2009b), *National Recovery Plan for Pomaderris cotoneaster.* Department of Environment, Climate Change and Water, Canberra.

Department of Environment, Climate Change and Water (DECCW) (2009) *National Recovery Plan for Pomaderris cotoneaster (Cotoneaster pomaderris)*. Department of Environment, Climate Change and Water, Canberra.

Department of Environment, Climate Change and Water (DECCW) (2010), *National Recovery Plan for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland.* Department of Environment, Climate Change and Water, Canberra.

Department of Environment, Climate Change and Water (DECCW) (2010), *Identification guidelines for endangered ecological communities – Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions.* Canberra. Accessed 2022: https://www.environment.nsw.gov.au/resources/pnf/10520TablelandBasaltForestGuidelines.pdf

Department of Environment, Climate Change and Water (DECCW) (2015), *National Recovery Plan for the Alpine Sphagnum Bogs and Associated Fens.* Department of Environment, Climate Change and Water, Canberra.

Department of Environment, Land, Water and Planning (DELWP) (2016), *National Recovery Plan for the Spotted-tailed Quoll Dasyurus maculatus.* Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/spotted-tailed-quoll

Department of Environment, Water Heritage and the Arts (DEWHA) (2010b), *Survey guidelines for Australia's threatened birds. EPBC Act survey guidelines 6.2.* Canberra. Available from: https://www.dcceew.gov.au/environment/epbc/publications/survey-guidelines-australias-threatened-birds

Department of Environment, Water, Heritage and the Arts (DEWHA) (2008), *Approved Conservation Advice for Alpine Sphagnum Bogs and Associated Fens ecological community.* Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/29-conservation-advice.pdf. In effect under the EPBC Act from 07-Jan-2009.

Department of Environment, Water, Heritage and the Arts (DEWHA) (2009), *Background Paper to EPBC Act Policy Statement 3.12 – Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (Synemon plana).* Canberra. Available from: http://www.environment.gov.au/system/files/resources/b945f32e-3f75-4739-a793-9f672893f3bb/files/background-paper-golden-sun-moth.pdf

Department of Environment, Water, Heritage and the Arts (DEWHA) (2010a), *Survey Guidelines for Australia's Threatened Frogs. EPBC Act survey guidelines 6.3.* Canberra. Available from: https://www.dcceew.gov.au/environment/epbc/publications/survey-guidelines-australias-threatened-frogs

Department of Environment, Water, Heritage and the Arts (DEWHA) (2010c), *Survey Guidelines for Australia's Threatened Bats. EPBC Act survey guidelines 6.1.* Canberra. Available from: https://www.dcceew.gov.au/environment/epbc/publications/survey-guidelines-australias-threatened-bats

Department of Land and Water Conservation (DLWC) (1994), *Guidelines for the planning, construction and maintenance of tracks.* Department of Land and Water Conservation, Maitland, June 1994, SH/4. ISBN 0 7310 29418 8.

Department of Planning and Environment (DPE) (1999), *Euphrasia scabra (a herb) – endangered species listing, NSW Scientific Committee – Final Determination.* Accessed 2022: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2008-2010/660chroma660t-scabra-endangered-species-listing

Department of Planning and Environment (DPE) (2001), *NSW Threatened Species Scientific Committee Final Determination: Mount Canobolas Xanthoparmelia Lichen Community - endangered ecological community listing.* Accessed 2023: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2000-2003/mount-canobolas-xanthoparmelia-lichen-community-endangered-ecological-community-listing

Department of Planning and Environment (DPE) (2003), *Caladenia chromate (a terrestrial orchid) – endangered species listing.* NSW Scientific Committee – final determination. Accessed 2022: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2000-2003/caladenia-tessellata-a-terrestrial-orchid-endangered-species-listing

Department of Planning and Environment (DPE) (2003a), *NSW Scientific Committee: Rhizanthella slateri (an underground orchid) – vulnerable species listing – Final Determination.* Accessed 2022: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2004-2007/pterostylis-oreophila-an-orchid-critically-endangered-species-listing

Department of Planning and Environment (DPE) (2003b), *NSW Scientific Committee: Solanum armourense (a shrub) – endangered species listing – Final Determination.* Accessed 2022: https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-Species-Scientific-Committee/Determinations/Final-determinations/2000-2003/Solanum-armourense-a-shrub-endangered-species-listing

Department of Planning and Environment (DPE) (2005), *Diuris chroma (an orchid) – endangered species listing -Final Determination.* Accessed 2022: https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-Species-Scientific-Committee/Determinations/Final-determinations/2004-2007/Diuris-ochroma-an-orchid-endangered-species-listing

Department of Planning and Environment (DPE) (2008), *Prasophyllum innubum* (*terrestrial orchid) – critically endangered species listing, NSW Scientific Committee – Final Determination.* Accessed 2022: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2008-2010/euphrasia-scabra-endangered-species-listing

Department of Planning and Environment (DPE) (2008a), *NSW Scientific Committee Pterostylis oreophila (an orchid) – critically endangered species listing – Final Determination.* Accessed 2022: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2004-2007/pterostylis-oreophila-an-orchid-critically-endangered-species-listing

Department of Planning and Environment (DPE) (2008b), *NSW Scientific Committee: Thelymitra atronitida (an orchid) – critically endangered species listing – Final Determination.* Accessed 2022: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2004-2007/pterostylis-oreophila-an-orchid-critically-endangered-species-listing

Department of Planning and Environment (DPE) (2008c), *Prasophyllum keltonii (terrestrial leek orchid) – NSW Scientific Committee – Final Determination.* Accessed 2022: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2008-2010/prasophyllum-keltonii-terrestrial-leek-orchid-critically-endangered-species-listing

Department of Planning and Environment (DPE) (2009), *NSW Threatened Species Scientific Committee Final Determination: Grevillea iaspicula - critically endangered species listing – critically endangered species listing.* Accessed 2023: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2008-2010/grevillea-iaspicula-critically-endangered-species-listing

Department of Planning and Environment (DPE) (2010a)., *Grevilea iaspicula – critically endangered species listing, NSW Scientific Committee – Final Determination.* Accessed 2022: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2008-2010/grevillea-iaspicula-critically-endangered-species-listing

Department of Planning and Environment (DPE) (2010b), *Smoky mouse (Pseudomys fumeus) – critically endangered species listing, NSW Scientific Committee – Final Determination.* Accessed 2022: https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-Species-Scientific-Committee/Determinations/Final-determinations/2008-2010/Smoky-Mouse-Pseudomys-fumeus-critically-endangered-species-listing

Department of Planning and Environment (DPE) (2014), *Prasophyllum bagoense, an orchid – critically endangered species listing Final Determination.* Accessed 2022: https://cms.environment.nsw.gov.au//topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2013-2015/prasophyllum-bagoense-an-orchid-critically-endangered-species-listing

Department of Planning and Environment (DPE) (2015a), *Glycine latrobeana, a herb – critically endangered species listing, NSW Scientific Committee – Final Determination.* Accessed 2022: https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-

Species-Scientific-Committee/Determinations/Final-determinations/2013-2015/Glycine-latrobeana-a-herb-critically-endangered-species-listing

Department of Planning and Environment (DPE) (2015b), *Saving Our Species strategies: Eucalyptus alligatrix* subsp. *alligatrix (Eucalyptus alligatrix* subsp. *alligatrix).* Accessed 2023: https://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10281

Department of Planning and Environment (DPE) (2015c), *South East Local Land Services Biometric vegetation map, 2014. VIS_ID 4211.* Accessed 2023: https://datasets.seed.nsw.gov.au/dataset/south-east-local-land-services-biometric-vegetation-map-2014-vis_id-4211

Department of Planning and Environment (DPE) (2020), *NSW Threatened Species Scientific Committee Final Determination: Grevillea wilkinsonii.* Accessed 2022: https://www.environment.nsw.gov.au/news/nsw-threatened-species-scientific-committee-final-determination-grevillea-wilkinsonii

Department of Planning and Environment (DPE) (2021a), *NSW Threatened Species Scientific Committee Final Determination: Southern corroboree frog (Pseudophryne corroboree) - critically endangered species listing.* Accessed 2023: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2008-2010/southern-corroboree-frog-pseudophryne-corroboree-critically-endangered-species-listing

Department of Planning and Environment (DPE) (2021b), *NSW Threatened Species Scientific Committee Final Determination: Brush-tailed rock-wallaby (Petrogale penicillata) - endangered species listing.* Accessed 2023: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2000-2003/brush-tailed-rock-wallaby-petrogale-penicillata-endangered-species-listing

Department of Planning and Environment (DPE) (2022), *Cumulative Impact Assessment for State Significant Projects guideline*, October 2022, Canberra.Department of Planning and Environment (DPE) (2022), *BioNet Threatened Biodiversity Data Collection,* NSW Office of Environment and Heritage, Sydney, Accessed 2022: https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-BioNet/web-services

Department of Planning and Environment (DPE) (2022a), *BioNet Atlas of NSW Wildlife – Spatial Viewer*, NSW Office of Environment and Heritage, Sydney, Accessed 2022: https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-BioNet/web-services

Department of Planning and Environment (DPE) (2022a), *Threatened species: Regent Honeyeater– profile*. Accessed January 2023 from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10841.

Department of Planning and Environment (DPE) (2022b), *Prasophyllum innubum (terrestrial orchid) – critically endangered species listing, NSW Scientific Committee – Final Determination.* Accessed 2022 https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-Species-Scientific-Committee/Determinations/Final-determinations/2008-2010/Prasophyllum-innubum-terrestrial-orchid-critically-endangered-species-listing

Department of Planning and Environment (DPE) (2022b), *Threatened species: Swift Parrot – profile*. Accessed January 2023 from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10455.

Department of Planning and Environment (DPE) (2022c), *Threatened species: Golden Sun Moth – profile.* Accessed September 2022 from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10791

Department of Planning and Environment (DPE) (2022d), *Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide.* Available from: https://www.environment.nsw.gov.au/research-and-publications/publications-search/koala-phascolarctos-cinereus-biodiversity-assessment-method-survey-guide

Department of Planning, Industry and Environment (DPIE) (2018a), *Biodiversity Assessment Method (BAM) Calculator User guide*, Canberra. Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/biodiversity-assessment-method-calculator-user-guide.pdf

Department of Planning, Industry and Environment (DPIE) (2018b), *Water Management (General) Reg 2018 Hydro Line spatial data,* Canberra. Accessed 2022: https://www.dpie.nsw.gov.au/water/licensing-and-trade/hydro-line-spatial-data

Department of Planning, Industry and Environment (DPIE) (2019), *Biodiversity Assessment Method Operational Manual Stage 2*, Canberra. Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/biodiversity-assessment-method-operational-manual-stage-2-190512.pdf

Department of Planning, Industry and Environment (DPIE) (2020), *Saving our Species Projects Granite zieria (Zieria obcordata) Fact Sheet.* Accessed 2022 https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/granite-zieria-zieria-obcordata-fact-sheet-200459.pdf.

