Gunnedah Solar Farm
Flora Assessment

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Prepared for:	Gunnedah Solar Farm Pty Ltd
Client representative:	Robert Ibrahim
Date:	8 February 2018 Rev01

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1. Introduction

pitt&sherry was commissioned by Gunnedah Solar Farm Pty Ltd (GSF) to undertake a flora survey and assessment as part of the preparation of an environmental impact statement (EIS) in relation to a proposed solar farm at Gunendah, NSW. The subject site is approximately 692 hectares and is currently used for agriculture, specifically cropping (irrigated cotton, wheat and chick pea). The preliminary concept design for the solar farm would occupy approximately 304 hectares out of the total 795 hectare site area (equivalent to approximately 38% of the total areal site extent) with the remaining land retaining its existing agricultural landuse. The reader is referred to the EIS for a full description of the proposal.

The objective of the flora assessment was to:

- Identify and map native plant community types (PCTs) listed under the Bionet Vegetation Classification Database and assess the conservation value of any identified native PCTs against endangered and critically endangered ecological communities (EECs/CEECs) listed under the NSW *Biodiversity Conservation Act* 2016 (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act);
- Search for Threatened flora species listed under the BC and EPBC Acts considered as possible occurrences within remnant native vegetation stands on the Site; and
- Assess impacts to Threatened Ecological Communities (TECs) and flora species recorded on the subject lands in accordance with the Part 7 test of significance (BC Act) and EPBC impact assessment criteria (as well as for any additional Matters of National Environmental Significance identified in the study area); and
- Provide recommendations to mitigate any predicted adverse impacts on flora.

It is noted that the SEARs issued for the proposal requires that the Framework for Biodiversity Assessment (FBA 2014) be used to assess all biodiversity values for the project. The FBA (2014) requires that biodiversity attributes be recorded through the conduct of biometric plots using the biobanking assessment methodology (BBAM 2014) with survey data subsequently run through the biobank credit calculator to determine offset requirements where biodiversity habitats are proposed for removal. The FBA also requires that a Biodiversity Assessment Report (BAR) be prepared as part of the EIS and is to include:

1. The methods and results of the biobank assessment (major projects site based development module) including all data that has been entered into the credit calculator;
2. An assessment of direct and indirect impacts on PCTs, TECs and Threatened flora as well as a suite of measures to mitigate predicted adverse impacts to flora; and
3. A Biodiversity Offset Strategy (BOS) detailing how the offset requirements outlined in Section 1 of the BAR would be met.

Given that the proposal does not involve the removal of remnant native vegetation stands on the Site and given the absence of any predicted indirect impacts to retained native vegetation (via the establishment of nominated buffers), an FBA/BBAM (2014) assessment was not undertaken nor a BAR prepared. Rather, a 'traditional' flora survey and assessment report has been prepared. This approach was confirmed as being adequate by telephone discussion with OEH contact Liz Mazzer on 9 November 2017.

2. Environmental Setting

The subject site is located on the Liverpool Plains, approximately 8.5km to the north-east of Gunnedah township and 1 km to the north of the Namoi River (refer Figure 1). The site is described as 765 Orange Grive Road, Gunnedah, contained within Lot 1 DP 1202625, Lot 153 DP 754954, Lot 264 DP 754954, Lot 2 DP 801762, Lot 151 DP 754954 and part of Lot 1 DP 186590 (the "Site").

The Site lies within the eastern portion of the Brigalow Belt South Bioregion (near its transition to the Nandewar Bioregon to the east), within the Liverpool Plains IBRA subregion and within the Gunnedah Shire Council LGA. The Site is situated on the floodplain of the Namoi River, with the topography being relatively flat, gradually grading upslope from south to the north where the adjoining properties run into the lower foot slopes and ridge country. Locally, the site is situated between the riparian woodlands of the Namoi River and the eucalypt forests and woodlands associated with the rocky ridge country to the north.

The Site is mapped as being underlain with the Burburgate soil landscape grouping, comprising extensive, broad, level alluvial plains and floodplains of the Namoi River on the Liverpool Plains, extending from west of Carroll past Gunnedah and downstream to Boggabri. Plain areas are dominated by giant, moderately well-drained self-mulching brown vertosols (brown clays) or giant, poorly drained brown chromosols (red-brown earths) or giant, imperfectly drained self-mulching red vertosols (red clays). This is generally consistent with site observations of topsoils being self-mulching clays or clay loams.

3. Methodology

pitt&sherry undertook the following scope of works for the project:

- A desktop assessment of relevant spatial ecological datasets (e.g. Namoi regional vegetation mapping, Bionet Atlas search, EPBC Protected Matters Search) to assist in identifying vegetation communities mapped for the study area as well as locations of Threated flora species that have been previously recorded in the Gunnedah locality;
- A site walkover within 2 remnant native vegetation stands situated in Fields B7a and B9 by **pitt&sherry** Senior Consultant David Pritchard on 26 October 2017 over a 4 hour period in fine and windy conditions. This was supplemented with a Biodiversity Assessment Method (BAM 2017) plot within a small remnant stand between Field's B1a and B1b as well a single rapid data point (RDP) within the remnant stand in Field B7a on 18-19 January 2017 by **pitt&sherry** Botanist, Isaac Mamott, in sunny and hot conditions over a 4 hour period. The BAM plot comprised a 20 metre x 20 metre (0.04 hectare) quadrat nested within a 20 metre x 50 metre (0.1 hectare) plot bisected with a 50 metre straight line transect to record full floristics (with cover and abundance values), stem DBH counts, litter cover, length of fallen logs and tree hollows. The RDP comprised a survey of the dominant floristics of all woodland strata at an arbitrary point within the remnant stand to assist in the validation of vegetation community mapping; and
- Preparation of a survey and assessment report detailing the methods and results of the desktop review and field survey, along with an impact assessment and outline of mitigation measures. Remnant stands of vegetation along with the proposed development footprint were mapped using arcmap 10.3 (ESRI DesktopGIS) by **pitt&sherry** Botanist, Isaac Mamott.

4. Results

4.1 Database Search Results

A search of the Bionet Wildlife database found 7 threatened flora species (comprising a total of 146 records) listed under the BC Act, previously recorded within the Gunnedah LGA.

A search of the EPBC Act Protected Matters database found that there were 3 wetlands of international importance, 6 listed Threatened Ecological Communities and 10 listed Threatened flora species recorded or potentially occurring within a 20km radius from the study area.

None of those listed wetlands, Threatened flora species and ecological communities (as well as other MNES) identified in the Bionet and EPBC searches that were considered as possible occurrences on the subject site were assessed as having a significant impact as a result of the proposal. The reader is referred to the impact assessment below (Section 5).

The desktop search results are provided as **Appendix A**.

4.2 Native Vegetation and PCT Identification

The subject site is utilised as cropping lands, sown at the time of inspection with wheat, cotton and chickpeas, as well as being serviced by an extensive network of irrigation and drainage channels. As such, the subject site is largely devoid of native vegetation with only small, isolated stands of remnant vegetation recorded as described below.

A total of 2 native vegetation communities were recorded on the Site, these being:

1. River Red Gum (*Eucalyptus camaldulensis*) – Yellow Box (*Eucalyptus melliodora*) Dry Sclerophyll Woodland/Open Woodland; and
2. Bimble Box (*Eucalyptus populnea* subsp. *bimbil*) Dry Sclerophyll Open Woodland.

