Attachment 4 – Detailed MNES impact assessment

1. Section 2.4 Is the proposed action likely to have any direct or indirect impacts on the members of any listed species or any threatened ecological community, or their habitat?

1.1. Overview of approach

The desktop and likelihood assessment identified several threatened species or threatened ecological communities (TECs) listed under the EPBC Act that would have a high or moderate likelihood of occurring within the proposal study area and may be directly or indirectly impacted by the proposal. These are:

- Three EPBC Act listed TECs:
    - Grey Box Grassy Woodlands and Derived Native Grasslands
    - Alpine Sphagnum Bogs and Associated Fens
    - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland
- Six flora species
    - *Ammobium craspedioides*
    - *Leucochrysum albicans var. tricolor*
    - *Prasophyllum bagoense*
    - *P. keltonii*
    - *Rutidosis leptorrhynchoides*
    - *Xerochrysum palustre*
- Seven threatened fauna species:
    - Swift Parrot,
    - Superb Parrot
    - Greater Glider
    - Pink-tailed Worm Lizard
    - Striped Legless Lizard
    - Golden Sun Moth

Koala. The potential direct or indirect impacts on these species are summarised in Section 1.2 below. More detailed assessment against the 'Matters of National Environmental Significance Significant impact guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*' for each relevant species or TEC is provided in Section 1.3 below.

For context:

- The proposed action area is around 1 km wide in most places up to 5 km wide in select locations and includes the area where HumeLink assets such as transmission lines and substations are likely to be located as well as areas likely to be required for permanent and temporary access tracks and roads.

- The disturbance footprint (i.e. area of direct impact) is likely to be located within the proposed action area and is subject to design refinement. To calculate an indicative disturbance footprint, the following was assumed:
    - An indicative area of investigation (AOI), which is between 100 to 200 m wide and follows an indicative centreline for the transmission line. This is considered conservative as the transmission line easement would be up to 70 m wide and have refined assumptions for vegetation clearance over a certain height.
    - Indicative footprints for construction of the new Gugaa 500 kV substation (170,000m^2), augmented Wagga 330 kV substation (900 m^2) and augmented Bannaby 500 kV substation (42,100 m^2)

Additional areas of disturbance for construction locations (such as compound sites and accommodation camps) are yet to be determined and would be confirmed as part of the EIS.

It should be noted that the proposed action area presents the full range of options being considered for the project (i.e. three transmission line route options at Tumut, Tumut North and Blowering). The final disturbance area in the EIS would comprise just one of the options and will result in a much smaller impact than currently indicated.

1.2. Summary of potential direct or indirect impacts on listed species, TECs or their habitat

Threatened ecological community or species	Potential impact
Alpine Sphagnum Bogs and Associated Fens	The proposed action has the potential to directly impact approximately 5.27 ha, of which about 5.07 ha of this TEC has been verified as being present. There is the potential to fragment, introduce exotic species or pathogens and alter hydrological processes supporting the community. The potential impact area was calculated using the disturbance footprint, desktop mapping using available data, and limited survey. The final impact area is subject to change through design refinement and field verification of the extent of this TEC through further field surveys in 2022. The final impact area will be confirmed as part of the EIS. The community occurs in the alpine region of the proposal in the following local government areas of Tumbarumba, Tumut and Upper Lachlan. Design refinement and environmental management measures may assist in reducing impacts on this community. These would be described in the EIS and BDAR. It is likely that ongoing management of the community in the proposal area would be limited since it does not contain a canopy. The proposed action is expected to result in clearing, the introduction of exotics and potentially altering the hydrological processes supporting the community. The scale of these impacts would be relatively small, but permanent. Despite this, the impacts are unlikely significant.
Grey Box Grassy Woodlands and Derived Native Grasslands	The proposed action has the potential to directly impact about 0.14 ha. There is potential to fragment, introduce exotic species and remove habitat features (e.g. hollows and coarse woody debris) supporting fauna in the community. The potential impact area was calculated using the disturbance footprint, desktop mapping using available data, and limited survey. The final impact area is subject to change through design refinement and field verification of the extent of this TEC through further field surveys in 2022. The final impact area will be confirmed as part of the EIS. The community occurs predominantly within the Riverina and South West Slopes regions of NSW down to the Victorian border. In the proposed action area it occurs in the following LGAs, Cootamundra-Gundagai Regional, Upper Lachlan Shire, and Wagga Wagga. Design refinement and environmental management measures may assist in reducing impacts on this community. These would be described in the EIS and BDAR. The proposed action is expected to result in clearing, removal of threatened species habitat and the introduction of exotics. The scale of these impacts would be relatively small, but permanent. Despite this, the impacts are unlikely significant.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	The proposed action has the potential to directly impact up to 1861.72 ha, of which about 1583.98 ha of this TEC has been field validated. There is potential to fragment, introduce exotic species and remove habitat features (e.g. hollows and coarse woody debris) supporting fauna in the community. The potential impact area was calculated using the disturbance footprint, desktop mapping using available data, and limited survey. The final impact area is subject to change through design refinement and field verification of the extent of this TEC through further field survey in 2022. The final impact area will be confirmed as part of the EIS.

	The community occurs predominantly within the Riverina and South West Slopes regions of NSW down to the Victorian border. In the proposed action area the community occurs in the following LGAs, Cootamundra-Gundagai Regional, Upper Lachlan Shire, Yass and Wagga Wagga. Design refinement and environmental management measures may assist in reducing impacts on this community. These would be described in the EIS and BDAR. The proposed action is expected to result in clearing, removal of threatened species habitat and the introduction of exotics. The scale of these impacts is potentially large, despite efforts to minimise through design refinement. The potential impacts are likely to have a significant impact on this community.
Ammobium craspedioides *Leucochrysum albicans* var. *tricolor* *Rutidosis leptorrhynchoides* *Xerochrysum palustre*	The proposed action would potentially clear large areas of habitat of these species. Three of the four species have been observed during surveys, excluding *Rutidosis leptorrhynchoides*. Despite the potential habitat occurring, the species' occupancies have not been high. The final impact area is subject to change through design refinement and field verification of the extent of these species through further field survey in 2022. The final impact area will be confirmed as part of the EIS. These four species occupy grassy woodland communities across both high and lower slope country. Since these species occupy the ground cover, there is a possibility that management of the corridor may avoid complete vegetation removal. This and other measures to avoid and minimise impacts would be described in the EIS and BDAR. The proposed action is expected to result in clearing, removal of threatened species habitat and the introduction of exotics. The scale of these impacts is potentially large, despite efforts to minimise through design refinement. However, the level of occupancy of these species across the potential habitat is relatively low. The potential impacts are unlikely to have a significant impact on these species.
Prasophyllum bagoense and *P. keltonii*	Several small populations of these species were observed on McPhersons Plains and Modder Creek Plain. These areas are treeless plains and swamps. The proposed action has the potential to remove small areas of potential habitat for these species, introduce weeds and potentially alter hydrological processes that may support species' microhabitats. The final impact area is subject to change through design refinement and field verification of the extent of these species through further field surveys in 2022. The final impact area will be confirmed as part of the EIS. These species occupy treeless communities on the high plains near Maragle. Since these species occupy the ground cover, there is a possibility that management of the corridor may avoid complete vegetation removal. This and other measures to avoid and minimise impacts would be described in the EIS and BDAR. The proposed action could result in removal of species habitat and the introduction of exotics. The scale of these impacts is potentially small due to the ability to microsite tower pads and avoid large scale clearing of treeless areas. However, it is recommended that due to the highly restricted habitats and areas of occupancy, low population numbers and sensitivity to disturbances, these species' habitats are avoided altogether.
Swift Parrot Superb Parrot	The proposed action may result in clearing of potential forging habitat in suitable woodland areas near Wagga Wagga. Due to these species' large home ranges, nomadic nature and the potential ability to avoid breeding areas, the proposed action is not considered likely to significantly contribute to a long-term decline in the size of a population of these species. Although potentially suitable woodland habitat has been mapped within the proposal study area, records within the area are rare and intermittent. It is considered unlikely