Department of Planning, Industry and Environment (DPIE) (2020a), *Biodiversity Assessment Method.* NSW Government, Sydney. Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/biodiversity-assessment-method-2020-200438.pdf

Department of Planning, Industry and Environment (DPIE) (2020b), *Biodiversity Assessment Method 2020 Operational Manual – Stage 1*, Canberra. Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/biodiversity-assessment-method-2020-operational-manual-stage-1-200582.pdf

Department of Planning, Industry and Environment (DPIE) (2020c), *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method*, Canberra. Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/surveying-threatened-plants-and-habitats-nsw-survey-guide-biodiversity-assessment-method-200146.pdf

Department of Planning, Industry and Environment (DPIE) (2020d), *NSW Survey Guide for Threatened Frogs: a Guide for the Survey of Threatened Frogs and their Habitats for the Biodiversity Assessment Method,* Canberra. Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/nsw-survey-guide-for-threatened-frogs-200440.pdf

Department of Planning, Industry and Environment (DPIE) (2020e), *Guideline for applying the Biodiversity Assessment Method at severely burnt sites*, Canberra. Accessed 2022, https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/guidelineforapplyingbiodiversityassessmentmethodatseverelyburntsitesassessmentreports200104.pdf

Department of Planning, Industry and Environment (DPIE) (2020f), *Fire Extent Severity Mapping*, Canberra. Accessed 2021: https://datasets.seed.nsw.gov.au/dataset/fire-extent-and-severity-mapping-fesm

Department of Planning, Industry and Environment (DPIE) (2020g), *Independent Audit – Post Approval Requirements*, Sydney. Accessed 2023: https://www.planning.nsw.gov.au/sites/default/files/2023-02/independent-audit-par-202005.pdf

Department of Planning, Industry and Environment (DPIE) (2021), *BioNet Threatened Species Database Collection*, Canberra. Available from: https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet/web-services

Department of Planning, Industry and Environment (DPIE) (2021a), *NSW Wildlife and Conservation Bushfire Recovery – medium-term response plan.* Available from: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Fire/nsw-wildlife-and-conservation-bushfire-recovery-medium-term-response-plan-200478.pdf.

Department of Planning, Industry and Environment (DPIE) (2021a), *Saving our Species Projects 2016-21 – Alpine Leek Orchids – Prasophyllum bagoense and P. keltonii, Endangered*. Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/sos-summaries/2016-21/saving-our-species-projects-2016-21-alpine-leek-orchid-prasophyllum-bagoense-p-keltonii-210378.pdf

Department of Planning, Industry and Environment (DPIE) (2021a), *Bionet Threatened Species Database Collection*, Canberra, Accessed 2021 from: https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet/web-services

Department of Planning, Industry and Environment (DPIE) (2021b), *Saving our Species Projects 2016-21 – Delicate Pomaderris Pomaderris delicata, Critically endangered.* Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/sos-summaries/2016-21/saving-our-species-projects-2016-21-delicate-pomaderris-pomaderris-delicata-210382.pdf

Department of Planning, Industry and Environment (DPIE) (2021c), *Saving our Species Projects 2016 – 21, Wee Jasper grevillea – Critically endangered*, Canberra, ISBN 978-1-922715-65-4; EES 2021/0457; October 2021

Department of Planning, Industry and Environment (DPIE) (2021d), *Saving our Species Projects 2016-21 – Mauve burr-daisy Calotis glandulosa, Vulnerable.* Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/sos-summaries/2016-21/saving-our-species-projects-2016-21-mauve-burr-daisy-calotis-glandulos-210349.pdf

Department of Planning, Industry and Environment (DPIE) (2021e), *Saving our Species Projects 2016-21 – Thick-lip spider orchid Caladenia chromate, Endangered.* Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/sos-summaries/2016-21/saving-our-species-projects-2016-21-thick-lip-spider-orchid-caladenia-tessellata-210433.pdf

Department of Planning, Industry and Environment (DPIE) (2021f), *Smoky mouse (Pseudomys fumeus), Critically endangered Saving our Species Projects 2016-21.* Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/sos-summaries/2016-21/saving-our-species-projects-2016-21-smoky-mouse-pseudomys-fumeus-210385.pdf

Department of Planning, Industry and Environment (DPIE) (2021g), S*aving our Species – Pilularia novae-hollandiae.* Accessed 2022: https://www.environment.nsw.gov.au/savingourspeciesapp/ViewFile.aspx?ReportProjectID=48&ReportProfileID=10628

Department of Planning, Industry and Environment (DPIE) (2021h), *Saving our Species Projects 2016-21 Crimson spider orchid Caladenia concolor Endangered.* Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/sos-summaries/2016-21/saving-our-species-projects-2016-21-crimson-spider-orchid-caladenia-concolor-210374.pdf

Department of Primary Industries (DPI) (2004), *Policy and Guidelines for Fish Friendly Waterway Crossings,* NSW Government, Orange. Accessed 2022: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/634697/Fish-friendly-waterway-crossings_Policy-and-guidelines_FN-1181.pdf

Department of Primary Industries (DPI) (2005a), *Degradation of native riparian vegetation along NSW water courses*, June 2005. Primefact 12, NSW Government. Accessed 2022: https://www.dpi.nsw.gov.au/fishing/threatened-species/what-current/key-threatening-processes1/degradation-of-native-riparian-vegetation

Department of Primary Industries (DPI) (2005b), *Instream structures and other mechanisms that alter natural flows*, June 2005. Primefact 10, NSW Government. Accessed 2022: https://www.dpi.nsw.gov.au/fishing/habitat/publications/pubs/instream-structures

Department of Primary Industries (DPI) (2005c), *Removal of large woody debris from NSW rivers and streams*, June 2005. Primefact 11, NSW Government. Accessed 2022: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/634529/Primefact_Removal_of_large_woody_debris.pdf

Department of Primary Industries (DPI) (2006), *Trout cod (Maccullochella macquariensis) recovery plan.* Threatened Species Unit. Fisheries Conservation and Aquaculture.

Department of Primary Industries (DPI) (2006a), *Trout cod (Maccullochella macquariensis) recovery plan,* Threatened Species Unit, Fisheries Conservation and Aquaculture. Accessed 2022: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0006/228498/trout-cod-recovery-plan.pdf

Department of Primary Industries (DPI) (2006b*), Aquatic ecological community in the natural drainage system of the lowland catchment of the Lachlan River*, October 2006, Primefact 145.

Department of Primary Industries (DPI) (2007*), Endangered ecological communities in NSW: Lower Murray River aquatic ecological community*, September 2007, Primefact 172, second edition.

Department of Primary Industries (DPI) (2008), *Threatened species assessment guidelines: The assessment of significance*, Canberra.

Department of Primary Industries (DPI) (2013), *Primefact: Southern Pygmy Perch Nannoperca australis.* November 2013. Primefact 190, Second Edition. Fisheries Ecosystems Unit, Port Stephens Fisheries Institute.

Department of Primary Industries (DPI) (2013*), Southern Pygmy Perch: Nannoperca australis*, November 2013, Primefact 190, Second Edition. Fisheries Ecosystems Unit, Port Stephens Fisheries Institute.

Department of Primary Industries (DPI) (2014), *Flathead Galaxias – Galaxias rostratus.* December 2014, Primefact 880, First Edition. Aquatic Ecosystems Unit, Port Stephens Fisheries Institute.

Department of Primary Industries (DPI) (2014), *Flathead Galaxias – Galaxias rostratus*, December 2014, Primefact 880, First Edition, Aquatic Ecosystems Unit, Port Stephens Fisheries Institute.

Department of Primary Industries (DPI) (2015), *Indicative Distribution in NSW: Macquarie Perch (Macquaria australasica).* Available from: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/670248/Macquarie-Perch.pdf

Department of Primary Industries (DPI) (2015a), *Surveys, monitoring and conservation status of Southern Pygmy Perch (Nannoperca australis) within Blakney and Pudman Creeks*, Department of Trade and Investment. Accessed 2022: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/551927/southern_pygmy_perch_web_version.pdf

Department of Primary Industries (DPI) (2015b), *Indicative Distribution in NSW: Southern Pygmy Perch (Nannoperca australis)*, Accessed 2022: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/670261/Southern-Pygmy-Perch.pdf

Department of Primary Industries (DPI) (2015c), *Indicative Distribution in NSW: Macquarie Perch (Macquaria australasica)*, Accessed 2022: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/670248/Macquarie-Perch.pdf.

Department of Primary Industries (DPI) (2016a), *Fish communities and threatened species distributions of NSW*, NSW Department of Primary Industries, Second edition July 2016.

Department of Primary Industries (DPI) (2016a), *Macquarie Perch - Macquaria australasica.* April 2016, Primefact 9, Third Edition. Threatened Species Unit, Port Stephens Fisheries Institute.

Department of Primary Industries (DPI) (2016b), *Macquarie Perch - Macquaria australasica,* April 2016, Primefact 9, Third Edition, Threatened Species Unit, Port Stephens Fisheries Institute.

Department of Primary Industries (DPI) (2016c), *Indicative Distribution in Murray Darling Basin NSW, Silver Perch (Bidyanus bidyanus),* Accessed 2022*:* https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/635778/Silver-Perch-Bidyanus-bidyanus.pdf

Department of Primary Industries (DPI) (2017), *Trout Cod Maccullochella macquariensis.* February 2017, Primefact 185, Third edition. Threatened Species Unit, Port Stephens Fisheries Institute.

Department of Primary Industries (DPI) (2017), *Trout Cod Maccullochella macquariensis, February 2017, Primefact 185, Third edition.* Threatened Species Unit, Port Stephens Fisheries Institute.

Department of Primary Industries (DPI) (2018), *Indicative Distribution in NSW: Murray Crayfish (Euastacus armatus)*, Accessed 2022: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0020/670250/MurrayCrayfish_Distribution.pdf

Department of Primary Industries (DPI) (2019), *Murray Crayfish - Euastacus armatus,* February 2019, Primefact 1300, Second Edition. DPI Fisheries Threatened Species Unit.

Department of Primary Industries (DPI) (2022a), *Fisheries Spatial Data Portal*. Available from: https://www.dpi.nsw.gov.au/about-us/research-development/spatial-data-portal

Department of Primary Industries (DPI) (2022a), *Fisheries Spatial Data Portal*, Accessed 2022: https://www.dpi.nsw.gov.au/about-us/research-development/spatial-data-portal

Department of Primary Industries (DPI) (2022b), *Request for SEARS – HumeLink (SSI-36656827) (Wagga Wagga City, Snowy Valleys, Cootamundra-Gundagai Regional, Yass Valley, Upper Lachlan Shire)*, FE22/180. C22/122, Letter dated: 23 February 2022.