A description of the 2 remnant vegetation communities recorded is provided below.

Vegetation Community No. 1 River Red Gum (*Eucalyptus camaldulensis*) – Yellow Box (*Eucalyptus melliodora*) Dry Sclerophyll Woodland/Open Woodland

Table 1 Structure and Floristics Summary

Strata	Height (m)	% Cover	Floristics (20 x 20 nested plot)
Upper (Tree)	8-10	30	*Eucalyptus camaldulensis, Eucalyptus melliodora*
Mid (Small tree, shrub)	2-6	5	*Geijera parviflora, Cassinia quinquefaria, Lycium ferocissimum**
Ground (tree/shrub saplings and seedlings, grasses, forbs)	1	70	*Sclerolaena muricata, Einadia trigonos, Aristida ramosa, Austrostipa verticillata, Chloris truncata, Rytidosperma bipartitum, Boerhavia dominii, Avena sp.*, Lepidium africanum*, Digitaria sp., Bromus catharticus**

*= exotic taxon

Occurrence – Recorded as 2 small, isolated open woodland remnant stands in the north-west of the Site within Fields B7a and B9 and as an isolated stand in the north-western corner of the 'Front Paddock' on alluvial flats on clays and clay loams. Also recorded as a linear remnant within the road reserve outside the southern boundary of the Site (northern side of Orange Grove Road) and as a single row along the western boundary of the 'Front Paddock' (probably as plantings). The total areal extent of this vegetation community on the Site (excluding the road reserve and row of plantings) is approximately 5 hectares.

Condition - The upper strata was generally suffering moderate to severe levels of dieback (ie. defoliation) although was showing evidence of resprouting in places. The community supported a partially intact understorey with a mosaic of native grasses and forbs amongst a suite of exotic pasture grasses and forbs. Native mid strata was sparse and was being invaded by the exotic African Boxthorn (*Lycium ferocissimum*) particularly in Field's B7a and B9.

Best fit/Equivalent PCT – PCTID 78 River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion.

Equivalent TECs – Not considered to be analogous to any BC/EPBC Act-listed TECs. The Hunter region *Eucalyptus camaldulensis* Endangered population listed under the BC Act does not have a distribution outside the Hunter catchment and is not considered to be representative of this community at Gunnedah.

Threatened Flora Species Recorded– Nil.

Vegetation Community No. 2 - Bimble Box (*Eucalyptus populnea* subsp. *bimbil*) Dry Sclerophyll Open Woodland

Table 1 Structure and Floristics Summary

Strata	Height (m)	% Cover	Floristics (20 x 20 nested plot)
Upper (Tree)	8-10	5-10	*Eucalyptus populnea* subsp. *bimbil*
Ground (tree/shrub saplings and seedlings, grasses, forbs)	1	80	*Sclerolaena muricata, Einadia trigonos, Austrostipa verticillata, Rytidosperma bipartitum, Boerhavia dominii, Avena fatua*, Triticum sp.*, Rumex crispus, Vittadinia sulcata, Paspalidium sp., Bromus catharticus*, Polygonum aviculare**

*= exotic taxon

Occurrence – recorded as a small, isolated open woodland remnant between Fields B1a and B1b on alluvial flats on clays and clay loams. The total areal extent of this vegetation community on the Site is approximately 0.83 hectares.

Community - The community supported a total of 15 widely spaced remnant trees with an absent mid stratum and a predominantly exotic groundcover dominated by wheat and oats which are cropped amongst the stand of trees.

Best fit/Equivalent PCT – PCTID 101 Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion **and/or** PCTID Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).

Equivalent TECs – Considered to be analagous to the following 3 EEC listings under the BC Act:

- Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions;
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions; and
- Native Vegetation on Cracking Clay Soils of Liverpool Plains EEC listings under the BC Act.

The community is not considered to be analagous to the following 3 EPBC-listed TECs as the community recorded on the Site does not meet the condition thresholds prescribed in the listings due to the degree of understorey disturbance and/or size of the remnant (even though floristics, soils and landscape features match that of the listings):

- Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland;
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia; and
- Poplar Box Grassy Woodland on Alluvial Plains (Draft EEC).

Threatened Flora Species Recorded– Nil.

A vegetation and field map is provided as **Appendix B**. A photographic record of site vegetation is provided as **Appendix C**.

4.3 Threatened Flora Habitat Assessment

A habitat assessment for the following 7 BC Act-listed Threatened flora species identified in the Bionet search is provided below.

- *Tylophora linearis* (90 records from Tinkey SCA, Breeza and Doona State Forests in dry woodlands of *Eucalyptus fibrosa, Eucalyptus sideroxylon, Eucalyptus albens, Callitris endlicheri, Callitris glaucophylla* and *Allocasuarina luehmannii*, as well as Acacia scrub. Preferred habitat not present – low likelihood of occurrence, listed as Vulnerable under BC Act;
- *Commersonia procumbens* (2 records from Tinkey SCA in *Eucalyptus dealbata* and *Eucalyptus sideroxylon* communities, *Melaleuca uncinata* scrub, under mallee eucalypts with a *Calytrix tetragona* understorey, and in recently burnt Ironbark and Callitris communities on sand. Preferred habitat not present – low likelihood of occurrence, listed as Vulnerable under BC Act. More likely to occur on the Kelvin Range to the north of the Site;
- *Dichanthium setosum* (9 records from Breeza State Forest and roadside woodland/derived grassland west of Breeza SF, in grassy roadside remnants and disturbed pasture on basaltic black soils and red brown loams. Habitat present – moderate likelihood of occurrence, listed as Vulnerable under the BC Act.
- *Digitaria porrecta* (33 records scattered throughout the Gunnedah LGA mostly confined to roadside and rail easement grasslands and grassy woodlands with an intact native groundcover, mostly in White Box and Myall woodland vegetation types. Preferred habitat not present – low likelihood of occurrence, listed as Endangered under the BC Act;
- *Homopholis belsonii* (4 records from Vickery State Forest in Belah Woodland and on alluvial clays, with preferred habitat not well known. Considered a low to moderate likelihood of occurrence, listed as Endangered under the BC Act.
- *Hakea pulvinifera* (5 records from Lake Keepit on a rocky hillside, with associate species including *Alstonia constricta* and Acacia decora. Preferred habitat not present – low likelihood of occurrence, listed as Endangered under the BC Act;
- *Cadellia pentastylis* (3 records from forested slopes SW of Gunnedah, typically in White Box/Grey Box/Ironbark/Cypress Pine Woodlands. Preferred habitat not present – low likelihood of occurrence, listed as Vulnerable (as an individual species) and an EEC (as a community) under the BC Act.

Based on the above, 2 of the 7 Threatened flora species are considered as possible occurrences in native woodland remnants on the site (having at least a moderate likelihood of occurrence), these being *Dichanthium setosum* and *Homopholis belsonii* (both species are native grasses).