	that the proposal will fragment an existing population given the ecology of the two species and current fragmented state of potential habitat. Avoidance of large tracts of suitable woodland habitat through proposal design refinement would reduce potential impacts and these would be described in the EIS and BDAR. The proposed action is considered unlikely to have a significant impact on these species
Pink-tailed Worm Lizard Striped Legless Lizard	The proposed action may result in clearing of potential habitat for these two species. There are no records of these species within the proposal study area however they are known from the wider locality and occupy grassy woodlands and native grasslands. Survey for these species continues in 2022 and would inform the design, EIS and BDAR. The final design and its impacts would be described in the EIS. Efforts to minimise impacts would occur and include potentially avoiding areas containing these species, avoiding clearance of the grassy understories and minimising clearing for towers. Considering the fragmented state of the landscape, the proposed action is unlikely to significantly fragment and/or isolate these species that would place it them at risk of extinction. For the above reasons the proposed action is unlikely to significantly impact these species.
Greater Glider	The proposed action has the potential to clear and fragment habitat and remove habitat features (e.g. hollows and coarse woody debris) supporting populations of this species. The Greater Glider is found in higher montane wet forests. These forests have been observed between Maragle and Tumut in managed state forests. Large areas of these forests were burnt in 2019/2020, although they were regenerating in 2020 and 2021. It is highly likely that some hollow trees would have been burnt, with tree fall rendering the hollows unsuitable for the Glider. The final impact area is subject to change through design refinement. The final impact area will be confirmed as part of the EIS. The size of the population overall is estimated around 100,000 individuals across its range (TSSC 2016), with densities between 0.6 and 2.8 per hectare in Victoria and higher in the north-east of NSW. This species has been observed during survey and field verification of the extent of habitat is subject to further field surveys and assessment in 2022. This species has relatively small home ranges and is likely to be very sensitive to fragmentation as a result. Therefore, minimisation of the proposed action on potential habitat would be a key feature to reduce impacts on this species. The species relies on hollows for denning and requires a high density of hollows to persist. Hollow removal is therefore a key threat to the persistence of populations. While efforts would be made to minimise or avoid hollow bearing trees, it is likely that hollows and other features would be removed from potential Glider habitat. The proposed action has the potential to fragment habitat and introduce pathogens which could affect habitat trees and connectivity between forest patches.
Golden Sun Moth	The proposed action may result in clearing of large areas of potential habitat for the Golden Sun Moth. The Golden Sun Moth's NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. There are no records of these species within the proposal study area however they are known from the wider locality and occupy grassy woodlands and native grasslands. The Conservation Advice (TSSC 2013) suggests that while the extent of occurrence is large, the area of occupancy of this species is very small. The presence of wallaby grasses is a key characteristic of the species' habitat and presence of interstitial tussock spaces is also important.

The species is generally a poor flier, with females being reluctant to fly and males limited to relatively short distances (about 100 m) (DPIE 2021). Thus, the species is sensitive to fragmentation, as well as modification of soil and grass diversity, invasion of exotic grass species and habitat loss.

Survey for this species continued through 2021 and 2022 and would inform the design, EIS and BDAR. The final design and its impacts would be described in the EIS. Survey carried out to date has not identified any individuals, although the conditions during survey were noted to be unsuitable due to prolonged wet weather.

Efforts to minimise impacts would occur and include potentially avoiding areas containing this species, avoiding clearance of the grassy understories and minimising clearing for towers and reducing gaps between habitats to less than 200 m.

There are potentially large areas of habitat in the proposed action area. While fragmentation of the habitat could be minimised and long-term maintenance of habitat (i.e. slashing) avoided, habitat loss of over 0.5 ha in a large or contiguous habitat is likely to be significant (DEWHA 2009). Therefore, there is potential that the proposed action would be a significant impact on this species.

1.3. Detailed assessment against relevant guidelines

The above matters were assessed against the 'Matters of National Environmental Significance Significant impact guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*'

1.3.1. Threatened ecological communities

Criterion	Assessment
reduce the extent of an ecological community	The proposed action would reduce the extent of the threatened ecological communities Grey Box Grassy Woodlands and Derived Native Grasslands, Alpine Sphagnum Bogs and Associated Fens and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. Survey and validation of the extent and condition of these communities is not yet complete. However based on regional, publicly available vegetation mapping, 5.27 ha of Alpine Sphagnum Bogs and Associated Fens, 0.14 ha of Grey Box Grassy Woodlands and Derived Native Grasslands and about 1861.72 ha of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland is likely to be present within the proposed action area. Based on complete removal of the treed vegetation this would be about 1867.13 ha removed. The treeless community Alpine Sphagnum Bogs and Associated Fens may not require ongoing maintenance for trees, since they are absent. Based on the proposed management of tracks, construction of pads for towers, and the re-use of existing tracks, about 25% of the treeless community would be affected by the proposed action. Around 1.3 ha of this community may be impacted across the proposed action area.
fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	The proposed action would result in an easement up to 70m wide through parts of these three threatened ecological communities. While some species may be able to move across this relatively small gap, others may not, thus potentially affecting the communities' overall genetic diversity and structure. Conservation and listing advices suggest that gaps of over 100 m for woody vegetation define separate patches for ecological communities listed under the EPBC Act. Therefore, if the easement traversed a patch, the resulting gap may not necessarily result in two patches. Of the three communities assessed, the impacts on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland resulting from fragmentation are likely to be the greatest. The final impact areas, design and approach to maintenance of the corridor is yet to be determined. There is potential for increased fragmentation in this community.
adversely affect habitat critical to the survival of an ecological community	Habitat critical to the survival of an ecological community is defined as areas that are necessary for the long-term maintenance of the species or ecological community, such as: to maintain genetic diversity and long-term evolutionary development, or for the reintroduction of populations or recovery of the species or ecological community. All occurrences of Alpine Sphagnum Bogs and Associated Fens are considered important (DoE 2014), therefore the proposed action has the potential to adversely affect habitat critical to the survival of this community.

	All occurrences of all areas of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland which meet the minimum condition criteria should be considered critical to the survival of this ecological community (DECCW 20210). Therefore, the proposed action has the potential to adversely affect habitat critical to the survival of this community. Habitat critical to the survival of Grey Box Grassy Woodlands and Derived Native Grasslands has not been defined. Given the small area mapped in the proposed action area, this is not likely to be critical to the survival of this community, which extends over hundreds of kilometres from northern NSW into SA.
modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	The proposed action has the potential to alter water regimes required for the maintenance of the Alpine Bogs and Fens community though altering surface drainage patterns. The grassy woodland communities are unlikely to rely on any particular ground water or surface water regime. It is not anticipated that the proposed action would alter flows such that these communities are affected. The proposed action is not likely to alter soils or increase nutrients that would modify or alter any of these communities.
cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	The proposed action would not increase burning and would not harvest flora or fauna. However, there is a requirement to manage the areas of vegetation beneath the transmission lines. Management and removal of vegetation taller than 4 m is anticipated. The proposed action has the potential to substantially change the species composition and structure in the grassy woodland communities.
cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – assisting invasive species, that are harmful to the listed ecological community, to become established, or – causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or	All three communities would be sensitive to invasion by harmful exotic plant species. The proposed action has a high potential to introduce these species to previously unaffected patches of remnant native vegetation. These impacts would be minimised and mitigated by strict adherence to environmental management measures such as 'come clean, go clean', not using infected fill, environmental inductions, monitoring and reporting. Threshold triggers and response would form part of a construction and operational management plan. With these proposed measures, the risk of substantially reducing the quality or integrity of the ecological communities would be lessened. Fertilisers are not proposed to be used, neither would herbicides. During construction and operation, there is a chance that chemicals or pollutants may be introduced to the habitats. The risk is small and would be managed by implementing chemical handling and storage procedures, implementing the use of spill kits and other measures.
interfere with the recovery of an ecological community.	The proposed action is not likely to interfere with the recovery of the Alpine Bogs and Fens and the Grey Box Grassy woodland communities. There is potential for the proposed action to interfere with the recovery of the Box Gum Woodland, through modification and clearing of good quality remnants.