Department of Primary Industries (DPI) (N.D.), *Eel-Tailed Catfish in the Murray-Darling Basin,* Webpage. Accessed 2022: https://www.dpi.nsw.gov.au/fishing/threatened-species/what-current/endangered-populations2/eel-tailed-catfish

Department of Primary Industries (DPI) (N.D.), *Epizootic Haematopoietic Necrosis Virus (EHNV),* Webpage. Accessed 2022: https://www.dpi.nsw.gov.au/fishing/aquatic-biosecurity/aquatic-industries/wildfish-shellfish/ehnv

Department of Primary Industries (DPI) (N.D.), *Freshwater threatened species distribution maps*, NSW Government. Accessed 2022: https://www.dpi.nsw.gov.au/fishing/species-protection/threatened-species-distributions-in-nsw/freshwater-threatened-species-distribution-maps#limitations

Department of Primary Industries (DPI) (N.D.), *NSW Aquatic pest and Disease Locations viewer*, Webpage. Accessed 2022: https://www.dpi.nsw.gov.au/fishing/aquatic-biosecurity/pests-diseases/pest-disease-distribution

Department of Primary Industries (DPI) (N.D.), *Priorities Action Statement - Actions for Flathead Galaxias*, NSW Government. Accessed 2022: https://www.dpi.nsw.gov.au/fishing/threatened-species/what-current/critically-endangered-species/flathead-galaxias/priorities-action-statement-actions-for-flathead-galaxias

Department of Regional New South Wales 2022 (DRNSW) (2022), *NSW Seamless Geology.* NSW Government. Accessed 2022: https://data.nsw.gov.au/data/dataset/nsw-seamless-geology

Department of Sustainability Environment Water Population and Communities (DSEWPaC) (2011a), *Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed under the Environment Protection and Biodiversity Conservation Act 1999.* Available from: https://www.agriculture.gov.au/sites/default/files/documents/survey-guidelines-mammals.pdf

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2011b), *Survey guidelines for Australia's threatened reptiles as threatened under the EPBC Act.* Available from: https://www.dcceew.gov.au/environment/epbc/publications/survey-guidelines-australias-threatened-reptiles

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2011c), *Referral guidelines for the striped legless lizard, Delma impar.* Available from: https://www.dcceew.gov.au/environment/epbc/publications/epbc-act-referral-guidelines-vulnerable-striped-legless-lizard-delma-impar

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2011d), *Survey guidelines for Australia's threatened fish. Guidelines for detecting fish listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999.* Available from: https://www.agriculture.gov.au/sites/default/files/documents/survey-guidelines-fish.pdf

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2012a), *Approved Conservation Advice for Prasophyllum bagoense (Bago leek-orchid).* Canberra, ACT: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/84276-conservation-advice.pdf

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2012b), *Approved Conservation Advice for Pterostylis oreophila (Kiandra greenhood).* Canberra, ACT: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/22903-conservation-advice.pdf

Department of Sustainability, Environment, Water, Population and Communities (2011), *Approved Conservation Advice for Euphrasia arguta (a herb).* Canberra, ACT: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/4325-conservation-advice.pdf. In effect under the EPBC Act from 19-Mar-2011.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2011a), *Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*, Commonwealth Government, Canberra. Accessed 2022: https://www.awe.gov.au/sites/default/files/documents/survey-guidelines-mammals.pdf

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2011b), *Survey guidelines for Australia's threatened reptiles: Guidelines for detecting reptiles listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*, Commonwealth Government, Canberra. Accessed 2022: https://www.awe.gov.au/sites/default/files/documents/survey-guidelines-reptiles.pdf

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2011c), *European wild rabbit (Oryctolagus cuniculus), Commonwealth Government, Canberra.* Accessed 2022: https://www.dcceew.gov.au/environment/invasive-species/publications/factsheet-european-wild-rabbit-oryctolagus-cuniculus

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2011d), *Feral deer. European wild rabbit (Oryctolagus cuniculus), Commonwealth Government, Canberra.* Accessed 2022: https://www.dcceew.gov.au/environment/invasive-species/publications/factsheet-feral-deer

Department of the Environment (DoE) (2013), *Draft survey guidelines for Australia's threatened orchids,* Commonwealth Government, Canberra. Accessed 2022: https://www.awe.gov.au/sites/default/files/documents/draft-guidelines-threatened-orchids.pdf

Department of the Environment (DoE) (2013), *Matters of National Environmental Significance: Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999, Canberra.* Accessed 2022: https://www.dcceew.gov.au/environment/epbc/publications/significant-impact-guidelines-11-matters-national-environmental-significance.

Department of the Environment (DoE) (2013a), *Approved Conservation Advice for Acacia bynoeana (Bynoe's Wattle).* Canberra: Department of the Environment. Available from: https://www.environment.gov.au/biodiversity/threatened/species/pubs/8575-conservation-advice.pdf

Department of the Environment (DoE) (2013b), *Draft survey guidelines for Australia's threatened orchids*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/resource/draft-survey-guidelines-australias-threatened-orchids

Department of the Environment (DoE) (2013c), *Approved Conservation Advice for Thesium australe (austral toadflax).* Canberra: Department of the Environment. Accessed October 2022 from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/15202-conservation-advice.pdf

Department of the Environment (DoE) (2014a), *Approved Conservation Advice for Prasophyllum innubum (Brandy Mary's leek-orchid).* Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/83603-conservation-advice.pdf

Department of the Environment (DoE) (2014b), *Approved Conservation Advice for Prasophyllum keltonii (Kelton's leek-orchid).* Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/83604-conservation-advice.pdf

Department of the Environment (DoE) (2014c), *EPBC Act referral guidelines for the vulnerable koala.* Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/epbc-act-referral-guidelines-vulnerable-koala

Department of the Environment (DoE) (2014d), *Approved Conservation Advice for Litoria aurea (green and golden bell frog).* Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1870-conservation-advice.pdf

Department of the Environment (DoE) (2015), *Threat abatement plan for predation by feral cats.* Commonwealth of Australia. Accessed 2022: https://www.dcceew.gov.au/environment/biodiversity/threatened/publications/tap/threat-abatement-plan-feral-cats

Department of the Environment (DoE) (2015a), *National Recovery Plan for the Alpine Sphagnum Bogs and Associated Fens.* Available from: https://www.dcceew.gov.au/sites/default/files/documents/alpine-sphagnum-bogs-associated-fens-recovery-plan.pdf

Department of the Environment (DoE) (2015c), *Threat abatement plan for predation by feral cats.* Available from: https://www.dcceew.gov.au/sites/default/files/documents/tap-predation-feral-cats-2015.pdf

Department of the Environment (DoE) (2015d), *Conservation Adivce: Grantiella picta – painted honeyeater.* Available from: https://www.environment.gov.au/biodiversity/threatened/species/pubs/470-conservation-advice.pdf

Department of the Environment (DoE) (2016a), *Threat abatement plan for infection of amphibians with chytrid fungus resulting in chytridiomycosis*. Canberra, ACT: Commonwealth of Australia. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/tap/infection-amphibians-chytrid-fungus-resulting-chytridiomycosis-2016.

Department of the Environment (DoE) (2016b), *National Recovery Plan for the Regent Honeyeater (Anthochaera phrygia).* Canberra, ACT: Commonwealth of Australia. Available from: https://www.dcceew.gov.au/sites/default/files/documents/national-recovery-plan-regent-honeyeater.pdf.

Department of the Environment (DoE) (2019), *Consultation Document on Listing Eligibility and Conservation Actions – Pseudomys fumeus (Smoky Mouse), Canberra.*

Department of the Environment (DoE) (2022b), *Pygmy Perch in Species Profile and Threats Database*. Department of the Environment, Canberra. Available from: https://www.environment.gov.au/sprat

Department of the Environment (DoE) (2022c), *Monarcha melanopsis in Species Profile and Threats Database*. Department of the Environment, Canberra. Available from: https://www.environment.gov.au/sprat

Department of the Environment (DoE) (2022d), *Myiagra cyanoleuca in Species Profile and Threats Database*. Department of the Environment, Canberra. Available from: https://www.environment.gov.au/sprat

Department of the Environment (DoE) (2022e), *Rhipidura rufifrons in Species Profile and Threats Database*. Department of the Environment, Canberra. Available from: https://www.environment.gov.au/sprat

Department of the Environment and Energy (DEE) (2014), *Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi*, Commonwealth of Australia, 2014. Accessed 2022: https://www.dcceew.gov.au/environment/biodiversity/threatened/publications/threat-abatement-plan-disease-natural-ecosystems-caused-phytophthora-cinnamomi

Department of the Environment and Energy (DEE) (2016), *Threat abatement plan for infection of amphibians with chytrid fungus resulting in chytridiomycosis*, Commonwealth of Australia 2016. Accessed 2022: https://www.dcceew.gov.au/environment/biodiversity/threatened/publications/tap/infection-amphibians-chytrid-fungus-resulting-chytridiomycosis-2016

Department of the Environment and Energy (DEE) (2017), *Threat Abatement Plan for predation, habitat, degradation, competition and disease transmission by feral pigs (Sus scrofa), Commonwealth Government, Canberra.* Accessed 2022: https://www.dcceew.gov.au/environment/biodiversity/threatened/publications/tap/feral-pig-2017

Department of the Environment and Energy (DEE) (2018), *National Recovery Plan for the Macquarie Perch (Macquaria australasica).* Commonwealth of Australia, 2018.

Department of the Environment and Energy (DEE) (2018), *National Recovery Plan for the Macquarie Perch (Macquaria australasica),* Commonwealth Government, Canberra. Accessed 2022: https://www.agriculture.gov.au/sites/default/files/documents/recovery-plan-macquarie-perch-2018.pdf

Department of the Environment and Heritage (DEH) (2006), *White Box-Yellow Box-Blakely's Red Gum grassy woodlands and derived grasslands.* EPBC Act Policy Statement. Available from: https://www.dcceew.gov.au/sites/default/files/documents/box-gum.pdf

Department of the Environment, Water, Heritage and the Arts (2008), *Approved Conservation Advice for Pomaderris pallida.* Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/13684-conservation-advice.pdf. In effect under the EPBC Act from 01-Oct-2008.

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008a), *Approved Conservation Advice for Alpine* Sphagnum *Bogs and Associated Fens ecological community*. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/29-conservation-advice.pdf

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008b), *Approved Conservation Advice for Ammobium craspedioides (Yass Daisy).* Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/20758-conservation-advice.pdf

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008c), *Approved Conservation Advice for Kunzea cambagei.* Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/11420-conservation-advice.pdf

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008d), *Approved Conservation Advice for Alpine Sphagnum Bogs and Associated Fens ecological community.* Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/29-conservation-advice.pdf

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008e), *Threat Abatement Plan for predation by the European red fox.* Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: https://www.dcceew.gov.au/sites/default/files/documents/tap-fox-background.pdf

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2009), *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (Synemon plana).* Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: https://www.agriculture.gov.au/sites/default/files/documents/golden-sun-moth.pdf

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008a), *Threat abatement plan for predation by the European red fox, DEWHA, Canberra.* Accessed 2022: https://www.dcceew.gov.au/environment/biodiversity/threatened/publications/tap/predation-european-red-fox

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008b), *Threat abatement plan for competition and land degradation by unmanaged goats, DEWHA, Canberra.* Accessed 2022: https://www.dcceew.gov.au/environment/biodiversity/threatened/publications/tap/competition-and-land-degradation-unmanaged-goats

Department of the Environment, Water, Heritage, and the Arts (DEWHA) (2010a*), Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*, Commonwealth Government, Canberra. Accessed 2022: https://www.awe.gov.au/sites/default/files/documents/survey-guidelines-birds-april-2017.pdf

Department of the Environment, Water, Heritage, and the Arts (DEWHA) (2010b), *Survey Guidelines for Australia's Threatened Frogs: Guidelines for detecting frogs listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*, Commonwealth Government, Canberra. Accessed 2022: http://www.environment.gov.au/system/files/resources/ff3eb752-482d-417f-8971-f93a84211518/files/survey-guidelines-frogs.pdf.

Department of the Environment, Water, Heritage, and the Arts (DEWHA) (2010c), *Survey guidelines for Australia's threatened bats Guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999,* Commonwealth Government, Canberra. Accessed June 2022: http://www.environment.gov.au/system/files/resources/2f420bf1-d9e4-44ec-a69c-07316cb81086/files/survey-guidelines-bats.pdf

Doherty, M. D., and Wright, G. (2006, June), *Vegetation dynamics in the northern extremities of the Australian Alps after the 2003 fires: the story so far.* In Bushfire 2006 Conference Proceedings, Brisbane.