5. Impact Assessment

5.1 Part 7 Assessment (5 Part Test)

An impact assessment under Part 7 of the BC Act (referred to as the 5 part test of significance) has been undertaken for the following suite of BC Act-listed Threatened species and ecological communities (subject species and communities) recorded or predicted to occur in the study area that have the potential to be impacted upon as a result of the proposed works.

Endangered Ecological Communities

Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions.

Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions; and

Native Vegetation on Cracking Clay Soils of Liverpool Plains EEC listings under the BC Act.

Flora

Dichanthium setosum
Homopholis belsonii

The Part 7 assessment prepared below is based on our understanding of the proposal, which, at present, avoids the need to disturb or remove any of the remnant native vegetation stands on the subject site. The assessment has been prepared in accordance with the Threatened Species Assessment Guidelines (DECC 2007), which defines key terms used in the assessment, including 'viable', 'local occurrence', 'local population', and 'risk of extinction'. Life cycle characteristics of the subject species and communities included in this assessment are derived from the OEH Threatened Species website and are not reproduced here.

a. In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction;

Neither of the subject species were recorded on the subject site as part of the flora survey. The proposal will not result in the loss of potential habitats for any of the subject species and thus would not place a viable local population of these taxa at risk of extinction.

b. In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

a. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

The subject EECs recorded as part of the flora survey would be retained and protected as part of the proposal (via the establishment of buffers) and thus their local occurrence would not be expected to be placed at risk of extinction. It should also be noted that the native woodland remnants on the site are exhibiting a high degree of suspected stress-induced dieback which is expected to be impacting upon their long-term viability.

b. Or, is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;

Refer (b)i.

c. In relation to the habitat of a Threatened species or ecological community:

a. The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity.

As per (a) and (b)i.

b. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity,

The proposal would not be expected to contribute to further fragmentation or isolation of the already highly isolated woodland remnants on the subject site (which occur amidst a sea of agricultural lands).

c. The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

Given the small areal extent of the remnant stands, their degree of isolation and poor health and low viability, it is unlikely that these habitats are 'important' for the long term survival of the subject species.

d. Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly);

There are no declared areas of outstanding biodiversity value listed under the BC Regulation 2017 that would be impacted upon as a result of the proposal.

e. Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The BC Act defines a 'key threatening process' as 'a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities'. Schedule 4 of the BC Act 2016 provides a list of the 'key threatening processes' (KTP). One KTP listed can be considered relevant to the proposal and are addressed below.

Clearing of native vegetation

The proposal will not result in the removal of any stands of remnant native vegetation and thus would not contribute to this KTP.

Part 7 Assessment Conclusion

In light of the consideration of the above 5 factors, it is our opinion that the proposal is not expected to have "a significant effect" on the subject species and communities and thus the preparation of a Species Impact Statement is not deemed to be required.

5.2 EPBC Assessment

An EPBC Assessment was undertaken for the current proposal and is provided below. The assessment has been undertaken in accordance with the Commonwealth Significant Impact Assessment Guidelines (DoE 2013) which lists a suite of significant impact criteria to assist in

determining whether there is likely to be a significant impact on Matters of National Environmental Significance (MNES) and thus whether a referral to the Commonwealth DoEE is required.

An EPBC Act Protected Matters report was generated using the EPBC Protected Matters Search Tool on the Commonwealth Department of the Environment and Energy website (http://www.environment.gov.au/webgis-framework/apps/pmst/pmst.jsf) based on a 20km buffer search centered on the study area.
The Protected Matters report (2017) yielded the following search results listed below in Table 1:

Table 1 - EPBC Protected Matters Search Tool Results

MNES	Number of MNES identified within a 20km buffer from subject site
World Heritage Properties	None
National Heritage Places	None
Wetlands of International Importance	3
Great Barrier Reef Marine Park	None
Commonwealth Marine Area	None
Listed Threatened Ecological Communities	6
Listed Threatened Flora Species	10

Based on the search results, the proposal would not impact upon any world heritage properties, national heritage places, Commonwealth marine areas nor the Great Barrier Reef Marine Park given their absence in the vicinity of the subject site. Remaining MNES are address below.

Wetland of International Importance

An action is likely to have a significant impact on the ecological character of a declared Ramsar wetland if there is a real chance or possibility that it will result in:

- Areas of the wetland being destroyed or substantially modified;
- A substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration, and frequency of ground and surface water flows to and within the wetland;
- The habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected;
- A substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health, or
- An invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.

The EPBC PMS report lists the following 3 RAMSAR wetlands and their distances to the site:

- Banrock station wetland complex (900-1000km upstream);
- Riverland (900-1000 km upstream); and
- The coorong and lakes alexandrina and albert wetland (1000-1200km).

None of these 3 wetlands would be expected to be impacted by the proposal.

Threatened Ecological Communities (TECs)

The Protected Matters report lists the following 7 TECs that may occur or are likely to occur within the 20km buffer search area:

1. Coolibah-Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions (Endangered - community may occur within area);
2. Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of south-eastern Australia (Endangered - community likely to occur in area);
3. Natural grasslands on basalt and fine textured alluvial plains of northern NSW and southern Qld (Critically Endangered – community likely to occur in area);
4. New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands (Critically Endangered – community may occur in area);
5. Weeping Myall Woodlands (Endangered – community likely to occur in area); and
6. White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered – community likely to occur in area).

A seventh EPBC listing, this being the Draft Poplar Box Grassy Woodland on Alluvial Plains EEC, was not identified in the search report but is considered relevant to the proposal.

Remnant native vegetation stands on the subject site are considered to be representative of TEC no's 2,3 and the Draft Poplar Box Grassy Woodland on Alluvial Plains EEC and would be retained and protected as part of the proposal. The native vegetation stands are highly disturbed with an exotic mid-storey and groundcover and are suffering severe dieback.

Listed Threatened Species

An action is likely to have a significant impact on a listed Threatened species if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of a population;
- Reduce the area of occupancy of the species;
- Fragment an existing population into two or more populations;
- Adversely affect habitat critical to the survival of a species;
- Disrupt the breeding cycle of a population;
- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat;
- Introduce disease that may cause the species to decline or;
- Interfere with the recovery of the species.

Of the 10 Threatened flora species listed in the EPBC report as possibly occurring within the nominated 20km buffer distance from the subject site, we consider a total of 3 of these species as possible occurrences in the study area based on the native habitats present, these being:

- *Cadellia pentastylis;*
- *Dichanthium setosum;* and
- *Swainsona murrayana*.

All 3 species are wide ranging and would be unlikely to be exclusively reliant on site habitats for their life cycle requirements. Regardless, the proposal would not result in a loss of potential

habitat for these 3 flora taxa as their woodland habitats would be retained and protected via nominated buffers.

Based on the above discussion, we do not consider the Proposal as being likely to result in a significant impact on the relevant subject species and TECs and thus a referral to the Commonwealth Department of Environment and Energy (DoEE) is not assessed as being required based on our interpretation of the guidelines. Notwithstanding the above, the Proponent may wish to refer the Proposal to DoEE to obtain legal certainty.

5.3 Cumulative Impacts

The proposal is not expected to result in either direct or indirect impacts to:

- the small isolated stands of remnant native bushland on the subject site;
- the forested ridge habitats of the Kelvin Range to the north of the site; and
- the River Red Gum-dominated riparian forests along the Namoi River to the south.