1.3.2. Vulnerable species

1.3.2.1. Ammobium craspedioides and Xerochrysum palustre

Criterion	Assessment
lead to a long-term decrease in the size of an important population of a species	Neither species has had important populations defined. *Ammobium crapsedioides* is known only from near Crookwell to Wagga Wagga and may be locally 'common'. By contrast *Xerochrysum palustre* has a wider but more scattered distribution, with a population estimate of about 10,000 plants. Of the areas surveyed, neither species had populations that were large. It is unlikely that the proposed action area contains an important population of either species.
reduce the area of occupancy of an important population	The proposed action area does not contain an important population of either species. There would be a potential reduction in the area of occupancy, since tower pads, access tracks and other facilities may remove habitat for either one, or both these species.
fragment an existing important population into two or more populations	The proposed action would construct tower pads, access tracks and other facilities and would maintain areas under the transmission lines. Removal of understorey, of which these plants are part, is not a necessary action for most of the corridor. Therefore, impacts could be managed to smaller, discrete patches of potential habitat of these two species, or in the case of *Xerochrysum palustre*, avoided altogether. It is not anticipated that the proposed action would fragment any populations of these species.
adversely affect habitat critical to the survival of a species	No critical habitat has been identified for either species.
disrupt the breeding cycle of an important population	There are not likely to be any important populations of *Ammobium craspedioides* and *Xerochrysum palustre* in the proposed action area. Further, there is unlikely to be large scale impacts to the understorey where these species might be present. There is not likely to disruption to the breeding cycle. This is because if the plants are self-pollinated, this is expected to be able to continue. For plants that are pollinated by fauna, these are likely to be by invertebrates. Invertebrates would continue to persist even in a structurally modified environment (i.e. trees and shrubs removed), although the diversity and abundance of pollinators might be altered. Seeds produced by both species are anticipated to be widely dispersed due to the pappus structures on the seeds. These are common structures in daisy species and facilitate the movement of seeds by wind.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed action would construct tower pads, access tracks and other facilities and would maintain areas under the transmission lines. Removal of understorey, of which these plants are part, is not a necessary action for most of the corridor. Therefore, impacts could be managed to smaller, discrete patches of potential habitat of these two species.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Both species would be sensitive to invasion by harmful exotic plant species. The proposed action has a high potential to introduce these species to previously unaffected patches of remnant native vegetation. These impacts would be minimised and mitigated by strict adherence to environmental management measures such as 'come clean, go clean', not using infected fill, environmental inductions, monitoring and reporting. Threshold triggers and response would form part of a construction and operational management plan. With these proposed measures, the risk of substantially reducing the quality or integrity of the habitats of these two species would be lessened.
introduce disease that may cause the species to decline, or	The proposed action has a low potential to introduce pathogens to previously unaffected patches of remnant native vegetation. These impacts would be minimised and mitigated by strict adherence to environmental management measures such as 'come clean, go clean', not using infected fill, environmental inductions, monitoring and reporting. Threshold triggers and response would form part of a construction and operational management plan.

interfere substantially with the recovery of the species.	The proposed action may reduce the species' occupancies but would unlikely result in the long-term decline of the species. Neither species has important populations within the proposed action area. The proposed action is not likely to substantially interfere with the recovery of these two daisies.

1.3.2.2. Superb Parrot

Criterion	Assessment
lead to a long-term decrease in the size of an important population of a species	The South-west Slopes of NSW, including around Wagga Wagga and Yass, are listed as a Key Biodiversity Area for this species in the Draft National Recovery Plan (Baker-Gabb 2011). This area supports the core distribution of the Superb Parrot. For this reason, the proposed action area may contain parts of an important population for this species. The proposed action area may traverse parts of a Key Biodiversity Area for this species and may be able to avoid breeding habitat. The proposed action may affect some elements of the foraging habitat of this species, but this is unlikely to be to an extent that would result in long term decline.
reduce the area of occupancy of an important population	The Draft National Recovery Plan states that: *Actions that remove habitat critical to the survival would interfere with the recovery of the Superb Parrot and reduce the area of occupancy of the species* (Baker-Gabb 2011). The proposed action would remove some habitat in one of the Key Biodiversity Areas for this species, therefore the proposed action would reduce the area of occupancy.
fragment an existing important population into two or more populations	The proposed action would traverse parts of a Key Biodiversity Area for this species. However the nature of the proposed action (long linear infrastructure) is unlikely to permanently sever habitat in a way that would result in two or more populations. This is because vegetation would remain beneath the transmission lines, suitable for foraging, the species would be able to move across the areas affected by the proposed action and unlikely to restrict movement of genetic material for this parrot in the landscape.
adversely affect habitat critical to the survival of a species	The proposed action is likely to adversely affect habitat critical to the survival of this species. The Draft National Recovery Plan identifies habitat critical to the survival of the species as: • Breeding habitat – hollows in trees of Box-Gum Woodlands and Riverine forests, near Wagga Wagga and Yass • Foraging habitat – Boree forests, River Redgum Forests, box-pine, box, pine and Boree woodlands in the Riverina. The proposed action area is likely to intersect with either or both these critical habitat areas.
disrupt the breeding cycle of an important population	In 2000, the total population size of Superb Parrot was estimated at between 5,000 and 8,000 birds. Successful breeding would rely on the presence of suitable hollows, ability to avoid illegal removal of birds, access to foraging habitat, and survival of fledglings. This proposed action has the ability to affect hollows and foraging habitat. It is unknown how many breeding pairs would occupy the areas likely to be affected. While several individuals may be affected, the proposed action is unlikely to wholly disrupt the breeding cycle of an important population of this species.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed action would have the ability to modify, destroy or remove the availability and potentially the quality of the habitat of the Superb Parrot. However, the proposed action is unlikely to do this to the extent that the whole species is likely to decline. This is because the species' distribution extends from Queensland, through NSW and ACT into Victoria. The species also extends west of the Great Dividing Range and is known as far west as Griffith and Deniliquin. The proposed action area would affect habitat in the south-eastern most part of the species' range.
result in invasive species that are harmful to a vulnerable species	The Superb Parrot is unlikely to be affected by invasive species directly. However the species can be affected by poisoning intended for other species, such as rabbits and over-abundant native birds. The proposed action is not intending on embarking on a pest control strategy that

becoming established in the vulnerable species' habitat	would result in the use of poison. The proposed action is for the construction and operation of transmission lines to disperse electricity.
introduce disease that may cause the species to decline, or	The proposed action is unlikely to result in a disease that may affect this species.
interfere substantially with the recovery of the species.	The proposed action is likely to affect some habitat for this species in the south-eastern most area of its distribution. The design would be refined to minimise and avoid impacts where practicable. While some of the results of the proposed action are listed as threats to the species, the action is not likely to interfere substantially with the recovery of the species in its entirety.