Dreyer, D., Frost, B. J., and Mouritsen, H. (2018), The Earth's magnetic field and visual landmarks steer migratory flight behaviour in the nocturnal Australian Bogong moth. *Current Biology,* 28, pp. 2160– 2166.

Dwyer P.D. (1966), Observations on *Chalinolobus dwyeri* (Chiroptera: Vespertilionidae) in Australia, *Journal of Mammalogy,* 47, pp. 716–718.

Dwyer, P. and Hamilton-Smith, E. (1965), Breeding caves and maternity colonies of the bent-winged bat in south-eastern Australia, *Helictite,* pp. 3-21.

Dwyer, P. D. (1962), *Studies on the two New Zealand bats*, Department of Zoology, Victoria University of Wellington. Accessed 10 Nov 2022 from: https://nzetc.victoria.ac.nz/tm/scholarly/tei-Vic28Zool.html

Dwyer, P., (1983), *Complete Book of Australian Mammals,* Angus and Robertson, Sydney.

Eby, P. (2000), Low reproductive output in Grey-headed Flying-foxes associated with a short period of food scarcity, *Australasian Bat Society Newsletter*, 14, pp. 17-20

Eby, P. and Law, B. (2008), *Ranking the feeding habitats of Grey-headed Flying-foxes for conservation management*, A report for a report for The Department of Environment and Climate Change and Water (NSW) & The Department of Environment, Water, Heritage and the Arts.

Eldridge, K., et al. (2017), Can powerline clearings be managed to promote insect-pollinated plants and species associated with semi-natural grasslands*, Landscape and Urban Planning*, 167, pp. 419-428.

Environment Conservation Council (ECC) (2001), '*Box-Ironbark Forests and Woodlands Investigation'*. Environment Conservation Council, Melbourne.

ESRI (2022), *World Imagery*, ESRI Inc. Accessed 2021: https://services.arcgisonline.com/ArcGIS/rest/services/World_Imagery/MapServer

Fagg, M. (2012), *Mistletoes and bushfires.* Australian National Herbarium. Accessed from: https://www.anbg.gov.au/mistletoe/fire-mistletoe.html#:~:text=Most%20eucalypts%20have%20developed%20strategies,resistance%20and%20are%20usually%20killed.&text=.,-The%20more%20mistletoe

Fairfull, S. and Witheridge, G. (2003), *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings*. NSW Fisheries, Cronulla, Accessed 2022: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/202693/Why-do-fish-need-to-cross-the-road_booklet.pdf

Fairfull, Sarah (2013), *Policy and guidelines for fish habitat conservation and management*, Fisheries NSW, Wollongbar, Accessed 2022: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/634694/Policy-and-guidelines-for-fish-habitat.pdf

Fairman, T.A., Nitschke, C.R. and Bennett, L.T. (2015), Too much, too soon? A review of the effects of increasing wildfire frequency on tree mortality and regeneration in temperate eucalypt forests, *International Journal of Wildland Fire*, 25(8), pp. 831-848.

Fisheries Scientific Committee (FSC) (2008a), *Final Determination: Galaxias rostratus – flathead galaxias.* Accessed 2022: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/636467/Galaxias-rostratus-proposed-determination-April08.pdf

Fisheries Scientific Committee (FSC) (2008b), *Final Determination: The Tandanus tandanus – Eel tailed catfish in the Murray/Darling Basin as an endangered population.* Accessed 2022: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/636528/FD41-catfish.pdf

Fisheries Scientific Committee (FSC) (2013), *Final Determination: The Murray crayfish – Euastacus armatus as a Vulnerable Species.* Accessed 2022: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/636492/Murray-Crayfish-final-determination.pdf

Fisheries Scientific Committee (FSC) (N.D.), *Final Recommendation: Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Lachlan River*, File No.: FSC 03/05. Ref No: FR 25.

Flann, C. (1998), Bracteantha palustris (Asteraceae: Gnaphalieae), a New Species in Victoria and Tasmania, *Muelleria,* 11, pp. 97-100

Garnett S., Crowley G. (Eds) (2000), '*The Action Plan for Australian Birds 2000*'. Environment Australia: Canberra.

Gellie, N.J.H., (2005), Native vegetation of the Southern Forests: South-east Highlands, Australian Alps, South-west Slopes and SE Corner bioregions, *Cunninghamia* 9, pp. 219–253.

Geoscience Australia (2006), *Geodata TOPO-250K Series 3*. Geoscience Australia. Accessed 2022: https://ecat.ga.gov.au/geonetwork/srv/eng/catalog.search#/metadata/64058

GHD (2022), *Concept Design and Cost Estimate. HumeLink Project – Underground*. Prepared for Transgrid. Dated 22 August 2022.

Gibbons, P. and Boak, M. (2000), *The importance of paddock trees for regional conservation in agricultural landscapes.* A discussion paper for consideration by Riverina Highlands Regional Vegetation Committee. NSW National Parks and Wildlife Service, Southern Directorate unpublished report.

Gibson, L. and T.R. New (2007), Problems in studying populations of the golden sun moth Synemon plana (Lepidoptera: Castniidae), in south-eastern Australia, *Journal of Insect Conservation,* 11, pp. 309-313

Gill, A.M. (1996), *How Fires Affect Biodiversity*. Fire and Biodiversity: The Effects and Effectiveness of Fire Management. Paper No. 8. Accessed from: https://www.anbg.gov.au/fire_ecology/fire-and-biodiversity.html

Gomon, M.F. and Bray, D.J. (2022), Galaxias rostratus in Fishes of Australia. Accessed Aug 2022 from: https://fishesofaustralia.net.au/home/species/3680

Gonsalves, L. and Law, B., (2017), Seasonal activity patterns of bats in North Sydney, New South Wales: implications for urban bat monitoring programs. *Australian Mammalogy,* 40(2), pp.220-229.

Gonsalves, L., and Law, B. (2017), Distribution and key foraging habitat of the Large-footed Myotis Myotis macropus in the highly modified Port Jackson estuary, Sydney, Australia: an overlooked, but vulnerable bat. *Australian Zoologist*, 38 (4): 629–642.

Goosem, M. (2007), Fragmentation impacts caused by roads through rainforests. *Current Science*, 93(11), pp. 1587-1595.

Green, K. (2010), The aestivation sites of bogong moths Agrotis infusa (Boisduval) (Lepidoptera: Noctuidae), in the snowy mountains and the projected effects of climate change, The Australian Entomologist, 37(3), 93.

Griffith, S.J. (1996), *Thesium australe*. Species Recovery Plan. Hurstville: NSW NPWS.

Haddock J.K, Threlfall C.G, Law B and Hochuli D.F. (2019), Light pollution at the urban forest edge negatively impacts insectivorous bats. *Biological Conservation*, 236, pp. 17-28.

Haddock, J. K., Threlfall, C. G., Law, B., and Hochuli, D. F. (2019), Light pollution at the urban forest edge negatively impacts insectivorous bats, *Biological conservation*, 236, pp. 17-28.

Hale S., Mendoza L., Yeatman T., Cooke R., Doherty T., Nimmo D and White J.G (2022), Evidence that post-fire recovery of small mammals occurs primarily via in situ survival. *Biodiversity Research*, 28, pp. 404-416.

Hammer, M. (2002), *Recovery outline for the Southern Pygmy Perch in the Mount Lofty Ranges, South Australia*. Department of Environmental Biology, University of Adelaide and Native Fish Australia (SA) Inc.

Harley., D K.P. (2005), *The life history and conservation of Leadbeater's possum (Gymnobelideus leadbeatereri) in lowland swamp forest*. Monash University. PHD Thesis. https://doi.org/10.26180/14966736.v1

Heinsohn R, Webb MH, Lacy R, Terauds A, Alderman R & Stojanovic D (2015), A severe predator-induced decline predicted for endangered, migratory swift parrots *(Lathamus discolor). Biological Conservation*, 186, 75-82.

Herbison-Evans and Crossley (2021), *Agrostis infusa (Boisduval, 1832) Bogong Moth*. Accessed 10 Nov 2022 from: http://lepidoptera.butterflyhouse.com.au/noct/infusa.html

Hoebee, S.E, Thrall, P.H and Young, A.G. (2007), Integrating population demography, genetics and self-incompatibility in a viability assessment of the Wee Jasper Grevillea (Grevillea iaspicula McGill., Proteaceae), *Conservation Genetics*, 9, pp. 515-529.

Hunter, D., and G.R. Gillespie (2011), *National Recovery Plan for the Stuttering Frog Mixophyes balbus.* Department of Sustainability and Environment, Melbourne. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-stuttering-frog-mixophyes-balbus. In effect under the EPBC Act from 10-Feb-2012.

Intergovernmental Committee on Surveying and Mapping (ICSM) (2022), *Elvis - Elevation and Depth - Foundation Spatial Data.* Accessed 2022: https://elevation.fsdf.org.au/

International Erosion Control Association (IECA) (2012), *Best Practice Erosion and Sediment Control (BPESC)*, Book 3 – Attachments H-N, prepared by G. Witheridge, International Erosion Control Association (Australasian Chapter). Available from: https://www.austieca.com.au/publications/best-practice-erosion-and-sediment-control-bpesc-document

Jones, D.L. (2006), *A complete guide to native orchids of Australia: including the island territories*. Reed New Holland, Australia.

Jones, D.L. (2007), Two endangered new species of Prasophyllum (Orchidaceae) from southern New South Wales, *The Orchadian,* 15(8), pp. 372-375

Jones, S.R. (1999), *Conservation biology of the pink-tailed worm lizard (Aprasia parapulchella).* PhD thesis Applied Ecology research group, University of Canberra

Keaney, B. (2016), *Bogong moth aestivation sites as an archive for understanding the Floral, Faunal and Indigenous history of the Northern Australian Alps*, Australian National University, PhD thesis.

Keaney, B. (2016), *Bogong Moth Aestivation Sites as an Archive for Understanding the Floral, Faunal and Indigenous History of the Northern Australian Alps*. PhD thesis. Australian National University, Canberra.

Keith DA, Bedward M, (1999), Native vegetation of the South East Forest region, Eden NSW, *Cunninghamia*, 6, pp. 1–218.

Keith, D. A. (1996), Fire-driven mechanisms of extinction in vascular plants: a review of empirical and theoretical evidence in Australian vegetation*, Proceedings of the Linnean Society of New South Wales*, 116, pp. 37-78.

Landcom (2004), *Managing Urban Stormwater: Soil and Construction Volume 1 ('the Blue Book'), 4th Edition, March 2004.*

Landcom (2004), Managing Urban Stormwater: Soils and construction - Volume 1, fourth edition, New South Wales Government, National Library of Australia. Available from: https://www.environment.nsw.gov.au/research-and-publications/publications-search/managing-urban-stormwater-soils-and-construction-volume-1-4th-editon

Laurance, W., Goosem, M. and Laurance, S. (2009), Impacts of roads and linear clearings on tropical forests. *Trends in Ecology and Evolution,* 24(12), pp. 659-669.