As such, the proposal would not be expected to contribute to cumulative impacts to local flora biodiversity.

6. Mitigation Measures

The following measures are proposed to ameliorate any adverse impacts to flora:

- The works (eg. plant, material stockpiling) should not encroach into retained woodland areas. To this end, a vegetation clearing protocol should be prepared and used as part of a site induction program for relevant Contractors;
- A weed management plan shall be developed and incorporated into an overall construction management plan to prevent further weed dispersal into retained native woodland habitats;
- A 10 metre pasture grassland buffer shall be established between the perimeter of the River Red Gum-Yellow Box and Bimble Box Woodland stands and the solar farm infrastructure. Cropping activity can continue within the nominated buffer zones.

Appendix A
Desktop Search Results

ScientificName	DateFirst	DateLast	Description	Zone
Tylophora linearis	21/05/2003	21/05/2003	'Trinkey State Forest' - site is l	55
Tylophora linearis	29/07/2003	29/07/2003	'Carnarvon', 3km north west i	55
Tylophora linearis	1/02/2015	1/02/2015	20km SW of GORAN SF	55
Tylophora linearis	1/02/2015	1/02/2015	20km SW of GORAN SF	55
Tylophora linearis	1/02/2015	1/02/2015	20km SW of GORAN SF	55
Tylophora linearis	1/02/2015	1/02/2015	20km SW of GORAN SF	55
Tylophora linearis	1/02/2015	1/02/2015	20km SW of GORAN SF	55
Tylophora linearis	1/02/2015	1/02/2015	20km SW of GORAN SF	55
Tylophora linearis	1/02/2015	1/02/2015	20km SW of GORAN SF	55
Tylophora linearis	1/02/2015	1/02/2015	20km SW of GORAN SF	55
Tylophora linearis	1/02/2015	1/02/2015	20km SW of GORAN SF	55
Tylophora linearis	1/02/2015	1/02/2015	20km SW of GORAN SF	55
Tylophora linearis	1/02/2015	1/02/2015	8km east of VICKERY SF	56
Tylophora linearis	1/02/2015	1/02/2015	KERRINGLE SF	55
Tylophora linearis	1/02/2015	1/02/2015	KERRINGLE SF	55
Tylophora linearis	1/02/2015	1/02/2015	KERRINGLE SF	55
Tylophora linearis	1/02/2015	1/02/2015	KERRINGLE SF	55
Tylophora linearis	1/02/2015	1/02/2015	KERRINGLE SF	55
Tylophora linearis	1/02/2015	1/02/2015	KERRINGLE SF	55
Tylophora linearis	1/02/2015	1/02/2015	KERRINGLE SF	55
Tylophora linearis	1/02/2015	1/02/2015	KERRINGLE SF	55
Tylophora linearis	1/02/2015	1/02/2015	KERRINGLE SF	55
Tylophora linearis	1/02/2015	1/02/2015	KERRINGLE SF	55
Tylophora linearis	1/02/2015	1/02/2015	KERRINGLE SF	55
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Tylophora linearis	1/02/2015	1/02/2015	KERRINGLE SF	55
Tylophora linearis	1/02/2015	1/02/2015	KERRINGLE SF	55
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Tylophora linearis	1/02/2015	1/02/2015	KERRINGLE SF	55
Tylophora linearis	1/02/2015	1/02/2015	KERRINGLE SF	55
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56

Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	1/02/2015	1/02/2015	BREEZA SF	56
Tylophora linearis	24/09/2012	12/10/2012	Pilliga East State Forest	55
Tylophora linearis	4/06/2014 16:04	4/06/2014 16:04	Doona SF	56
Tylophora linearis	4/06/2014 16:19	4/06/2014 16:19	Doona SF	56
Tylophora linearis	4/06/2014 16:47	4/06/2014 16:47	Doona SF	56
Tylophora linearis	4/06/2014 16:58	4/06/2014 16:58	Doona SF	56
Tylophora linearis	5/06/2014 12:49	5/06/2014 12:49	Doona SF	56
Tylophora linearis	5/06/2014 13:50	5/06/2014 13:50	Doona SF	56
Tylophora linearis	5/06/2014 14:28	5/06/2014 14:28	Doona SF	56
Tylophora linearis	5/06/2014 14:35	5/06/2014 14:35	Doona SF	56
Tylophora linearis	5/06/2014 15:19	5/06/2014 15:19	Doona SF	56
Tylophora linearis	5/06/2014 15:33	5/06/2014 15:33	Doona SF	56
Tylophora linearis	5/06/2014 15:40	5/06/2014 15:40	Doona SF	56
Tylophora linearis	5/06/2014 16:03	5/06/2014 16:03	Doona SF	56
Tylophora linearis	4/06/2014	4/06/2014	Doona SF	56
Tylophora linearis	6/06/2014 9:00	6/06/2014 9:00	Doona SF	56
Tylophora linearis	6/06/2014 9:16	6/06/2014 9:16	Doona SF	56
Tylophora linearis	6/06/2014 9:22	6/06/2014 9:22	Doona SF	56
Tylophora linearis	6/06/2014 9:33	6/06/2014 9:33	Doona SF	56
Tylophora linearis	6/06/2014 9:37	6/06/2014 9:37	Doona SF	56
Tylophora linearis	6/06/2014 9:42	6/06/2014 9:42	Doona SF	56
Tylophora linearis	6/06/2014 9:46	6/06/2014 9:46	Doona SF	56
Tylophora linearis	6/06/2014 9:51	6/06/2014 9:51	Doona SF	56
Tylophora linearis	6/06/2014 9:51	6/06/2014 9:51	Doona SF	56
Tylophora linearis	6/06/2014 10:05	6/06/2014 10:05	Doona SF	56
Tylophora linearis	6/06/2014 10:18	6/06/2014 10:18	Doona SF	56
Tylophora linearis	6/06/2014 10:20	6/06/2014 10:20	Doona SF	56
Tylophora linearis	6/06/2014 10:31	6/06/2014 10:31	Doona SF	56
Tylophora linearis	6/06/2014 11:08	6/06/2014 11:08	Doona SF	56
Tylophora linearis	6/06/2014 11:11	6/06/2014 11:11	Doona SF	56
Tylophora linearis	6/06/2014 11:14	6/06/2014 11:14	Doona SF	56
Tylophora linearis	6/06/2014 11:18	6/06/2014 11:18	Doona SF	56
Tylophora linearis	6/06/2014 11:27	6/06/2014 11:27	Doona SF	56
Commersonia procum	9/12/1999	9/12/1999	South of Keringle Rd east of G	55
Commersonia procum	21/10/1999	21/10/1999	900m NE along Revocation Rd	55
Dichanthium setosum	30/03/2009	1/04/2009	Watermark Exploratory Licenc	56