1.3.2.3. Pink-tailed Worm Lizard and Striped Legless Lizard

Criterion	Assessment
lead to a long-term decrease in the size of an important population of a species	The Approved Conservation Advice for the Striped Legless Lizard states that all populations are likely to be important for the recovery of the species. The Advice lists 18 areas that contain known important populations, including the areas of Gilmore, Batlow and Tumut, and Yass and Young. The proposed action is likely to traverse two areas that contain important populations. The Pink-tailed Worm Lizard's Approved Conservation Advice does not specify any areas or populations of importance. The species does not have an Approved Recovery Plan. In NSW, the species is thought to be restricted to widespread, but isolated sites scattered across the Central and Southern Tablelands and South Western Slopes. Given the nature of isolation of the species' distribution, it is likely that any population could be important since they would maintain genetic diversity across an environmental and geographic gradient. Both species generally occupy areas dominated by native grasses, with the presence of surface rock or boulders being a key habitat feature. The proposed action is unlikely to significantly affect the ground stratum, apart from tower pads and access tracks. The proposed action would minimise new tracks as far as possible and would retain surface rocks which are significant habitat for these lizards. The ability to affect areas containing important populations only minimally means the proposed action is unlikely to lead to a long-term decrease in the size of an important population.
reduce the area of occupancy of an important population	The proposed action could reduce the area of occupancy of an important population. However, the areas likely to be affected would be relatively small, since native grasses and rock habitats could be maintained in situ.
fragment an existing important population into two or more populations	Striped Legless Lizard are known to be poor dispersers, with evidence suggesting that they are genetically differentiated at distances less than 400 m (TSSC 2016a). Movement and dispersal behaviour in the Pink-tailed Worm Lizard is unknown. In the ACT following the 2003 bushfires, this species was observed in areas that had previously been planted to Monterey Pine (Wong et al 2011). However, these areas were only 30 m from a known source population. The proposed action is unlikely to significantly affect the ground stratum, apart from tower pads and access tracks. The proposed action would minimise new tracks as far as possible and would retain surface rocks which are significant habitat for these lizards. The ability to affect areas containing important populations only minimally means the proposed action is unlikely to fragment an existing important population into two or more populations of these two species of lizard.
adversely affect habitat critical to the survival of a species	No critical habitat has been identified for Pink-tailed Worm Lizard, however the needs are likely to be similar to Striped Legless Lizard to some extent. The Approved Conservation Advice for Striped Legless Lizard identifies habitat critical to the survival of the species that contains one or more of the following:

	• Provides breeding habitat – two or more adults present and the site contains complex grass structures, surface rocks or invertebrate burrows • Provides foraging habitat – floristically diverse with little disturbance and is connected to other habitat • Provides refuge from disturbance – contains surface rocks or arthropod burrows, or soil cracks • Has connectivity value and contributes to the evolutionary potential of the species in the wild across its natural geographical range. It is likely that some parts of the proposed action would affect habitat critical to the survival of these species. However given the relatively small areas required for towers and the ability to retain native grasses and surface rock, the effects are unlikely to be significant.
disrupt the breeding cycle of an important population	Both species rely on protection provided by rocks, cracks or arthropod burrows to nest and produce egg clutches. The proposed action may result in the removal of some, but not all, rocks in an area for tower pads and access tracks. Feeding on ants and other insects is likely to continue, since native grasses can and would be retained. It is therefore unlikely that the proposed actions would result in the disruption of an entire important population's breeding cycle.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed action is unlikely to significantly affect the ground stratum, apart from tower pads and access tracks. The proposed action would minimise new tracks as far as possible and would retain surface rocks which are significant habitat for these lizards. The ability to affect areas containing important populations only minimally means the proposed action is unlikely to modify habitats to such an extent that the species are likely to decline.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Both species are at risk of predation by feral cats and foxes. The likely habitats of these lizard species exist in a matrix of agriculture and where these predators are likely to be extant. The proposed action may potentially increase tracks in the landscape, particularly where existing tracks cannot be used. This may increase predator access to some areas. However, predation by cats is more likely in areas close to urban environments. Maintenance of native grasses is a key habitat requirement of these two species. Therefore, while some populations may persist in exotic grasslands, the species' securities are likely to increase with increasing native species diversity. It is imperative then that the proposed action limits the potential for invasive grass species from becoming established in known or potential Striped Legless Lizard and Pink-tailed Worm Lizard habitats. Biosecurity and the management of weed propagules will be an important feature in the construction and operational management of the proposed action. With this, the invasion by exotic species can be limited.
introduce disease that may cause the species to decline, or	It is not anticipated that any disease would be introduced that would cause the entire species to decline.
interfere substantially with the recovery of the species.	The proposed action may remove small areas of potential or known habitat. However because the proposed action can retain rocks and native grasses within the corridor, it is not expected that the action would substantially interfere with the recovery of either species.

1.3.2.4. Greater Glider

Criterion	Assessment
lead to a long-term decrease in the size of an important population of a species	The Approved Conservation Advice for the Greater Glider does not identify important populations and there is no Approved Recovery Plan for this species. They have small home ranges, particularly in more productive forests, and disperse poorly. For these reasons, it is likely that any population is important to the overall maintenance of the species' diversity. Greater Gliders have been observed mostly in the managed native forests between Maragle and Tumut. The proposed action in these locations would result in the clearing of known and potential habitat, including the loss of hollows. The species has a poor ability to persist in small

	forest fragments. These forests are productive, and many hollows have been observed, even following the 2019/2020 bushfires. The proposed action would remove some, but not all hollows in these forests and would alter some but not all foraging habitat. Therefore, the proposed action is not likely to lead to a long-term decrease in the size of an important population.
reduce the area of occupancy of an important population	The extent of occurrence is estimated at 1 586 870 km^2, and the area of occupancy estimated at 16 164 km^2. It is anticipated that the proposed action would remove some potential and known habitat. This may reduce the area of occupancy of an important population.
fragment an existing important population into two or more populations	This species is sensitive to fragmentation. The proposed final width of the action is likely to be up to 70 m. It is unknown whether Greater Glider would traverse this relatively narrow gap. The Conservation Advice suggests that the Greater Glider cannot traverse cleared areas. However, the Advice also suggests that Glider populations could be maintained in a post-logging environment where 40% of the original tree basal area is retained. This basal area is likely to be retained since the proposed action would not clear wide areas of forest. Therefore, if the proposed action severed a known population area, there is potential that an important population could be fragmented.
adversely affect habitat critical to the survival of a species	No such habitat has been identified for this species. However, given the reliance on large tracts of forest with relatively high densities of hollows, this habitat type is considered to be critical for this species. The proposed action would likely affect known and potential habitat critical to the survival of this species.
disrupt the breeding cycle of an important population	Young are born from March to June and generally only one is produced. The species relies on hollows for denning and breeding. Therefore, the continued presence of hollows in the landscape is important to maintaining populations. The proposed action is likely to remove hollow bearing trees in known and potential habitat for this species. The proposed action would traverse areas of forest where tracts containing hollows would be retained. Clearing trees with young may disrupt the breeding cycle.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Greater Gliders have been observed mostly in the managed native forests between Maragle and Tumut. The proposed action in these locations would result in the clearing of known and potential habitat, including the loss of hollows. It has a poor ability to persist in small forest fragments. These forests are productive, and many hollows have been observed. The proposed action would remove some, but not all hollows in these forests and would alter some but not all foraging habitat. The species is distributed from North Queensland to Central Victoria, and this proposed action would not affect the entire species' distribution. Therefore, while the proposed action would modify, destroy and remove habitat, this is unlikely to affect the whole species.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	No invasive exotic species is a known threat to the Greater Glider. Competition for hollows by the Sulphur-crested Cockatoo and hyper-predation by Powerful Owls are listed as known threats. The proposed action is not likely to increase the presence of either the Owl or the Cockatoo.
introduce disease that may cause the species to decline, or	*Phytophthora cinnamomi* is known to affect the health of eucalypts. While this fungus does not directly affect the Glider, infestation of a forest may damage habitat important to the species. Management of this and other pathogens will be important in minimising impacts on the habitat for the Glider. The proposed action has a low potential to introduce pathogens to previously unaffected patches of remnant native vegetation. These impacts would be minimised and mitigated by strict adherence to environmental management measures such as 'come clean, go clean', not using infected fill, environmental inductions, monitoring and reporting. Threshold triggers and response would form part of a construction and operational management plan.

interfere substantially with the recovery of the species.	Main actions to recover the species include reducing the frequency and intensity of prescribed burns, constraining hardwood production and clearing and avoiding fragmentation. The proposed action would not affect fire regimes. However, there is potential for clearing in native forests to remove important habitat and increase fragmentation. These effects would be greatest at the local level and would not affect the species across its entire range.