Lintermans (2007), *Fishes of the Murray-Darling Basin: An introductory guide.* MDBC Publication No. 10/07. Murray Darling Basin Commission. Accessed 2022: https://www.mdba.gov.au/sites/default/files/pubs/MDBA-Fish-species-book.pdf

Loss, S. R., Will, T., and Marra, P. P. (2014), Refining estimates of bird collision and electrocution mortality at power lines in the United States, *PloS One*, 9(7), e101565.

Loyn, R.H., Legge, S.M., Ehmke, G., Woinarski, J.C.Z., Dutson, G. and Garnett, S.T. (2021), *Upland Pilotbird Pycnoptilus floccosus and Lowland Pilotbird P. f. sandlandi,* The Action Plan for Australian Birds 2020, Garnett, S.T. and Baker, G.B. Eds, CSIRO Publishing, Melbourne.

Magee, J. (2009), *Palaeovalley Groundwater Resources in Arid and Semi-Arid Australia - A Literature Review*. Geoscience Australia.

Martyn Yenson A.J., Offord C.A., Meagher P.F., Auld T., Bush D., Coates D.J., Commander L.E., Guja L.K., Norton S.L., Makinson R.O., Stanley R., Walsh N., Wrigley D., and Broadhurst L. (2021), *Plant Germplasm Conservation in Australia: strategies and guidelines for developing, managing and utilising ex situ collection Third Edition*, Australian Network for Plant Conservation, Canberra.

Maryott-Brown, K. and Wilks, D. (1993) *Rare and endangered plants of Yengo National Park and adjacent areas.* NSW National Parks and Wildlife Service, Sydney, Australia.

McDougall K.L. (1989), The Re-establishment of Themeda triandra (Kangaroo Grass): Implications for the Restoration of Grassland, Arthur Rylah Institute for Environmental Research, Technical Report Series No. 89. Department of Conservation, Forests and Lands, Melbourne.

McGarvey R, Burch P and Matthews JM (2016), *Precision of systematic and random sampling in clustered populations: habitat patches and aggregating organisms.* Ecological applications, Vol.26, no.1, pp.233–248

Menkhorst, P. and Broome, L. (2006), *Background and Implementation Information for the Smoky Mouse Pseudomys fumeus National Recovery Plan*. Department of Sustainability and Environment, Melbourne.

Miles, J. and Cameron, S. (2007), Observations on the ecology and conservation statis of Haloragis exalata subsp. exalata (Haloragaceae) in southern New South Wales. *Cunninghamia*, 10(2), pp. 263-272.

Miller, B.P. and MurPhy, B.P. (2017), Fire and Australian vegetation. *Australian vegetation*, 113-134.

Millon, L., Colin, C., Brescia, F. and Kerbiriou, C., (2018), Wind turbines impact bat activity, leading to high losses of habitat use in a biodiversity hotspot. *Ecological Engineering*, 112, pp.51-54.

Mills Doug (2021), Summer and autumn activity patterns of the eastern bent-wing bat (Miniopterus orianae oceanensis) at a large maternity site in southern New South Wales. *Australian Journal of Zoology,* 68, pp. 332-345.

Milner, R., Starrs, D., Hayes, G. and Evans, M. (2016), *Distribution and Ecology of the Broad-toothed Rat in the ACT.* Conservation Research, Technical Report 35, ACT Government. Accessed from: https://www.environment.act.gov.au/__data/assets/pdf_file/0006/995532/Technical-Report-35-BT-Rat-survey.pdf

Mo, M., Roache, M., Haering, R., and Kwok, A. (2020), Using wildlife carer records to identify patterns in flying-fox rescues: a case study in New South Wales, Australia, *Pacific Conservation Biology*, 27(1), pp. 61-69.

Morris, S., Pollard, D., Gehrke, P. and Pogonoshi, J. (2001), *Threatened and Potentially Threatened Freshwater Fishes of Coastal New South Wales and the Murray-Darling Basin,* Report to Fisheries Action Program and World Wide Fund for Nature. NSW Fisheries Final Report Series, No. 33.

Morrison, D.A., Cary, G.J., Pengelly, S.M., Ross, D.G., Mullins, B.J., Thomas, C.R. and Anderson, T.S. (1995), Effects of fire frequency on plant species composition of sandstone communities in the Sydney region: Inter-fire interval and time-since-fire. *Australian Journal of Ecology*, 20(2), pp. 239-247.

Moss C.F., Surlykke A. (2001), Auditory scene analysis by echolocation in bats, *The Journal of the Acoustical Society of America*, 110(4), pp. 2207-26.

National Biosecurity Committee (NBC) (2016), National framework for the management of established pests and diseases of national significance, Department of Agriculture and Water Resources, Canberra.

National Environmental Science Program Threatened Species Research Hub (NESP TSRH) (2019), *Threatened Species Strategy Year 3 Scorecard – Swift Parrot.* Australian Government, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/20-birds-by-2020/swift-parrot

National Murray Cod Recovery Team (2010), *National Recovery Plan for the Murray Cod Maccullochella peelii peelii,* Victorian Government, Department of Sustainability and Environment. Accessed 2022: https://www.agriculture.gov.au/sites/default/files/documents/murray-cod.pdf

Natural Resource Management (NRM) (2004), *Advisory Series Note 1: Trees with Hollows.* Department of Environment and Conservation, Coffs Harbour. Accessed 2022: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20079

Natural Resources Access Regulator (NRAR) (2018), *Guidelines for controlled activities on waterfront land - Riparian corridors*, INT19/15607, NSW Department of Industry.

Nayak et al. (2020), Bits and pieces: Forest fragmentation by linear intrusions in India. *Land Use Policy. 99.* Accessed from: https://doi.org/10.1016/j.landusepol.2020.104619.

Neale, T. and Macdonald, J.M. (2019), Permits to burn: weeds, slow violence, and the extractive future of northern Australia. *Australian Geographer*, 50(4), pp. 417-433.

NSW Government (2021), *Saving Our Species: Broad-toothed Rat*. 2020-2021 annual report card. Accessed from: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/Report-cards/2020-2021/02-site-managed-species/broad-toothed-rat-mastacomys-fuscus-2020-21.pdf

NSW National Park and Wildlife Services (NSW NPWS) (2001a), *Recovery Plan for the Tumut Grevillea (Grevillea wilkinsonii).* NSW National Parks and Wildlife Service, Hurstville NSW. Accessed 2022: https://www.environment.nsw.gov.au/research-and-publications/publications-search/recovery-plan-for-the-tumut-grevillea-grevillea-wilkinsonii

NSW National Parks and Wildlife Service (NSW NPWS) (1998), *Tarlo River National Park Plan of Management,* August 1998, National Parks and Wildlife Service, Nowra NSW. Accessed 2022:

https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Parks-plans-of-management/tarlo-river-national-park-plan-of-management-980129.pdf

NSW National Parks and Wildlife Service (NSW NPWS) (1999), *Threatened Species of South-eastern New South Wales - Riverina Highlands.* Hurstville: NSW NPWS.

NSW National Parks and Wildlife Service (NSW NPWS) (2000a), Threatened Species Information – Kunzea cambagei, NSW NPWS, Hurstville, NSW.

NSW National Parks and Wildlife Service (NSW NPWS) (2001), *Approved Recovery Plan for the "lost" threatened flora of south-eastern NSW.* NSW NPWS, Hurstville, NSW.

NSW National Parks and Wildlife Service (NSW NPWS) (2001), *Yellow-spotted Bell Frog (Litoria castanea) and Peppered Tree Frog (Litoria piperata) recovery plan.* NPWS, Hurstville, NSW. Available from: http://www.environment.gov.au/resource/yellow-spotted-bell-frog-litoria-castanea-and-peppered-frog-litoria-piperata-recovery-plan

NSW National Parks and Wildlife Service (NSW NPWS) (2001b), *Yellow-spotted Bell Frog (Litoria castanea) and Peppered Tree Frog (Litoria piperata) recovery plan.* NSW NPWS, Hurstville, NSW.

NSW National Parks and Wildlife Service (NSW NPWS) (2003), *Draft Recovery Plan for the Crimson Spider Orchid (Caladenia concolor) (Including populations at Bethungra and Burrinjuck to be described as two new species)* NSW NPWS, Hurstville NSW.

NSW National Parks and Wildlife Service (NSW NPWS) (2004), *Minjary National Park Plan of Management, Department of Environment and Conservation NSW, Tumut NSW*. Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Parks-plans-of-management/minjary-national-park-plan-of-management-040144.pdf.

NSW Office of Environment and Heritage (OEH) (2012), *National Recovery Plan for Booroolong Frog (Litoria booroolongensis).* Office of Environment and Heritage (NSW), Hurstville. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/booroolong-frog-litoria-booroolongensis-national-recovery-plan

NSW Office of Environment and Heritage (OEH) (2012), *National Recovery Plan for the Southern Corroboree Frog, Pseudophryne corroboree, and the Northern Corroboree Frog, Pseudophryne pengilleyi, Office of Environment and Heritage (NSW), Hurstville.*

NSW Office of Environment and Heritage (OEH) (2013), Austral Toadflax – profile. Sydney, New South Wales, Office of Environment and Heritage. Accessed 22 Jan 2023 from: http://www.environment.nsw.gov.au/threatenedspecies/

NSW Office of Environment and Heritage (OEH) (2017a), *Biodiversity Assessment Method (BAM) Calculator User guide,* NSW Government, Sydney. Accessed 2022: https://www.lmbc.nsw.gov.au/bamcalc/app/assets/BAMTools_UserGuide.pdf

NSW Office of Environment and Heritage (OEH) (2017a), *Threatened species: Superb Parrot – profile.* Accessed July 2022 from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10645

NSW Office of Environment and Heritage (OEH) (2017b), *Interim Grasslands and other Groundcover Assessment Method Determining conservation value of grasslands and groundcover vegetation in NSW,* NSW Government, Sydney. Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/interim-grasslands-other-groundcover-assessment-method-170443.pdf

NSW Office of Environment and Heritage (OEH) (2017b), *Threatened species: Large-eared Pied Bat– profile.* Accessed July 2022 from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10697

NSW Office of Environment and Heritage (OEH) (2017c), *Threatened species: White-throated Needletail – profile.* Available from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10105

NSW Office of Environment and Heritage (OEH) (2018), *'Species credit' threatened bats and their habitats – NSW survey guide for the Biodiversity Assessment Method.* Available from: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/species-credit-threatened-bats-survey-guide-180466.pdf

NSW Office of Environment and Heritage (OEH) (2018), *'Species credit' threatened bats and their habitats, NSW survey guide for the Biodiversity Assessment Method,* NSW Government, Sydney. Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/species-credit-threatened-bats-survey-guide-180466.pdf

NSW Office of Environment and Heritage (OEH) (2018), *Threatened biodiversity profile search – Rough Eyebright – profile.* Accessed 2022: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10329

NSW Office of Environment and Heritage (OEH) (2018a), '*Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method.* Office of Environment and Heritage, Sydney NSW 2000.