Dichanthium setosum	30/03/2009	1/04/2009	Watermark Exploratory Licenc	56
Dichanthium setosum	30/03/2009	1/04/2009	Watermark Exploratory Licenc	56
Dichanthium setosum	30/03/2009	1/04/2009	Watermark Exploratory Licenc	56
Dichanthium setosum	30/03/2009	1/04/2009	Watermark Exploratory Licenc	56
Dichanthium setosum	30/03/2009	1/04/2009	Watermark Exploratory Licenc	56
Dichanthium setosum	30/03/2009	1/04/2009	Watermark Exploratory Licenc	56
Dichanthium setosum	30/03/2009	1/04/2009	Watermark Exploratory Licenc	56
Dichanthium setosum	30/03/2009	1/04/2009	Watermark Exploratory Licenc	56
Digitaria porrecta	23/02/2004	23/02/2004	On a TSR, 7 km south from Mu	55
Digitaria porrecta	18/02/2015	18/02/2015	20m wide TSR strip east of Mu	55
Digitaria porrecta	18/02/2015	18/02/2015	Wide TSR on western side of M	55
Digitaria porrecta	18/02/2015	18/02/2015	20m wide TSR strip east of Mu	55
Digitaria porrecta	18/02/2015	18/02/2015	South of Mullaley on Coolah R	55
Digitaria porrecta	19/02/2015	19/02/2015	Grain Valley Rd TSR just west a	55
Digitaria porrecta	19/02/2015	19/02/2015	Grain Valley Rd TSR just north	55
Digitaria porrecta	25/02/2015	25/02/2015	Just north of Pullaming Road i	56
Digitaria porrecta	25/02/2015	25/02/2015	TSR north side of road approx	56
Digitaria porrecta	25/02/2015	25/02/2015	TSR north side of Oxley Highw	56
Digitaria porrecta	25/02/2015	25/02/2015	east side of TSR along Coolah	55
Digitaria porrecta	25/02/2015	25/02/2015	east side of TSR along Coolah	55
Digitaria porrecta	25/02/2015	25/02/2015	TSR Oxley Highway 500m wes	55
Digitaria porrecta	25/02/2015	25/02/2015	TSR south of Mullaley on Cool	55
Digitaria porrecta	31/01/2015	31/01/2015	TSR south of Mullaley on Cool	55
Digitaria porrecta	31/01/2015	31/01/2015	TSR south of Mullaley on Cool	55
Digitaria porrecta	31/01/2015	31/01/2015	TSR south of Mullaley on Cool	55
Digitaria porrecta	31/01/2015	31/01/2015	TSR south of Mullaley on Cool	55
Digitaria porrecta	31/01/2015	31/01/2015	TSR south of Mullaley on Cool	55
Digitaria porrecta	31/01/2015	31/01/2015	TSR south of Mullaley on Cool	55
Digitaria porrecta	31/01/2015	31/01/2015	TSR south of Mullaley on Cool	55
Digitaria porrecta	15/04/2015 15:53	15/04/2015 15:53	Railway corridor 2 km east of	56
Digitaria porrecta	15/04/2015 16:05	15/04/2015 16:05	Railway corridor 2.5 km east c	56
Digitaria porrecta	15/04/2015 16:40	15/04/2015 16:40	Sisson Road verge 1.6km from	56
Digitaria porrecta	15/04/2015 16:58	15/04/2015 16:58	Railway line corridor, Quia roa	56
Digitaria porrecta	15/04/2015 17:17	15/04/2015 17:17	West of railway corridor east c	56
Digitaria porrecta	14/02/1995	14/02/1995	15 km NNE of Tambar Springs,	55
Digitaria porrecta	14/02/1995	14/02/1995	4 km E of Premer, road betwe	55
Digitaria porrecta	14/02/1995	14/02/1995	5.8 km S of Mullaley, road bet	55
Digitaria porrecta	14/02/1995	14/02/1995	13.5 km ENE of Mullaley, on C	56
Digitaria porrecta	14/02/1995	14/02/1995	4.4 km N of Tambar Springs, r	55
Digitaria porrecta	15/02/1995	15/02/1995	18.2 km N of Mullaley, road b	55
Digitaria porrecta	23/02/2004	23/02/2004	Travelling Stock Route, 7 km S	55
Homopholis belsonii	21/11/2001	21/11/2001	Vickery State Forest	56
Homopholis belsonii	5/06/2014	5/06/2014	No description provided	56
Homopholis belsonii	5/06/2014	5/06/2014	No description provided	56
Homopholis belsonii	5/06/2014	5/06/2014	No description provided	56
Hakea pulvinifera	14/11/1988	14/11/1988	Location Description withheld	56
Hakea pulvinifera	20/02/1990	20/02/1990	Location Description withheld	56

Hakea pulvinifera	15/11/1988	15/11/1988	Location Description withheld	56
Hakea pulvinifera	15/11/1988	15/11/1988	Location Description withheld	56
Hakea pulvinifera	12/01/2006	12/01/2006	Location Description withheld	56
Cadellia pentastylis	13/11/2008	13/11/2008	'Wilga Park (Namoi Valley Bric	56
Cadellia pentastylis	13/11/2008	13/11/2008	'Wilga Park (Namoi Valley Bric	56

Easting	Northing	SightingNo	LocationNotes
782602	6526424		
769699	6558426		
781822	6530237		
782005	6530294		
782033	6530274		
781994	6530312		
782051	6530260		
782003	6530317		
782035	6530293		
782021	6530314		
782039	6530301		
781731	6530868		
246005	6594845		
767318	6579539		
767262	6579519		
767252	6579545		
767252	6579528		
767181	6579539		
767179	6579533		
767230	6579486		
767222	6579466		
767227	6579479		
767245	6579463		
767239	6579483		
767261	6579469		
767267	6579480		
767281	6579470		
767292	6579461		
767328	6579477		
767344	6579452		
767364	6579463		
767367	6579470		
767377	6579487		
243105	6537194		
243128	6537243		
243143	6537233		
243161	6537261		
243249	6537307		
243812	6537668		
243820	6537679		
243830	6537691		
243832	6537716		
243072	6537405		
243043	6537320		
241618	6539381		
241228	6538695		

241096 6538480
241029 6538452
241027 6538460
241028 6538469
241010 6538476
240989 6538543
240954 6538677
240961 6538709
241147 6539138
241194 6539294
241249 6537741
241243 6537750
752032 6579316
252065 6529188
252064 6529182
252021 6529135
251971 6529092
251739 6529259
251884 6529044
252277 6529312
252356 6529243
252262 6529319
252050 6529341
251986 6529360
252087 6529289
251751 6529077
253131 6527888
253196 6527836
253229 6527796
253141 6527863
253134 6527872
253118 6527888
253101 6527884
253110 6527883
253115 6527871
253139 6527856
253192 6527873
253195 6527860
253234 6527846
253114 6527836
253133 6527816
253139 6527805
253163 6527760
253115 6527826
753643 6577574
783762 6523834
247076 6536327