1.3.3. Critically endangered or endangered species

1.3.3.1. Leucochrysum albicans var. tricolor and Rutidosis leptorrhynchoides

Criterion	Assessment
lead to a long-term decrease in the size of a population	*Leucochrysum albicans* var. *tricolor* has been observed during survey in summer 2020/2021 in about 13 properties that intersect with the proposed action. The proposed action would construct tower pads, access tracks and other facilities and would maintain areas under the transmission lines. Removal of understorey, of which these plants are part, is not a necessary action for most of the corridor. Therefore, impacts could be managed to smaller, discrete patches of potential habitat. However, where populations occur in areas for tracks or tower pads, there is a chance that there would be a long-term decrease in the size of a population. No *Rutidosis leptorrhynchoides* have been observed in the proposed action area surveyed to date. As with *Leucochrysum albicans* var. *tricolor,* there is a chance that if the proposed action area intersects with populations of this species, there could be a long-term decrease in the size of a population.
reduce the area of occupancy of the species	According to the National Recovery Plan for *Leucochrysum albicans* var. *tricolor* (Sinclair 2010), the species exists in several hundred populations across Tasmania, south-western Victoria and the southern tablelands of NSW. An area of occupancy has not been estimated. For *Rutidosis leptorrhynchoides*, the total area occupied across its range is only 13.4 ha, despite a relatively broad distribution (OEH 2012). Of this total, about 6 ha occurs in NSW across 13 known populations, none of which occur in the proposed action area. There is a high chance that the proposed action could reduce the area of occupancy for *Leucochrysum albicans* var. *tricolor*. However, for *Rutidosis leptorrhynchoides*, the chance is less since populations are better known. Regardless, if a population was discovered in the proposed action area, there would be a significant chance that the actions would reduce the area of occupancy.
fragment an existing population into two or more populations	*Leucochrysum albicans* var. *tricolor* is an outbreeding species with pollination likely to be facilitated by small flying insects. The seeds have numerous pappus bristles which assist in dispersal, likely over many kilometres (Sinclair 2010). Given this and the likely flying distances of pollinators, if the proposed action area intersected a population, it is unlikely to sever these genetic flows, thus fragmenting a population. By contrast, *Rutidosis leptorrhynchoides*, is thought to be a poor disperser, despite it being wind dispersed. Coupled with this, the species exhibits self-incompatibility, thus limiting seed set where pollen transfer occurs relatively locally. The proposed action would have the ability to potentially fragment an existing population into two or more populations. However this chance would be reduced through avoidance (at detailed design) and because the ground cover does not need to be disturbed outside of proposed tracks and tower pads.
adversely affect habitat critical to the survival of a species	All populations of more than ten plants are important to the long-term survival and maintenance of genetic diversity for *Rutidosis leptorrhynchoides* (OEH 2012). No known habitat containing ten or more plants (according to the Recovery Plan) would be affected by the proposed action, however survey is continuing. If the proposed action intersected with a population, and that population contained more than 10 plants, it would adversely affect critical habitat. This could be avoided by detailed design and micro siting of tower pads and tracks.

	Habitat critical to the survival of *Leucochrysum albicans* var. *tricolor* has not been identified (Sinclair 2010). In the Monaro and southern tablelands of NSW, nine of 15 known populations contain 'several hundred' to 'several thousand' plants. These locations are likely to be important for the maintenance of genetic diversity and recovery of the species. None of these populations are known from within the proposed action area.
disrupt the breeding cycle of a population	As described above, both species are likely insect pollinated and wide (*Leucochrysum*) or local dispersers (*Rutidosis*). The proposed action may alter small areas of potential (*Rutidosis*) or known (*Leucochrysum*) habitats however this is unlikely to substantially affect pollinator populations. Both species occupy grassy habitats and so long as there are appropriate interstitial spaces for germination, it is likely that germination can continue in areas unaffected by the proposed action. Further, the action could avoid populations and minimise impacts on the ground stratum occupied by these species. For these reasons, it is unlikely that the proposed action would disrupt the breeding cycle of a population of either species.
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed action could modify or remove habitat for *Leucochrysum albicans* var. *tricolor* since it has been observed in the proposed action area. *Rutidosis leptorrhynchoides* has not. Both species occupy grassy habitats, and so long as there are appropriate interstitial spaces for germination, it is likely that this can continue in areas unaffected by the proposed action. Further, the action could avoid populations and minimise impacts on the ground stratum occupied by these species. Both species also occur across broad extents, most of which would remain unaffected by the proposed action. Therefore, while there is a small chance that some habitats may be modified or destroyed, neither species is likely to decline as a result.
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Both species would be sensitive to invasion by harmful exotic plant species, such as heavy biomass producers. The proposed action has a high potential to introduce these species to previously unaffected patches of remnant native vegetation. These impacts would be minimised and mitigated by strict adherence to environmental management measures such as 'come clean, go clean', not using infected fill, environmental inductions, monitoring and reporting. Threshold triggers and response would form part of a construction and operational management plan. With these proposed measures, the risk of substantially reducing the quality or integrity of the habitats of these two species would be lessened.
introduce disease that may cause the species to decline	No known diseases are likely to be threats to either species. The proposed action is unlikely to introduce a disease that may cause the species to decline.
interfere with the recovery of the species	Without careful management and avoidance, the proposed action could interfere with the recovery of *Leucochrysum albicans* var. *tricolor* through accidental destruction and introduction of pest plants. While *Rutidosis leptorrhynchoides* has not been observed in the proposed action area, accidental destruction, direct clearing, and exotic species could pose a risk to the species' recovery. The proposed action has the flexibility to avoid direct impacts on both species. Therefore, the management of the other threats which have the potential to be introduced by the proposed action is important.