NSW Office of Environment and Heritage (OEH) (2020), *Threatened biodiversity profile search – Euphrasia arguta– profile*. Accessed 2022: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20165

NSW Office of Environment and Heritage (OEH) (2020), *Threatened species: Grey-headed flying fox – profile.* Accessed July 2022 from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10697

NSW Office of Environment and Heritage (OEH) (2021), T*hreatened biodiversity profile search – Superb Midge Orchid – profile.* Accessed 2022: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20029

NSW Office of Environment and Heritage (OEH) (2021), *Threatened species: Smoky Mouse – profile.* Accessed July 2022 from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10686

NSW Office of Environment and Heritage (OEH) (2022), *Threatened biodiversity profile search – Solanum armourense – profile.* Accessed 2022: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10760

NSW Office of Environment and Heritage (OEH) (2022), Threatened *species: Koala – profile.* Available from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10616

NSW Office of Environment and Heritage (OEH) (2022a), '*Saving Our Species Strategy: High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition.* Accessed 2022: https://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=20014

NSW Office of Environment and Heritage (OEH) (2022a), *Prasophyllum innubum* – Saving our Species Strategy. *Prasophyllum innubum* Conservation project. NSW Environment, Energy and Science. Retrieved September 30, 2022, from https://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=20084

NSW Office of Environment and Heritage (OEH) (2022a). Kelton's Leek Orchid – profile. Accessed 5 December 2022 from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20085

NSW Office of Environment and Heritage (OEH) (2022b), *Bossiaea fragrans - profile.* Accessed 5 December 2022 from: https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20122

NSW Office of Environment and Heritage (OEH) (2022b), *Saving our Species Strategy –Blue-tongued Greenhood (Pterostylis oreophila).* Accessed 2022: https://www.environment.nsw.gov.au/savingourspeciesapp/ViewFile.aspx?ReportProjectID=1140&ReportProfileID=20059

NSW Office of Environment and Heritage (OEH) (2022b), *Saving Our Species Strategy: Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae.* Accessed 2022: https://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=20264

NSW Office of Environment and Heritage (OEH) (2022c), *Crimson Spider Orchid - profile.* Profile last updated: 07 Jun 2022. Accessed 8 December 2022 from: https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10122

NSW Office of Environment and Heritage (OEH) (2022c), *Thelymitra atronitida* (Black-hooded Sun Orchid)) – Saving our Species Strategy. Conservation project. NSW Environment, Energy and Science. Retrieved September 30, 2022, from https://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=20084

NSW Office of Environment and Heritage (OEH) (2022d), *Square Raspwort - profile.* Profile last updated: 13 Jan 2022. Accessed 8 December 2022 from: https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10122

NSW Office of Environment and Heritage (OEH) (2022d), *Threatened biodiversity profile search*. Accessed 2022: https://www.environment.nsw.gov.au/threatenedspeciesapp/

NSW Office of Environment and Heritage (OEH) (2022e), *Saving our Species Strategy –Thick Lip Spider Orchid (Caladenia chromate).* Accessed 2022: https://www.environment.nsw.gov.au/savingourspeciesapp/ViewFile.aspx?ReportProjectID=294&ReportProfileID=10124

NSW Office of Environment and Heritage (OEH) (2022f), *Bossiaea fragrans* – profile. Profile last updated: 29 Jun 2022. Accessed 2022: https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20122

NSW Office of Water (NSW OW) (2012), *Controlled activities on waterfront land - Guidelines for watercourse crossings on waterfront land,* Department of Primary Industries: Office of Water. Accessed 2022: https://water.dpie.nsw.gov.au/__data/assets/pdf_file/0010/386209/licensing_approvals_controlled_activities_watercourse_crossings.pdf

NSW Scientific Committee (NSW SC) (1999), *Bushrock removal - Key threatening process determination - final.* Accessed 2022: https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-Species-Scientific-Committee/Determinations/Final-determinations/1996-1999/Bushrock-removal-key-threatening-process-listing

NSW Scientific Committee (NSW SC) (2001a), *Broad-toothed rat (Mastacomys fuscus) population, Barrington Tops – endangered population listing.* Accessed 23 January 2023 from: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2000-2003/broad-toothed-rat-mastacomys-fuscus-endangered-population-listing

NSW Scientific Committee (NSW SC) (2001b), *Clearing of native vegetation - key threatening process determination – final.* Accessed 2022: https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-Species-Scientific-Committee/Determinations/Final-determinations/2000-2003/Clearing-of-native-vegetation-key-threatening-process-listing NSW Scientific Committee (2010) Bossiaea fragrans - critically endangered species listing. Accessed 5 December 2022 from: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2008-2010/bossiaea-fragrans-critically-endangered-species-listing

NSW Scientific Committee (NSW SC) (2002), *Pomaderris delicata* (a shrub) – endangered species listing Final Determination. Accessed 2022: https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-Species-Scientific-Committee/Determinations/Final-determinations/2000-2003/Pomaderris-delicata-a-shrub-endangered-species-listing

NSW Scientific Committee (NSW SC) (2003), Final determination to list ‘invasion of native plant communities by exotic perennial grasses’ as a key threatening process. Schedule 3 of the Threatened Species Conservation Act.

NSW Scientific Committee (NSW SC) (2005), *Genoplesium superbum - endangered species listing Final Determination.* Accessed 2022: https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-Species-Scientific-Committee/Determinations/Final-determinations/2004-2007/Genoplesium-superbum-endangered-species-listing

NSW Scientific Committee (NSW SC) (2008), *Gang-gang Cockatoo Callocephalon fimbriatum.* Review of current information in NSW. December 2008. Unpublished report arising from the Review of the Schedules of the Threatened Species Conservation Act 1995. NSW Scientific Committee, Hurstville.

NSW Scientific Committee (NSW SC) (2008), *Sooty Owl Tyto tenebricosa – Review of Current Information in NSW. Sydney.* Available at: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Scientific-Committee/sc-sooty-owl-tyto-tenebricos-review-report.pdf?la=en&hash=1D9AEFC731BE34218DD514BC480810A9D3C5646A

NSW Scientific Committee (NSW SC) (2008a), *Yellow-spotted Bell Frog (Litoria castanea)* – Review of Current Information in NSW. Sydney. Available at: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Scientific-Committee/sc-sooty-owl-tyto-tenebricos-review-report.pdf?la=en&hash=1D9AEFC731BE34218DD514BC480810A9D3C5646A

NSW Scientific Committee (NSW SC) (2009), *Bossiaea fragrans* – critically endangered species listing. Accessed 2022: https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-Species-Scientific-Committee/Determinations/Final-determinations/2008-2010/Bossiaea-fragrans-critically-endangered-species-listing

NSW Scientific Committee (NSW SC) (2010), *Australasian bittern (Botaurus poiciloptilus) - endangered species listing.* Available from: https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-Species-Scientific-Committee/Determinations/Final-determinations/2008-2010/Australasian-bittern-Botaurus-poiciloptilus-endangered-species-listing

NSW Scientific Committee (NSW SC) (2010a), *Northern Corroboree Frog Pseudophryne pengilleyi.* Review of current information in NSW. May 2010. Unpublished report arising from the Review of the Schedules of the Threatened Species Conservation Act 1995. NSW Scientific Committee, Hurstville.

NSW Scientific Committee (NSW SC) (2010b), *Pomaderris delicata* – critically endangered species listing Final Determination. Accessed 2022: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2008-2010/683chroma683te-delicata-critically-endangered-species-listing

NSW Scientific Committee (NSW SC) (2011), *Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions – Determination to make a minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act.* Accessed 2022:
https://www.environment.nsw.gov.au/Topics/Animals-and-plants/Threatened-species/NSW-Threatened-

Species-Scientific-Committee/Determinations/Final-determinations/2011-2012/Tableland-Basalt-Forest-in-the-Sydney-Basin-minor-amendment-Determination

NSW Scientific Committee (NSW SC) (2015), *Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South-Western Slopes and South-Eastern Highlands Bioregions – endangered ecological community listing,* NSW Government, Sydney. Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Scientific-Committee/Determinations/2015/coolac-tumut-serpentinite-nsw-scientific-committee-final-determination.pdf?la=en&hash=E0DE1B722B49C714ACBA89F1C3A91BCB0E4A0D84

NSW Scientific Committee (NSW SC) (2015), *Coolac-Tumut Serpentinite Shrubby Woodland in the NSW Scientific Committee (2015). NSW South Western Slopes and South Eastern Highlands Bioregions – endangered ecological community listing.* Accessed 2022: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Scientific-Committee/Determinations/2015/coolac-tumut-serpentinite-nsw-scientific-committee-final-determination.pdf?la=en&hash=E0DE1B722B49C714ACBA89F1C3A91BCB0E4A0D84

NSW Scientific Committee (NSW SC) (2016), *Final Determination for listing Robertson Basalt Tall Open-forest in the Sydney Basin and South Eastern Highlands Bioregions as a CRITICALLY ENDANGERED ECOLOGICAL COMMUNITY.* Available at: Robertson Basalt Tall-open Forest in the Sydney Basin and South Eastern Highlands Bioregions (nsw.gov.au)

NSW Scientific Committee (NSW SC) (2019), *Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion – critically endangered ecological community listing.* Accessed 2022: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2019/684chrom-tableland-critically-endangered-ecological-community-listing#:~:text=The%20NSW%20Threatened%20Species%20Scientific,Part%201%20of%20Schedule%202

NSW Threatened Species Scientific Committee (TSSC) (2019), *Conservation Assessment of Grevillea wilkinsonii Makinson (Proteaceae).* Accessed 2022: https://www.dcceew.gov.au/sites/default/files/env/consultations/4264ba54-69fc-481f-afdc-595842e69006/files/conservation-assessment-grevillea-wilkinsonii.pdf

NSW Threatened Species Scientific Committee (TSSC) (2020), *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Final Determination.* Parramatta NSW 2124.

Osborne, W. S., and Jones, S. R. (1995), *Recovery plan for the Pink-tailed Worm Lizard (Aprasia parapulchella),* Department of the Environment, Land and Planning, ACT Government, Canberra. Available from: https://www.environment.act.gov.au/__data/assets/pdf_file/0009/576810/Technical_Report_10.pdf

Osborne, W.S. (1989), Distribution, relative abundance and conservation status of Corroboree Frogs Pseudophryne corroboree Moore (Anura: Myobatrachidae). *Australian Wildlife Research,* 16, pp. 537-547.

O'Shea, M. (1996)*, An Ecological Study of the Population of Striped Legless Lizards Delma impar (Fischer, 1882) Inhabiting Native and Exotic Grasslands in the North-east Corner of the Albion Explosives Factory Site*

(St. Albans, Victoria). Hons. Thesis. Victoria University of Technology. St Albans, Victoria: Victoria University of Technology.

Parry-Jones, K and Augee, L. (2008), Factors affecting the occupation of a colony site in Sydney, New South Wales by the Grey-headed Flying-fox Pteropus poliocephalus (Pteropodidae). *Austral Ecology* 26, pp. 47 – 55.

Parry-Jones, K., and Wardle, G. (2004), A sink or source? *The Grey-headed Flying-fox, Pteropus poliocephalus at an urban colony site*, 11th Australasian Bat Conference, Toowoomba 13th-16th April 2004, Program and Abstracts. Australasian Bat Society Newsletter.

Parry-Jones, K.A. and Augee, M.L. (2001), Factors affecting the occupation of a colony site in Sydney, New South Wales by the Grey-headed Flying-fox, *Pteropus poliocephalus (Pteropodidae), Austral Ecology,* 26, pp. 47-55.

Patykowski J, Gibson M and Dell M (2014) A review of the conservation ecology of Round-leaf Pomaderris Pomaderris vacciniifolia F. Muell. ex Reissek (Rhamnaceae), *The Victorian Naturalist,* 131, pp. 44–51.