247932	6541500	
247808	6540553	
247772	6540342	
241755	6539067	
246755	6536007	
249085	6537980	
247728	6540039	
247680	6539638	
776120	6548228	
776879	6550678	
776735	6550326	
776216	6548376	
776109	6548209	
778276	6572384	
779812	6574389	
240056	6562758	
216802	6561993	
215116	6560672	
773999	6543930	
770097	6534129	
785686	6559229	
776964	6551155	
776216	6548376	
776182	6548349	
776210	6548329	
776172	6548325	
776195	6548270	
776189	6548257	
776131	6548169	
224832	6577420	
225161	6576951	
226236	6574879	
225766	6576077	
225534	6576013	
773982	6543950	Altitude: 3: Alluvial plain, dark cracking clay soil, tussock grassland.
781182	6518050	Altitude: 3: Alluvial plain; dark cracking clay soil; remnant patch of native grasses
776966	6550622	Altitude: 3(Alluvial flat, dark cracking clay soil, tussock grassland.
217082	6562271	Altitude: 3- Rolling hills, simple hillslope red firable earth, open forest with tusso
770100	6534125	Altitude: 3: Alluvial flat, in broad valley, dark cracking clay soil, woodland with tu
779845	6574375	Altitude: 2: Alluvial plain, dark cracking clay soil, remnant native grasses on stock
776244	6548391	Determina A flat on a level plain within a plains landform pattern with minor gilg
236940	6592914	
236948	6592936	IDMethod: Observed MaterialPartNotes: 5 to 10 individuals present
236943	6592945	IDMethod: Observed MaterialPartNotes: 100's of individuals present
236929	6592970	IDMethod: Observed MaterialPartNotes: 100's of individuals present
261050	6578802	Sighting Nc Location Notes withheld
261050	6578802	Sighting Nc Location Notes withheld

261050	6578802	Sighting Nc Location Notes withheld
261050	6578802	Sighting Nc Location Notes withheld
261050	6578802	Sighting Nc Location Notes withheld
231316	6567509	
231299	6567546	

ʒais, growing in medium clay (black self-mulching) associated with a basalt substrate (Tertiary Basalt geo

logic unit), within a Dichanthium sericeum subsp. sericeum/Aristida leptopoda/

Australian Government
Department of the Environment and Energy

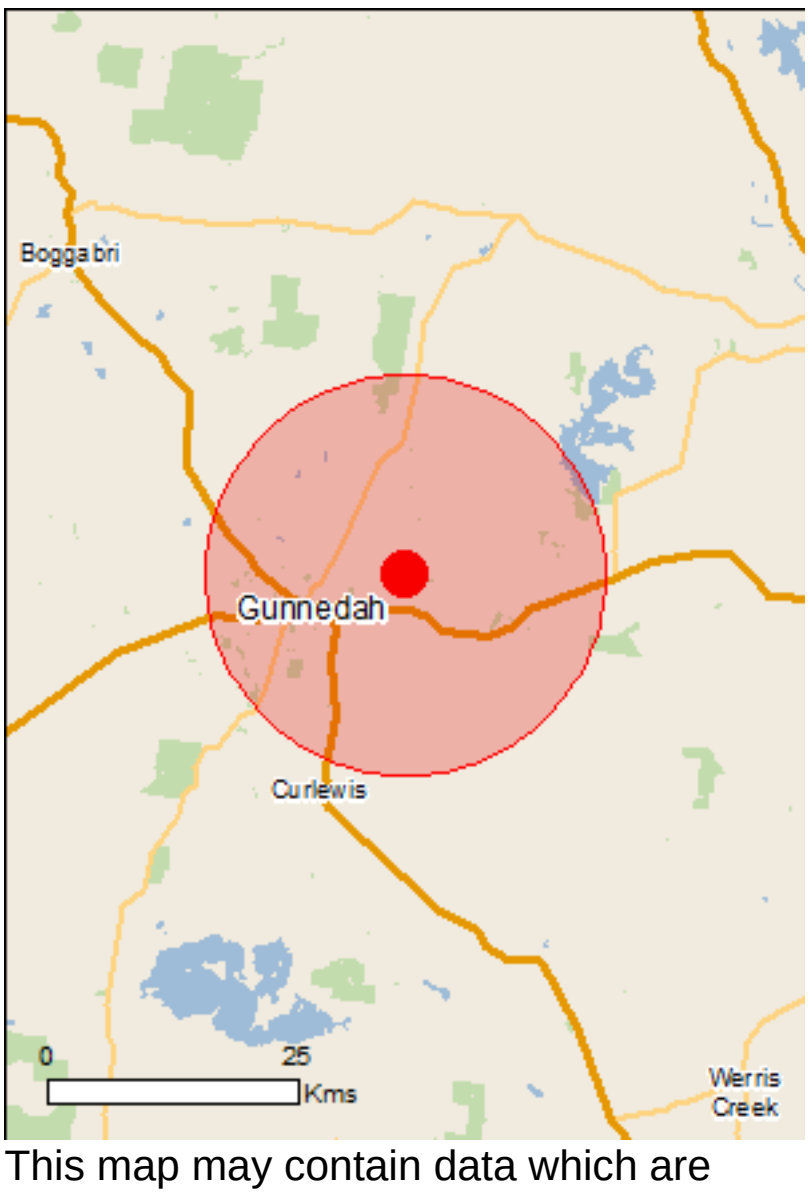
EPBC Act Protected Matters Report

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

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

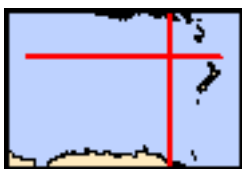
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 23/11/17 09:19:59



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 20.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	3
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	6
Listed Threatened Species:	28
Listed Migratory Species:	10

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	16
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	31
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Banrock station wetland complex	900 - 1000km upstream
Riverland	900 - 1000km upstream
The coorong, and lakes alexandrina and albert wetland	1100 - 1200km

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community may occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community likely to occur within area
New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands	Critically Endangered	Community may occur within area
Weeping Myall Woodlands	Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Fish		

Name	Status	Type of Presence
Bidyanus bidyanus		
Silver Perch, Bidyan [76155]	Critically Endangered	Species or species habitat known to occur within area
Maccullochella peelii		
Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Frogs		
Litoria booroolongensis		
Booroolong Frog [1844]	Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Nyctophilus corbeni		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans		
Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Petrogale penicillata		
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Plants		
Cadellia pentastylis		
Ooline [9828]	Vulnerable	Species or species habitat likely to occur within area
Dichanthium setosum		
bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Euphrasia arguta		
[4325]	Critically Endangered	Species or species habitat may occur within area
Hakea pulvinifera		
Lake Keepit Hakea [14228]	Endangered	Species or species habitat known to occur within area
Homopholis belsonii		
Belson's Panic [2406]	Vulnerable	Species or species habitat may occur within area
Philotheca ericifolia		
[64942]	Vulnerable	Species or species habitat likely to occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269)		
a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Swainsona murrayana		
Slender Darling-pea, Slender Swainson, Murray	Vulnerable	Species or species

Name	Status	Type of Presence
Swainson-pea [6765]		habitat likely to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Tylophora linearis [55231]	Endangered	Species or species habitat may occur within area
Reptiles		
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat known to occur within area
Uvidicolus sphyrurus Border Thick-tailed Gecko, Granite Belt Thick-tailed Gecko [84578]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Bank of Australia

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Pandion haliaetus		
Osprey [952]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Somerton	NSW

Invasive Species	[Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis		
Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis		
European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus		
House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis		
Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris		
Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula		
Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		

Name	Status	Type of Presence
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Cylindropuntia spp. Prickly Pears [85131]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-30.95178 150.34274