1.3.3.2. Prasophyllum bagoense and P. keltonii

Criterion	Assessment

lead to a long-term decrease in the size of a population	A total of 63 individuals of *Prasophyllum bagoense* were observed during the current survey during 2019 (56 on McPhersons Plains and 7 on Modder Creek Plain). Considering the area searched this number appeared to be relatively low and was likely to have been severely affected by the drier than normal winter/spring/early summer leading up to the survey. Geoff Robertson and Gavin Philips (pers. comm.) both agreed that their surveys, conducted at the same time, yielded far fewer plants than in previous seasons. A total of 25 individuals of *P. keltonii* were observed during the current survey (5 on McPhersons Plains and 20 on Modder Creek Plain). As with *P. bagoense*, the number of flowering plants appeared low relative to previous surveys in the same area (G. Robertson pers. comm., G. Philips pers. comm.). The estimated total population size of P. *bagoense* is difficult to determine as it appears to have a dynamic response to rainfall, grazing and changes in hydrology. The Approved Conservation Advice (TSSC 2012) reported that between 2000 and 2003, 20 to 80 mature plants were observed. However, this declined in to six in 2008 and increased to 30-40 in 2010. Therefore, it is likely that the population found is very significant. Similarly, *P. keltonii* has a fluctuating visible population between 10 and 250 plants and has declined from 400 since about 2004 (TSSC 2014). The proposed action has a small risk that it may lead to the long term decrease in the size of a population of both species. This is because the proposed action could place tower pads or tracks on or near the known habitat. These impacts could be entirely avoidable through design changes and micro siting of infrastructure. There would be no requirement to manage or maintain the habitat for vegetation height clearance, since the existing habitat is treeless.
reduce the area of occupancy (AOO) of the species	The AOO of *P. bagoense* is less than 1 km^2 (TSSC 2012). The AOO of *P. keltonii* is exceptionally small at 1 ha. The proposed action has a small risk that it may reduce the AOO of both species. This is because the proposed action could place tower pads or tracks on or near the known habitat. These impacts could be entirely avoidable through design changes and micro siting of infrastructure. There would be no requirement to manage or maintain the habitat for vegetation height clearance, since the existing habitat is treeless. It is strongly recommended that the habitats are avoided and protected.
fragment an existing population into two or more populations	Both species have an exceptionally restricted range and AOO. Any activity that affects the species' habitats would fragment an existing population, if not remove it altogether. The proposed action could place tower pads or tracks on or near the known habitat. These impacts could be entirely avoidable through design changes and micro siting of infrastructure. There would be no requirement to manage or maintain the habitat for vegetation height clearance, since the existing habitat is treeless. It is strongly recommended that the habitats are avoided and protected.
adversely affect habitat critical to the survival of a species	While neither Conservation Advice for these two species outline habitat critical to the survival of a species, it is very clear that the areas containing the species are the only places in Australia where they occur. Therefore, these areas are habitat critical to the survival of these species. Any activity that affects the species' habitats would adversely affect critical habitats for these species. The proposed action could place tower pads or tracks on or near the known habitat. These impacts could be entirely avoidable through design changes and micro siting of infrastructure. There would be no requirement to manage or maintain the habitat for vegetation height clearance, since the existing habitat is treeless. It is strongly recommended that the habitats are avoided and protected.
disrupt the breeding cycle of a population	The populations of these species are low in number and are in decline. They respond to good rainfall but are adversely affected by grazing, changes to hydrology and weed incursion. The species are both likely to be wasp pollinated. While the proposed action would not necessarily

	affect pollinators, any impacts to the habitats or the populations themselves is likely to disrupt the breeding cycle. This is because: • There are few plants • The areas of occupancy are very small • Flowering and seeding are likely to be dynamic spatially. As above, the proposed action could avoid these species' habitats altogether, thus not affecting the breeding cycle at all.
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed action could place tower pads or tracks on or near the known habitat. These impacts could be entirely avoidable through design changes and micro siting of infrastructure. There would be no requirement to manage or maintain the habitat for vegetation height clearance, since the existing habitat is treeless. It is strongly recommended that the habitats are avoided and protected.
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Both species would be sensitive to invasion by harmful exotic plant species. The proposed action has a high potential to introduce these species to previously unaffected patches of remnant native vegetation. These impacts would be minimised and mitigated by strict adherence to environmental management measures such as 'come clean, go clean', not using infected fill, environmental inductions, monitoring and reporting. Threshold triggers and response would form part of a construction and operational management plan. With these proposed measures, the risk of substantially reducing the quality or integrity of the habitats of these two species would be lessened. However, it is recommended that the proposed action avoids these areas altogether.
introduce disease that may cause the species to decline	Neither species is known to be sensitive to diseases. The proposed action has a low potential to introduce pathogens to previously unaffected patches of remnant native vegetation. These impacts would be minimised and mitigated by strict adherence to environmental management measures such as 'come clean, go clean', not using infected fill, environmental inductions, monitoring and reporting. Threshold triggers and response would form part of a construction and operational management plan. However, it is recommended that the proposed action avoids areas of *P. bagoense* and *P. keltonii* habitat altogether.
interfere with the recovery of the species	If the proposed action cannot avoid the habitats of *P. bagoense* and *P. keltonii*, it is very likely that it would interfere with the recovery of these two critically endangered species.

1.3.3.3. Swift Parrot

Criterion	Assessment
lead to a long-term decrease in the size of a population	The Swift Parrot has not been observed in the proposed action area during surveys between 2021 and 2022. The Swift Parrot breeds in Tasmania and migrates to the mainland during winter, where the range extends from eastern South Australia, across most of Victoria, the entire ACT, the eastern third of NSW and into south-east Queensland (Saunders and Tzaros 2011). The species forms a single migratory population of no more than 1,000 pairs (Saunders et al 2010). Key foraging species in NSW include *Eucalyptus sideroxylon, E. microcarpa, E. albens* and *E. melliodora*. Larger, mature specimens of these species are more likely to be used for foraging than younger plants. The proposed action would remove these eucalypt species where the alignment intersects, particularly in the Box-Gum Woodlands. About 1861.72 ha of Box-Gum Woodland is estimated to be in the proposed action area and would be affected. No priority areas for Swift Parrot have been identified for NSW in the Approved National Recovery Plan (Saunders and Tzaros 2011). Across the species' distribution, there are numerous priority sites and vegetation types that would be important to maintaining the population size.

	It is unclear how much preferred habitat remains and spatially where it is arranged. It is unlikely given the range of sites and communities, that the removal of this amount of potential foraging habitat would lead to a long term decrease in the population, but given the uncertainties, and the small population size there is a chance that this may occur. This is further compounded by the species generally only using about five sites per year (TSSC 2016b) and in response to dynamic flowering events.
reduce the area of occupancy of the species	Area of occupancy is dynamic, and varies spatially and temporally, depending on flower production near suitable nesting trees. While the proposed action would not affect breeding areas, it is likely to reduce the area of occupancy where the Box-Gum community is removed. The area of occupancy is relatively restricted and exceptionally dynamic (TSSC 2016b). Therefore, there is a chance that the proposed action would reduce the area of occupancy of this species.
fragment an existing population into two or more populations	The entire species forms one population. There is little chance the proposed action would sever the population into two or more populations. The nature of the proposed action (long linear infrastructure) is unlikely to permanently sever habitat in a way that would result in two or more populations. This is because the species would be able to move across the areas affected by the proposed action and unlikely to restrict movement of genetic material for this parrot in the landscape. The proposed action would not affect breeding habitat.
adversely affect habitat critical to the survival of a species	The National Recovery Plan for the Swift Parrot identifies habitat critical to the species' survival as: Habitat critical to the survival of the Swift Parrot includes; those areas of priority habitat for which the Swift Parrot has a level of site fidelity or possess phenological characteristics likely to be of importance to the Swift Parrot, or are otherwise identified by the recovery team. The Plan does not explicitly identify any sites of priority habitat or of high site fidelity.
disrupt the breeding cycle of a population	The proposed action does not affect breeding habitat for this species.
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Key foraging species in NSW include *Eucalyptus sideroxylon, E. microcarpa, E. albens* and *E. melliodora.* Larger, mature specimens of these trees are more likely to be used for foraging than younger plants. The proposed action would remove these species where the alignment intersects, particularly in the Box-Gum Woodlands. About 1861.72 ha of Box-Gum Woodland is estimated to be in the proposed action area and would be affected. Across the species' distribution, there are numerous priority sites and vegetation types that would be important to maintaining the population size. It is unclear how much preferred habitat remains and spatially where it is arranged. It is unlikely given the range of sites and communities, that the removal of this amount of potential foraging habitat would lead to a long term decrease in the population, but given the uncertainties, and the small population size there is a chance that this may occur. This is further compounded by the species generally only using about five sites per year (TSSC 2016b).
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Competition from a range of species from feral bees to Sugar Gliders is listed as a threat to the Swift Parrot (Saunders and Tzaros 2011). The proposed action is not likely to result in increases in: • Bees • Sugar Gliders • Noisy Miner or Rainbow Lorikeets • European Starlings.

introduce disease that may cause the species to decline	Psittacine Beak and Feather Disease (PBFD) is a deadly disease that naturally occurs in parrot populations. Of note is the prevalence of PBFD in parrots / birds that are injured, rehabilitated and release back into the wild. There is a chance that these released birds could interact with the Swift Parrot. The proposed action is unlikely to introduce this disease given it exists in the wild and cannot be controlled by the proposed action.
interfere with the recovery of the species	The proposed action is likely to affect some habitat for this species in its area of distribution. The design would be refined to minimise and avoid impacts where practicable. While some of the results of the proposed action are listed as threats to the species, the action is not likely to interfere with the recovery of the species in its entirety.