Pearce, L., Bice, C., Whiterod, N. and Raadik, T. (2019), *Nannoperca australis. The IUCN Red List of Threatened Species 2019*. Accessed March 2022 from: https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T123358579A123382811.en.

Pearce, L., Bice, C., Whiterod, N. and Raadik, T. (2019), *Nannoperca australis.* The IUCN Red List of Threatened Species 2019. Accessed March 2022 from: https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T123358579A123382811.en.

Penman, T.D., Binns, D.L., Shiels, R.J., Allen, R.M. and Kavanagh, R.P. (2008), Changes in understorey plant species richness following logging and prescribed burning in shrubby dry sclerophyll forests of south-eastern Australia. *Austral Ecology*, 33(2), 197-210.

Pennay M., Law B., and Reinhold L. (2004), *Bat calls of New South Wales. Region based guide to the echolocation calls of microchiropteran bats.* NSW Department of Environment and Conservation, Hurstville. Accessed 2022: https://www.environment.nsw.gov.au/resources/nature/batcallsofnsw.pdf

Pennay, M. (2008), A maternity roost of the large-eared pied bat *Chalinolobus dwyeri* (Ryan) (Michrochiroptera: Vespertilionidae) in central New South Wales Australia, *Australian Zoologist*, 34, pp. 564–569.

Pennay, M., Law, B., and Reinhold, L. (2004), *Bat calls of New South Wales: Region based guide to the echolocation calls of Microchiropteran bats*, New South Wales Department of Environment and Conservation, Hurstville.

Phillips G., Colquhoun G.G., Hughes K.S., and Deyssing L. (2015), Seamless geology of New South Wales: approach, methodology and application. *Quarterly Notes of the Geological Survey of New South Wales,* 145, 1-28.

Phillips S., and Callaghan, J. (2011*),* The Spot Assessment Technique: A tool for determining localised levels of habitat use by Koalas Phascolarctos cinereus. *Australian Zoologist*, 35, DOI: 10.7882/AZ.2011.029.

Phillips, R. D., Reiter, N., and Peakall, R. (2020), Orchid conservation: from theory to practice, *Annals of Botany*, 126(3), pp. 345-362.

QLD Department of Primary Industries (QLD DPI) (1998), *Fish Passage in Streams – Fisheries Guidelines for Design of Stream Crossings*. Fish Habitat Guideline FHG 001. Prepared by Elizabeth Cotterel. Fisheries Group DPI.

Queensland Government (2022), *Species profile – Grantiella picta (painted honeyeater).* Accessed 23 January 2023 from: https://apps.des.qld.gov.au/species-search/details/?id=1521

Saunders, D., Tzaros, C., Webb, M. and Thurstans, S. (2010), *Background Document – Swift Parrot Recovery Plan.* Department of Environment, Climate Change and Water, Queanbeyan, and Birds Australia.

Saunders, D.L. and Tzaros, C.L. (2011), National Recovery Plan for the Swift Parrot Lathamus discolor, Birds Australia, Melbourne. Accessed November 2022 from: https://www.agriculture.gov.au/sites/default/files/documents/lathamus-discolor-swift-parrot.pdf

Saving our Species (SoS) (2018), *Superb Parrot Polytelis swainsonii: vulnerable.* NSW Office of Environment and Heritage. Available from: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/saving-our-species-superb-parrot-fact-sheet-180432.pdf

Schulz M (1998), Bats and Other Fauna in Disused Fairy Martin *Hirundo ariel* Nest, *Emu*, 98, pp. 184-191.

Sinclair, S.J. (2010), *National Recovery Plan for the Hoary Sunray Leucochrysum albicans* var. *tricolor. Department of Sustainability and Environment*, Melbourne. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-hoary-sunray-leucochrysum-albicans-var-tricolor

Singh A.P. and Kaur R. (2014), Electromagnetic Fields: Biological Implications on Various Life Forms, *International Journal of Bioassays,* 3, p. 2030.

Sivertsen D (1993), Conservation of remnant vegetation in the box and ironbark land of New South Wales. *Victorian Naturalist,* 110, pp. 24-29.

SLR (2023), *Technical Report 9 – Noise and Vibration Impact Assessment,* Prepared for Transgrid.

Smales, I. (2014), Fauna Collisions with Wind Turbines: Effects and Impacts, Individuals and Populations. What Are We Trying to Assess?, *Wind and Wildlife*, 23-40.

Spate A., and Baker A. (2018), Karst Values of Kosciuszko National Park A Review of Values and of Recent Research, *Proceedings of the Linnean Society of New South Wales,* 140, pp. 253 – 264.

Spatial Services (DCS) (2021a), *NSW Elevation and Depth Theme*, NSW Department of Environment and Climate Change, Sydney NSW. Accessed 2021 from: https://portal.spatial.nsw.gov.au/portal/home/item.html?id=f1b1b26b23ab4574a561f890edd3bd7e

Spatial Services (DCS) (2021b), *NSW Hydrography*, NSW Department of Environment and Climate Change, Sydney NSW. Accessed 2021 from: https://portal.spatial.nsw.gov.au/portal/home/item.html?id=d01c1953e13948ce961d48e9d7ac3c4d

Standards Reference Group SERA (2021), *National Standards for the Practice of Ecological Restoration in Australia Edition 2.2*, Society for Ecological Restoration Australasia. Accessed 22 Jan 2023 from: http://www.seraustralasia.com/standards/home.html

Stojanovic. D., Rayner. L., Cobden. M., Davey. C., Harris. S., Heinsohn. R., Owens. G. and Manning. A.D. (2020), Suitable nesting sites for specialized cavity dependent wildlife are rare in woodlands. *Forest Ecology and Management*, 483, e118718. DOI: doi.org/10.1016/j.foreco.2020.118718

Sutter, G. (2010), *National Recovery Plan for Phantom Wattle Acacia phasmoides.* Department of Sustainability and Environment, East Melbourne.

Taylor, B. D. and Goldingay, R. L. (2009), Can road-crossing structures improve population viability of an urban gliding mammal?, *Ecology and Society*, 14(2).

Taylor, R. J. and O'Neill, M. G. (1988), Summer activity patterns of insectivorous bats and their prey in Tasmania, *Australian Wildlife Research,* 15, pp. 533-539.

Thomas, V., Gellie, N. & Harrison, T. (2000), *Forest ecosystem classification and mapping for the Southern CRA region, Volume II Attachments.* NSW National Parks & Wildlife Service, Southern Directorate. A report undertaken for the NSW CRA/RFA Steering Committee.

Threatened Species Scientific Committee (TSSC) (2001), *Commonwealth Listing Advice on Pteropus poliuocephalus - Grey-headed Flying-fox.* Available from: https://www.dcceew.gov.au/environment/biodiversity/threatened/conservation-advices/pteropus-poliocephalus

Threatened Species Scientific Committee (TSSC) (2006), *Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.* Available from: http://www.environment.gov.au/biodiversity/threatened/communities/box-gum.html.

Threatened Species Scientific Committee (TSSC) (2007), *Commonwealth Listing Advice for Rhizanthella slateri (Eastern Australian Underground Orchid).* Canberra: Department of the Environment. Available from: https://environment.gov.au/biodiversity/threatened/species/pubs/11768-conservation-advice.pdf

Threatened Species Scientific Committee (TSSC) (2008), *Approved Conservation Advice for Persoonia marginata (Clandulla Geebung). Accessed from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/10852-conservation-advice.pdf*

Threatened Species Scientific Committee (TSSC) (2009), *Commonwealth Listing Advice on Alpine Sphagnum Bogs and Associated Fens.* Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/29-listing-advice.pdf.

Threatened Species Scientific Committee (TSSC) (2009a), *Commonwealth Listing Advice on Alpine Sphagnum Bogs and Associated Fens. Department of the Environment, Water, Heritage and the Arts.*

Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/29-listing-advice.pdf. In effect under the EPBC Act from 07-Jan-2009.

Threatened Species Scientific Committee (TSSC) (2009b), *Commonwealth Listing Advice on Cyclodomorphus praealtus (Alpine She-oak Skink).* Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/64721-listing-advice.pdf. In effect under the EPBC ACT from 24-Dec-2009.

Threatened Species Scientific Committee (TSSC) (2010), *Listing advice for Prasophyllum innubum* (Brandy Mary's leek-orchid). Canberra: Department of the Environment.

Threatened Species Scientific Committee (TSSC) (2011), *Approved Conservation Advice for Euphrasia arguta (a herb).* Accessed from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/4325-conservation-advice.pdf

Threatened Species Scientific Committee (TSSC) (2011), *Commonwealth Listing Advice on Euphrasia arguta.* Department of Sustainability, Environment, Water, Population and Communities, Canberra, ACT. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/4325-listing-advice.pdf

Threatened Species Scientific Committee (TSSC) (2012a), *Commonwealth Listing Advice on Prasophyllum bagoense (Bago Leek-orchid).* Department of Sustainability, Environment, Water, Population and Communities. Canberra, ACT. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/84276-listing-advice.pdf

Threatened Species Scientific Committee (TSSC) (2012a), C*ommonwealth Listing Advice for Pterostylis oreophila (Kiandra Greenhood).* Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/83603-listing-advice.pdf.

Threatened Species Scientific Committee (TSSC) (2012b), *Commonwealth Listing Advice on Eucalyptus robertsonii* subsp. *hemisphaerica (Robertson's Peppermint).* Department of Sustainability, Environment, Water, Population and Communities. Canberra, ACT: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/56223-listing-advice.pdf. In effect under the EPBC Act from 29-Jun-2012.

Threatened Species Scientific Committee (TSSC) (2012b), *Commonwealth Listing Advice on Pterostylis oreophila (Kiandra Greenhood).* Department of Sustainability, Environment, Water, Population and Communities. Canberra, ACT. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/22903-listing-advice.pdf

Threatened Species Scientific Committee (TSSC) (2013), *Conservation Advice Bidyanus bidyanus (silver perch).* Commonwealth Government, Accessed 2022: http://www.environment.gov.au/biodiversity/threatened/species/pubs/76155-conservation-advice.pdf

Threatened Species Scientific Committee (TSSC) (2013), *Conservation Advice on Bidyanus bidyanus (Silver Perch).* Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/76155-conservation-advice.pdf

Threatened Species Scientific Committee (TSSC) (2014), *Approved Conservation Advice for Eucalyptus alligatrix* subsp. *miscella (a stringybark).* Accessed from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/64341-conservation-advice.pdf

Threatened Species Scientific Committee (TSSC) (2014), *Commonwealth Listing Advice for Prasophyllum innubum (Brandy Marys Leek-orchid).* Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/83603-listing-advice.pdf.

Threatened Species Scientific Committee (TSSC) (2014a), *Advice to the Minister of the Environment from the Threatened Species Scientific Committee (the Committee) on Amendment to the list of Threatened Species under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Brandy Mary's leek-orchid.* Canberra: Department of the Environment.