Acknowledgements

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

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

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

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

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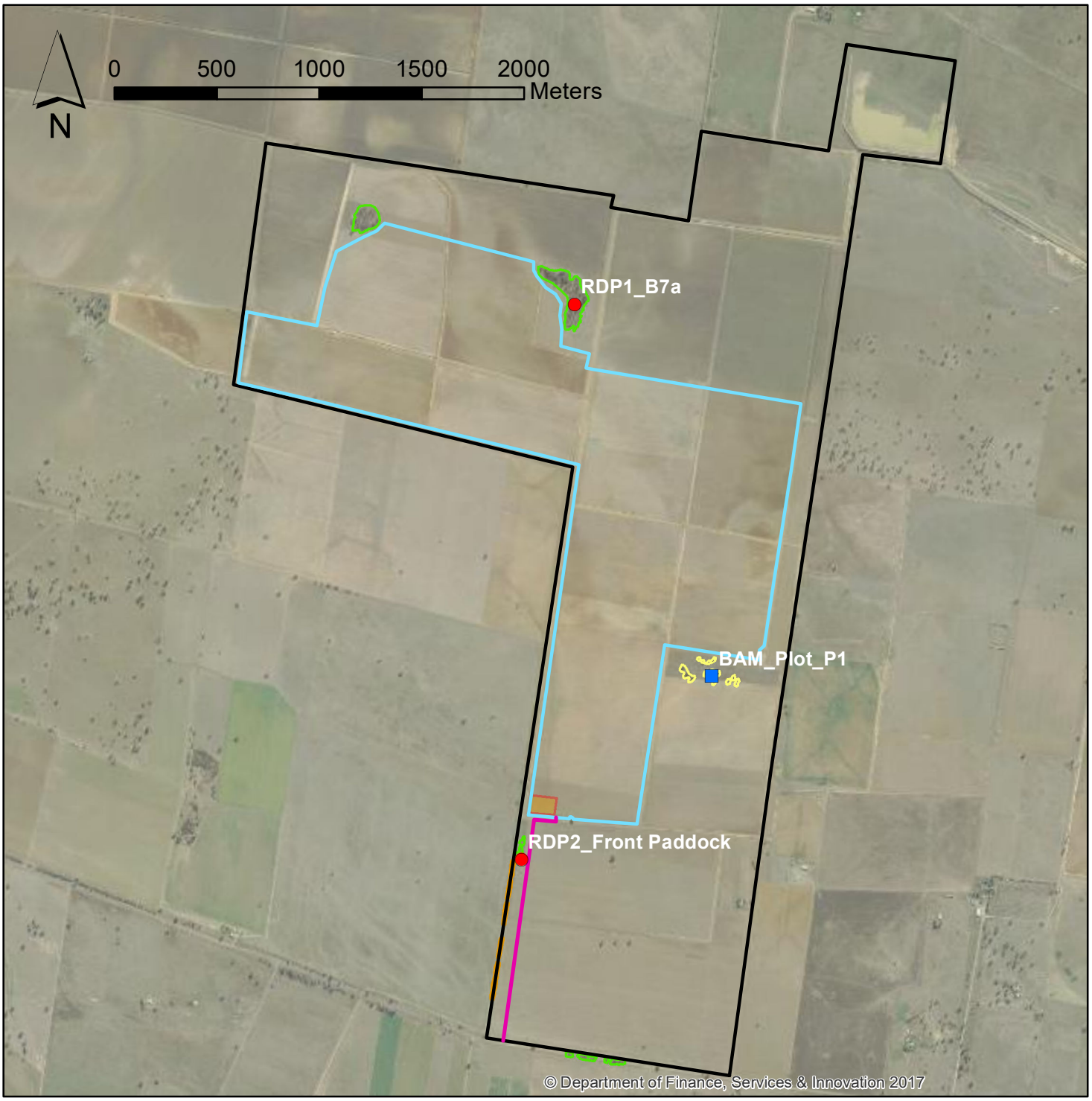
Appendix B
Figures



Flora Survey Locations

- BAM_Plot
- Rapid_Data_Point (RDP)
- Site Access
- Solar Farm Boundary
- Gunnedah_Site_Boundary
- Substation

Vegetation Community

- Bimble Box Open Woodland
- River Red Gum Plantings
- River Red Gum-Yellow Box Woodland/Open Woodland

Vegetation Map

pitt&sherry

Gunnedah Solar Farm Vegetation Map
SY17291/12P/Flora/Gunnedah.gdb

Prepared By: Isaac Mamott
9 Feb 2018

Appendix C
Site Photographs

Photo 1 – Isolated woodland stand in Field B9

Photo 2 – isolated Woodland stand in Field B7. Severe dieback (defoliation) is evident in the photo.

Photo 3 – Row of River Red Gum plantings along western boundary of Front Paddock along main access track and irrigation channel.

Photo 4 – View of young clump of native trees in Field B2 with a sward of Avena (Oats) in foreground

FAUNA ASSESSMENT

and

IMPACT

STATEMENT

Gunnedah Solar Farm

Biosphere Environmental Consultants Pty Ltd

Executive Summary

Gunnedah Solar farm Pty Ltd (GSF) propose to construct and operate a 150-megawatt (MW) solar farm (the “Proposal”) using photovoltaic (PV) technology at a 795-hectare site (the “Subject Land”) in Gunnedah, NSW. The solar farm would occupy 304 hectares (the “Site”) out of the 795 hectares (equivalent to approximately 38% of the Subject Land).

Up to 460,000 PV panels would be installed at a fixed angle or on a single axis tracker system across the Site.

Associated infrastructure to support the solar farm will include the upgrading of boundary access roads, the construction of a sub-station and power lines to the main electricity grid.

This report presents the results of a fauna assessment of the proposed site. The study involved a desktop assessment and field surveys of the solar farm site and the remainder of the property. It also includes database searches for records of threatened fauna. The current fauna survey included targeted searches for threatened fauna species that could potentially occur on the site and their habitats.

Two broad fauna habitat types were recorded within the site;

- isolated remnants of White Box, Yellow Box Blakely’s Red Gum Grassy Woodland and Derived Native Grassland. The areas of woodland within the project area were in moderate to poor condition and were subject to die-back. The understorey vegetation had been extensively removed and the remaining trees were confined to three patches (referred to B1, B7 and B9 tree patches).

- cleared land with scattered trees. The majority of the project area has been previously cleared for agricultural purposes.

Fourteen species of threatened fauna listed under the Biodiversity Conservation (BC) Act 2016 were recorded within 10 kilometres of the study area, although none had actually been recorded on the Project area. A fauna assessment of the site was conducted in October 2017 and none of the listed threatened species were found on site. The tree patches could provide seasonal habitat for some of the flying threatened species, including the Regent Honeyeater, Swift Parrot, Painted Honeyeater, Corben's Long-eared Bat and the Grey-headed Flying Fox. The tree patches (especially B7 and B9) contained tree species that are regarded as secondary food trees for koalas. No evidence was found of koalas in these areas and it appears that the tree patches are too remote from other koala habitat areas that koalas are unable to reach them. In addition, the remnant tree patches are quite small, highly exposed and totally surrounded by cleared paddocks.

No trees will be removed for the solar farm. All of the land to be used for the solar farm is land that has been cleared for agriculture and is devoid of woodland or native grasslands.

Tree patches B1, B7 and B9 will be retained and protected during the construction and operation of the solar farm.