1.3.3.4. Golden Sun Moth

Criterion	Assessment
lead to a long-term decrease in the size of a population	The Golden Sun Moth's NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. There are no records of these species within the proposal study area however they are known from the wider locality and occupy grassy woodlands and native grasslands. The proposed action has a small risk that it may lead to the long-term decrease in the size of a population this species. This is because the proposed action could place tower pads or tracks on or near known habitat. These impacts could be entirely avoidable through design changes and micro siting of infrastructure. There would be no requirement to manage or maintain the habitat for vegetation height clearance, since the habitat is largely treeless. It would be possible to retain habitat patches and minimise impacts on those patches through fencing and buffers. If the proposed action cannot avoid the Golden Sun Moth's habitat, then there is a chance that the action could lead to a long-term decrease in the size of a population.
reduce the area of occupancy of the species	In 2002 the extent of occurrence was estimated to be approximately 13 100 km², and the area of occupancy was estimated to be approximately 8.8 km² at that time (TSSC 2013). While it could be possible to avoid the Golden Sun Moth's habitat entirely, there is a chance that the proposed action may affect potential habitat. If this were the case, then the already small area of occupancy would be reduced.
fragment an existing population into two or more populations	The proposed action has a small risk that it may fragment a population. This is because the proposed action could place tower pads or tracks on or near potential habitat. These impacts could be entirely avoidable through design changes and micro siting of infrastructure. There would be no requirement to manage or maintain the habitat for vegetation height clearance, since the habitat is largely treeless. It would be possible to retain habitat patches and minimise impacts on those patches through fencing and buffers. Further, gaps or barriers in habitat of over 200 m are considered to limit dispersal. The proposed action is not likely to introduce barriers or gaps in habitat this wide. The proposed width would be up to 70 m.
adversely affect habitat critical to the survival of a species	Habitat critical to the survival of the species has not been defined. However, given that there are few known sites, these at least would be important, if not critical to the survival of the Golden Sun Moth. The proposed action area does not include any known sites between Yass and Boorowa. The proposed action could place tower pads or tracks on or near potential habitat. These impacts could be entirely avoidable through design changes and micro siting of infrastructure. There would be no requirement to manage or maintain the habitat for vegetation height clearance, since the habitat is largely treeless. It would be possible to retain habitat patches and minimise impacts on those patches through fencing and buffers. It would be possible to avoid habitat critical to the survival of the Golden Sun Moth.

disrupt the breeding cycle of a population	Disruption to the breeding cycle could happen if disturbance to flying males, laying females, deposited eggs or larvae occurred. Additionally, shading of known breeding locations would disrupt breeding because males do not fly in shade. The proposed action could place tower pads or tracks on or near potential habitat. These impacts could be entirely avoidable through design changes and micro siting of infrastructure. There would be no requirement to manage or maintain the habitat for vegetation height clearance, since the habitat is largely treeless. It would be possible to retain habitat patches and minimise impacts on those patches through fencing and buffers. The proposed action does not contain any known populations or known habitat for the Golden Sun Moth.
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed action could place tower pads or tracks on or near potential habitat. These impacts could be entirely avoidable through design changes and micro siting of infrastructure. There would be no requirement to manage or maintain the habitat for vegetation height clearance, since the habitat is largely treeless. It would be possible to retain habitat patches and minimise impacts on those patches through fencing and buffers. The proposed action does not contain any known populations or known habitat for the Golden Sun Moth. If the proposed action placed tower pads or access tracks through known habitat, habitat would be modified or destroyed. Depending on the spatial arrangement and the density of the habitat, the proposed action could result in the decline of this species.
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	The introduction of exotic grasses and other pasture species is a threat to the Golden Sun Moth. There have been reports that larvae have been found feeding on Chilean Needle Grass (TSSC 2013), however this is not likely to be superior habitat compared with native grasslands. The proposed action has a high potential to introduce exotic species to previously unaffected patches of remnant native vegetation. These impacts would be minimised and mitigated by strict adherence to environmental management measures such as 'come clean, go clean', not using infected fill, environmental inductions, monitoring and reporting. Threshold triggers and response would form part of a construction and operational management plan. With these proposed measures, the risk of substantially reducing the quality or integrity of the habitats of the Golden Sun Moth would be lessened. However, it is recommended that the proposed action avoids potential habitat altogether. While not necessarily all invasive, Golden Sun Moth are predated upon by birds and insects. The proposed action is unlikely to increase densities of these birds or insects, and should aim to avoid constructing structures on or near Golden Sun Moth habitat that encourages perching predatory birds.
introduce disease that may cause the species to decline	The Golden Sun Moth is not known to be sensitive to diseases. The proposed action has a low potential to introduce pathogens to previously unaffected patches of remnant native vegetation. These impacts would be minimised and mitigated by strict adherence to environmental management measures such as 'come clean, go clean', not using infected fill, environmental inductions, monitoring and reporting. Threshold triggers and response would form part of a construction and operational management plan. However, it is recommended that the proposed action avoids areas of Golden Sun Moth habitat altogether.
interfere with the recovery of the species	There is no Approved Recovery Plan for the Golden Sun Moth. One of the chief threats to the species is loss and degradation of habitat, therefore and action that removes or degrades habitat would be at odds with the species' recovery. The proposed action could place tower pads or tracks on or near potential habitat. These impacts could be entirely avoidable through design changes and micro siting of infrastructure. There would be no requirement to manage or maintain the habitat for vegetation height clearance, since the habitat is largely treeless. It would be possible to retain habitat patches and minimise impacts on those patches through fencing and buffers. The proposed action does not contain any known populations or known habitat for the Golden Sun Moth.