Threatened Species Scientific Committee (TSSC) (2014a), *Commonwealth Listing Advice for Prasophyllum innubum (Brandy Marys Leek-orchid).* Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/83603-listing-advice.pdf

Threatened Species Scientific Committee (TSSC) (2014b), *Commonwealth Listing Advice for Prasophyllum keltonii (Kelton's Leek-orchid).* Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/83604-listing-advice.pdf

Threatened Species Scientific Committee (TSSC) (2014b), *Conservation advice – Prasophyllum keltonii.* Accessed 2022: https://www.environment.gov.au/biodiversity/threatened/species/pubs/83604-conservation-advice.pdf

Threatened Species Scientific Committee (TSSC) (2014c), *Advice to the Minister of the Environment from the Threatened Species Scientific Committee (the Committee) on Amendment to the list of Threatened Species under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Pterostylis oreophila (Kiandra Greenhood).* Canberra: Department of the Environment.

Threatened Species Scientific Committee (TSSC) (2015), *Grantiella picta painted honeyeater Conservation Advice*. Department of the Environment. Available from: https://www.environment.gov.au/biodiversity/threatened/species/pubs/470-conservation-advice.pdf

Threatened Species Scientific Committee (TSSC) (2015a), *Conservation Advice Eucalyptus aggregata Black gum.* Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/20890-conservation-advice-171115.pdf

Threatened Species Scientific Committee (TSSC) (2015b), *Conservation Advice* Aprasia parapulchella *Pink-tailed worm-lizard*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1665-conservation-advice-01102015.pdf

Threatened Species Scientific Committee (TSSC) (2016), *Conservation Advice Galaxias rostratus flathead galaxias*, Commonwealth Government, Accessed 2022:

http://www.environment.gov.au/biodiversity/threatened/species/pubs/84745-conservation-advice-05052016.pdf

Threatened Species Scientific Committee (TSSC) (2016), *Conservation Advice Diuris chroma – Pale Golden Moths Orchid.* Canberra: Department of the Environment.

Threatened Species Scientific Committee (TSSC) (2016a), *Caladenia concolor* crimson spider orchid Conservation Advice. Available from: https://www.environment.gov.au/biodiversity/threatened/species/pubs/5505-conservation-advice-16122016.pdf

Threatened Species Scientific Committee (TSSC) (2016a), *Conservation Advice Lathamus discolor swift parrot.* Canberra: Department of the Environment. Accessed October 2022 from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/744-conservation-advice-05052016.pdf

Threatened Species Scientific Committee (TSSC) (2016a), *Conservation Advice Lathamus discolor swift parrot*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/744-conservation-advice-05052016.pdf. In effect under the EPBC Act from 05-May-2016.

Threatened Species Scientific Committee (TSSC) (2016b), *Caladenia concolor* (crimson spider orchid) Conservation Advice. Available from: https://www.environment.gov.au/biodiversity/threatened/species/pubs/5505-conservation-advice-16122016.pdf

Threatened Species Scientific Committee (TSSC) (2016b), *Conservation Advice Polytelis swainsonii superb parrot.* Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/738-conservation-advice-05052016.pdf

Threatened Species Scientific Committee (TSSC) (2016b), *Mastocomys fuscus mordicus broad-toothed rat (mainland) Conservation Advice*. Available from: chttp://www.environment.gov.au/biodiversity/threatened/species/pubs/87617-conservation-advice-05052016.pdf

Threatened Species Scientific Committee (TSSC) (2016c), *Conservation Advice Mastacomys fuscus mordicus broad-toothed rat (mainland).* Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/87617-conservation-advice-05052016.pdf

Threatened Species Scientific Committee (TSSC) (2016d), *Conservation Advice Delma impar striped legless lizard.* Canberra: Department of the Environment and Energy. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1649-conservation-advice-16122016.pdf

Threatened Species Scientific Committee (TSSC) (2016e), *Conservation Advice Galaxias rostratus flathead galaxias.* Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/84745-conservation-advice-05052016.pdf

Threatened Species Scientific Committee (TSSC) (2018), *Conservation advice – Pomaderris delicata*. Accessed 2022: http://www.environment.gov.au/biodiversity/threatened/species/pubs/67208-conservation-advice-11052018.pdf

Threatened Species Scientific Committee (TSSC) (2019), *Conservation Advice Litoria castanea (Yellow-spotted Bell Frog).* Canberra: Department of the Environment and Energy. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1848-conservation-advice-04072019.pdf. In effect under the EPBC Act from 04-Jul-2019.

Threatened Species Scientific Committee (TSSC) (2019a), *Conservation Advice Crinia sloanei (Sloane's Froglet).* Canberra: Department of the Environment and Energy. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/59151-conservation-advice-04072019.pdf

Threatened Species Scientific Committee (TSSC) (2019b), *Conservation Advice Litoria castanea (Yellow-spotted Bell Frog).* Canberra: Department of the Environment and Energy. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1848-conservation-advice-04072019.pdf

Threatened Species Scientific Committee (TSSC) (2019c), *Conservation Advice Botaurus poiciloptilus Australasian Bittern.* Department of the Environment and Energy. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1001-conservation-advice-18012019.pdf

Threatened Species Scientific Committee (TSSC) (2019d), *Conservation Advice Hirundapus caudacutus White-throated Needletail.* Canberra: Department of the Environment and Energy. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/682-conservation-advice-04072019.pdf

Threatened Species Scientific Committee (TSSC) (2020), *Conservation Advice Pseudomys fumeus Smoky Mouse.* Accessed from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/88-conservation-advice-01092020.pdf

Threatened Species Scientific Committee (TSSC) (2020a), *Conservation Advice Dasyurus maculatus maculatus (southeastern mainland population) Spotted-tailed Quoll, south eastern mainland.* Canberra: Department of Agriculture, Water and the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/75184-conservation-advice-01092020.pdf

Threatened Species Scientific Committee (TSSC) (2020b), *Conservation Advice Pseudomys fumeus Smoky Mouse.* Canberra: Department of Agriculture, Water and the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/88-conservation-advice-01092020.pdf

Threatened Species Scientific Committee (TSSC) (2021), *Conservation Advice Nannoperca australis Murray-Darling Basin lineage Southern Pygmy Perch-MDB*, Commonwealth Government, Accessed 2022: http://www.environment.gov.au/biodiversity/threatened/species/pubs/91711-conservation-advice-13042021.pdf

Threatened Species Scientific Committee (TSSC) (2021), *Conservation advice – Grevillea wilkinsonii*. Accessed 2022: https://envirojustice.org.au/wp-content/uploads/evidence/threatened-species-flora-4/56396-conservation-advice-13112021.pdf

Threatened Species Scientific Committee (TSSC) (2021), *Conservation Advice for Acacia phasmoides (Phantom Wattle).* Accessed from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/2784-conservation-advice-29092021.pdf

Threatened Species Scientific Committee (TSSC) (2021a), *Conservation Advice Litoria booroolongensis Booroolong Frog.* Canberra: Department of Agriculture, Water and the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1844-conservation-advice-19102021.pdf

Threatened Species Scientific Committee (TSSC) (2021b), *Conservation Advice Litoria spenceri Spotted Tree Frog.* Canberra: Department of Agriculture, Water and the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/25959-conservation-advice-13112021.pdf

Threatened Species Scientific Committee (TSSC) (2021c), *Conservation Advice Nannoperca australis Murray-Darling Basin lineage Southern Pygmy Perch*. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/84745-conservation-advice-05052016.pdf

Threatened Species Scientific Committee (TSSC) (2022), *Conservation Advice for Keyacris scurra – Key's Matchstick Grasshopper.* Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/89739-conservation-advice-05102022.pdf

Threlfall, C., Law, B., Penman, T., and Banks, P.B. (2011), Ecological processes in urban landscapes: mechanisms influencing the distribution and activity of insectivorous bats, *Ecography*, 34, pp. 814–826.

Threlfall, C.G., Law, B. and Banks, P.B., (2012), Sensitivity of insectivorous bats to urbanization: Implications for suburban conservation planning, *Biological Conservation*, 146(1), pp. 41-52.

Timmiss, L., Martin, J., Nicholas, J., Murray, B. F., Welbergen, J. A., Westcott, D., McKeown, A. and Kingsford, R. T. (2020), Threatened but not conserved: flying-fox roosting and foraging habitat in Australia. *Australian Journal of Zoology*, 68, pp. 226–233. https://doi.org/10.1071/ZO20086

Tozer MG, Turner K, Simpson C, Keith DA, Beukers P, MacKenzie B, Tindall D, Pennay C (2010), Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. *Cunninghamia,* 11, pp. 359–406.

Tozer, M. & Simpson, C. (2020), *Conservation Assessment of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland.* NSW Threatened Species Scientific Committee.

Transgrid (2020a), *Transmission Line Construction Manual – Major New Build TLCM-MNB*, D2020/00407. Approval/Review date: 11/02/2020.

Transgrid (2020b), *Maintenance Plan Easement and Access Tracks, D2003/2398.* Approval/Review date: 11/12/2020.

Transgrid (2023a). *Humelink Vegetation Clearing Method and Management Memorandum – Working Draft*

Transgrid (2023b), *Options Assessment Report HumeLink.* Draft report.

Trout Cod Recovery Team (2008), *National Recovery Plan for the Trout Cod Maccullochella macquariensis*, Department of Sustainability and Environment, Victoria. Accessed 2022: https://www.agriculture.gov.au/sites/default/files/documents/trout-cod.pdf

Tsai, H.C., Chiang, J.M., McEwan, R.W. and Lin, T.C. (2018), Decadal effects of thinning on understory light environments and plant community structure in a subtropical forest. *Ecosphere*, 9(10), p.e02464.

University of Wollongong (2020), *The race to save the corroboree frog- How bushfires impacted UOW's recovery program.* The Stand. Accessed from: https://www.uow.edu.au/the-stand/2020/the-race-to-save-the-corroboree-frog.php#:~:text=Considered%20one%20of%20the%20most,among%20Australia's%20most%20endangered%20vertebrates.

Vallee, L., Hogbin, T., Monks, L., Makinson, B., Matthes, M. and Rossetto, M. (2004), *Guidelines for the Translocation of Threatened Plants in Australia Second Edition,* Australian Network for Plant Conservation, Canberra.

Van, Z. and Yan, Z. (2006), Germination and seedling development of two mistletoes, *Amyema preissii and Lysiana exocarpi*: Host specificity and mistletoe-host compatibility. *Austral Ecology*, 18(4), pp. 419-429.

Vardon, M. J., and Tidemann, C. R. (2000), The black flying-fox (*Pteropus alecto*) in north Australia: juvenile mortality and longevity, *Australian Journal of Zoology*, 48(1), pp. 91-97.

VicFlora (2020), *Flora of Victoria*, Royal Botanic Gardens Victoria. Accessed Oct 2020. Available from https://vicflora.rbg.vic.gov.au/flora/taxon/6ab46dc7-8022-4255-93a3-cbeab381f17e

Warrant, E.J., and Dacke, M. (2016), Visual navigation in nocturnal insects, *Physiology,* 31, pp. 182–192, DOI:10.1152/physiol.00046.2015

Webb, M.H., Wotherspoon, S., Stojanovic, D., Heinsohn, R., Cunningham, R., Bell, P. and Terauds, A. (2014), Location matters: Using spatially explicit occupancy models to predict the distribution of the highly mobile, endangered swift parrot. *Biological Conservation*, 176, pp. 99-108.

Yabsley, S. H., Meade, J., Martin, J. M., & Welbergen, J. A. (2021), Human-modified landscapes provide key foraging areas for a threatened flying mammal: The grey-headed flying-fox, Plos one, 16(11), e025

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