1.3.3.5. Koala

Criterion	Assessment
Lead to a long-term decrease in the size of a population	In NSW, koalas mainly live on the central and north coasts, with some populations west of the Great Dividing Range, on the south coast and on the southern tablelands. Most populations live in isolated habitats and many areas in which koalas are most abundant are subject to intense pressures. Surveys in NSW indicate that since 1949, populations of koalas have been lost from many localities. During the 2019-2020 bushfire season an estimated 9 percent (>36,800 km2) of the koala's distribution was impacted by fire (DAWE 2021). Most populations in NSW now survive in fragmented and isolated habitat and many of the areas in which koalas are most abundant are subject to intense and ongoing pressures (DPE 2022). As of 12 February 2022, the Koala is listed as Endangered under the EPBC Act. Koalas are reported to utilise more than 400 different species of tree for their food and habitat requirements with different tree species varying by habitat type and location across their range. Primary food species differ across habitats and may be as few as two at a particular location (Melzer *et al.* 2000; Tucker *et al.* 2008; Kjeldsen *et al.* 2019). Koala browsing preferences show regional differences which are influenced by the chemical profiles and water content of different target food leaves. There is both intra- and inter-species variability in the palatability and nutritional value of the leaves of their preferred food trees. Their specialist dietary requirements determine their potential habitat and range distributions (Moore & Foley 2005; Moore *et al.* 2010). The proposed action area extends over the Central and Southern Tablelands and Far West Koala Management Areas (KMA), and Koala records are found in all cardinal directions of the disturbance footprint (in the last 20 years there has been 1457 sightings with 20 kilometres), however, sightings are mostly concentrated towards the north-east portion of the study area (Bungonia State Conservation Area). The occurrence of Koala feed tree species as listed by the SEPP (Koala Habitat Protection) 2021 is prevalent throughout the disturbance footprint including preferred species such as White Box (*Eucalyptus albens*), Blakely's Red Gum (*Eucalyptus blakelyi*), Brittle Gum (*Eucalyptus mannifera*), Ribbon Gum (*Eucalyptus viminalis*). Followed by high use trees such as Inland Scribbly Gum (*Eucalyptus rossii),* and significant use trees; Mountain Gum (*Eucalyptus dalrympleana*), and Broad-leaved Peppermint (*Eucalyptus dives*). Habitat to be removed within the proposed disturbance footprint is subject to varying degrees of disturbance and varied conditions. The proposed action would require the removal of portions of Koala use trees where the disturbance footprint alignment intersects. About 1861.72 ha of native vegetation (including Koala use trees) is estimated to occur within the proposed action area with the extent of clearing yet to be determined. The extent of clearing to be carried out is expected to be significantly less than the area proposed in the referral, as the footprint is refined and assumptions related to actual vegetation clearance are confirmed. Areas of regional koala significance (ARKS) use the information on koala occurrence to identify key koala populations and management areas with potential long-term viability. No ARKS intersect the disturbance footprint; the closest ARKS is located in Bungonia (40 km due east of the northern portion of the disturbance footprint). Portions of the disturbance footprint connect to large intact continuous habitat (managed native forests), providing continuous habitat within the broader locality. The proposal is considered to have some potential to lead to a long-term decrease in the local population based on overall carrying capacity as determined by the availability of feed trees. The likelihood of decline based on loss of feed trees will be better determined once the extent of clearing is defined with due consideration of available avoidance measures.
Reduce the area of occupancy of the species	Up to 1861.72 ha of native vegetation may be cleared or modified representing potential Koala habitat used as breeding, sheltering, foraging and dispersal habitat. Given the linear nature of the development and concentration of clearing within already predominantly cleared

	paddocks it appears unlikely that the proposal would reduce the area of occupancy for the Koala.
fragment an existing population into two or more populations	The proposal will increase fragmentation of remnants, through the removal of native vegetation for the proposed transmission line and associated infrastructure. The increase in fragmentation may influence Koala movement and habitat use throughout the regions however the extent of impact in this regard is likely to be limited given no hard barriers to Koala movement would be introduced from the proposal. Therefore, the proposal is unlikely to fragment existing known populations. Movement and connectivity on either side of the disturbance footprint are retained by riparian corridors, smaller remnants, paddock trees and nearby larger areas of intact, contiguous vegetation in the wider locality (e.g. Belanglo State Forest, Bungonia State Conservation Area, Tarlo River National Park, Bannaby, Black Arm Nature Reserve, Mundoonen Nature Reserve, Bango Nature Reserve, Bungongo State Forest, Red Hill State Forest, Billlapaloola State Forest, Tumut State Forest, Bago State Forest, Kosciusko National Park, Ellerslie Nature Reserve).
adversely affect habitat critical to the survival of a species	As defined in the conservation advice for Koala, habitat critical to the survival of the species is defined as the areas that the species relies on to avoid or halt decline and promote the recovery of the species (DAWE 2022). Given that records of the species are found in all cardinal directions of the disturbance footprint, all native vegetation within the disturbance footprint is considered habitat critical to the survival of the species. Native vegetation will be partially cleared to accommodate the development, and up to 1861.72 ha of critical habitat will be modified. Therefore, the proposal is likely to adversely impact habitat critical to the survival of the species. The extent of clearing to be carried out is expected to be significantly less than the area proposed in the referral, as the footprint is refined and assumptions related to actual vegetation clearance are confirmed.
disrupt the breeding cycle of a population	Individuals within the disturbance footprint and immediate surrounds are part of the 'Genetically important population' of south of the Sydney Basin to approximately the New South Wales /Victorian boarder (DAWE 2022). Koalas may not breed every year if conditions are unfavourable, and breeding can be unsuccessful due to poor body condition or disease (e.g. Chlamydia) (DAWE 2022). For an individual koala, these resources include access to sufficient quality food and shelter trees to meet their daily energetic requirements and reproductive needs, and a place to avoid predators. Large intact areas to the north-east of the disturbance footprint, towards Bungonia State Conservation Area is likely to support an increased number of breeding individuals (high abundance of recent records). Whereas sections of the disturbance footprint towards the south (Tumut) and west (Wagga Wagga), have fewer recent records. Low-density populations are known to occur in these areas, as habitats are fragmented, and this has resulted in a patchy distribution of koalas across their range with significant numbers occurring on privately owned land (Melzer et al. 2000; Lunney et al. 2009; TSSC 2012). Crucial habitat elements include patches and corridors for gene flow. Over longer-time frames habitat critical to survival includes climate refugia such as drainage lines, riparian zones and patches that are resilient to drying conditions due to favourable hydrological systems.
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Koala has been recently observed (in the last 20 years) mostly near Bungonia State Conservation Area (highest number of records), Mundoonen Nature Reserve (near Jarrawa) and Kapooka (near Wagga Wagga). The proposed action would result in the clearing of known and potential habitat, including koala use trees (used for sheltering, dispersal, foraging and potentially breeding). It is noted that the disturbance footprint does not directly impact on any of these conservation areas or reserves. The species is known to use paddock trees and small remnants to move between patches, however, clearing of native vegetation has the potential increases the risk of overbrowsing (overuse of trees leading to defoliation), disease, predation, vehicle strike and altered movement corridors. The proposed action would remove some, but not all crucial habitat elements for Koala, and is unlikely to substantially fragment movement/dispersal corridors. This proposed action would not affect the entire species'

	distribution and impacts from the proposal are distributed throughout a large area. Therefore, while the proposed action would modify, destroy and remove habitat, this is unlikely to cause the species to decline.
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	The proposal will not result in the establishment of invasive species.
introduce disease that may cause the species to decline	Diseases that currently impact koala populations include Koala retrovirus (KoRV) and Chlamydia (*Chlamydia pecorum*). Wild populations carry disease pathogens. Inadvertent spread of disease also occurred historically following koala translocations. The prevalence of disease (chlamydiosis) has been found to increase following extreme stress from hot weather, drought, habitat loss and fragmentation (Lunney *et al.* 2012; Davies *et al*. 2013). It is unlikely, the removal/modification of habitat as a result of the proposal, would increase the risk of chlamydiosis. *Phytophthora cinnamomi* is known to affect the health of eucalypts. While this fungus does not directly affect the Koala, infestation of a forest may damage habitat important to the species. Management of this and other pathogens will be important in minimising impacts on the habitat for the Koala. The proposed action has a low potential to introduce pathogens to previously unaffected patches of remnant native vegetation. These impacts would be minimised and mitigated by strict adherence to environmental management measures such as 'come clean, go clean', not using infected fill, environmental inductions, monitoring and reporting. Threshold triggers and response would form part of a construction and operational management plan.
interfere with the recovery of the species	There is no Approved Recovery Plan for the Koala under EPBC Act. Main actions to recover the species include reducing clearing, habitat restoration, avoiding fragmentation or isolation of Koala habitat. The proposed action has the potential for clearing in native forests and to remove important habitat and increase fragmentation. These effects would be greatest at the local level and would not affect the species across its entire range.

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