The following mitigation measures will be implemented during the preparation of the land for the solar farm:

- tree protection measures for the tree patches in fields B1, B7 and B9;
- enhancement of buffer around the perimeter of the site that includes additional planting of trees.
- irrigation and site water management;
- weed management; and
- animal pest management and monitoring.

The potential impacts of the Proposal are described herein for the range of threatened fauna identified in accordance with the Draft Guidelines for Threatened Species Assessment (DoE, DPI 2005). The results indicate that no threatened fauna is likely to be affected to the point that a local population would be placed at risk of extinction. Key thresholds were assessed as follows:

• The Proposal includes actions to avoid or mitigate impacts by excluding the three tree patches (B1, B7 and B9) from the solar farm footprint,

• All of the threatened fauna that could be potentially affected have been recorded in nearby areas and the tree patches that occur on site are likely to be used only during times of flowering of the Yellow Box and Blakely's Red Gum (White Box is not present on site),

• The Proposal will not place any local population of a threatened species at risk of extinction.

• The Proposal does not affect any critical habitat.

Contents

Figures

1.0 Introduction

1.1 Overview of the Project

Gunnedah Solar farm Pty Ltd. (GSF) propose to construct and operate a 150-megawatt (MW) solar farm (the “Proposal”) using photovoltaic (PV) technology at a 795-hectare site (the “Subject Land”) in Gunnedah, NSW. The solar farm would occupy 304 hectares (the “Site”) out of the 795 hectares (equivalent to approximately 38% of the Subject Land).

Up to 460,000 PV panels would be installed on a single axis tracker system across the Site.

Single Axis Tracker System option

The single axis tracker system option would consist of groups of east-west facing PV modules tilted at +/-60^{o} angle from horizontal (each approximately 2m x 1m in area) on mounting structures approximately 2.3m in height. The mounting structure would be piled steel posts that would extend 2.5m below ground.

The following works and infrastructure would be required to support the construction and operation of the solar farm:

- Construction of access roads including:
    - A main access road for all access and egress for the site and substation off Orange Grove Road
- Installation of Electrical infrastructure including:
    - A 132kV Substation
    - A new overhead transmission line (powerlines and poles for a distance of approximately 1.2km)
    - Inverters to convert energy from DC to AC.
    - Cabling and other electrical infrastructure (e.g. security systems).
- Ancillary works on the existing 132kV transmission line adjacent the site.
- A maintenance compound and buildings.
- Fencing, landscaping and environmental works.

Power generated by the facility will be transmitted via existing 132kV transmission lines, in an easement owned by TransGrid south of the Site along Orange Grove Road, to the local energy grid via the Gunnedah substation which is located 2.3km south of the Site on the Oxley Highway.

A tee in connection will be used to connect into the existing grid located 1.2km from the Site via a new above ground 132kV powerline. A tee connector is an electrical connector that joins three cables together.

The operational life of the solar farm is expected to be approximately 25 years at which point the panels are either replaced and operations continue or removed and the site is decommissioned and rehabilitated as required.

1.2 Scope and objectives

The primary aim of this assessment is to assess potential impacts on terrestrial fauna, in particular, fauna of conservation significance. Potential impacts of the Proposal on fauna were assessed in accordance with the Guidelines for Threatened Species Assessment (OEH 2017).

Fauna of conservation significance are defined in this report as threatened species or populations listed on the Schedules of the *NSW Biodiversity Conservation Act* 2016 (BC Act) and/or are listed as matters of national environmental significance by the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act).

- The specific objectives of this impact assessment are to consider the: terrestrial fauna known or likely to occur in the area that would be affected by the Proposal, including fauna of conservation significance;
- potential impacts of the Proposal on those fauna;
- proposed impact avoidance and mitigation measures.

This scope of this study includes:

- a desktop assessment of the fauna likely to occur in the vicinity;
- fauna surveys and field assessments;

Threatened fauna listed under the NSW Fisheries Management Act 1994 are not discussed further as not habitat exist for threatened fish species on the site.

1.3 Location

The Proposal would be located adjacent to Orange Grove Road, Orange Grove, NSW 2380 (Figure 1) and contained within Lot 1 DP 1202625, Lot 153 DP 754954, Lot 264 DP 754954, Lot 2 DP 801762, Lot 151 DP 754954 and part of Lot 1 DP 186590 (the “Subject Land”). The Proposal is located within the Gunnedah Local

Government Area (LGA) and is approximately 9km north-east from the Gunnedah town centre.

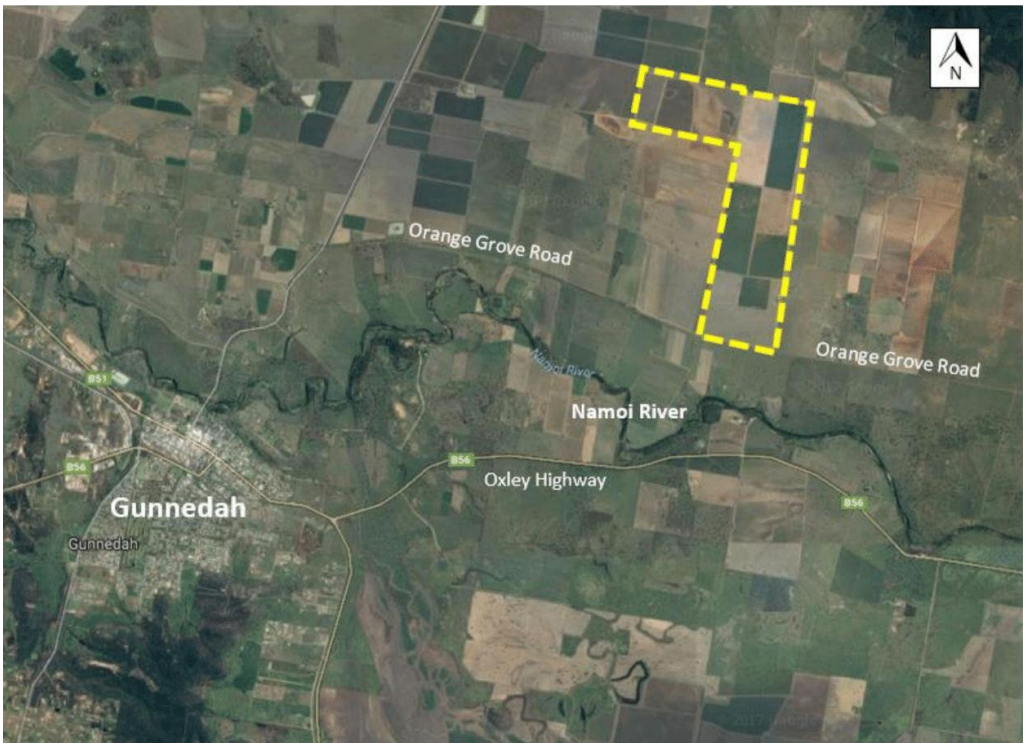


Figure 1 Location of Solar Farm Site

The Subject Land totals approximately 795 hectares in area and is currently used for agriculture specifically cropping (irrigated cotton and chick pea). The solar farm would occupy 304 hectares (the "Site") out of the 795 hectares (equivalent to approximately 38%) with the remaining land retained as agricultural land. It is proposed that grazing activities would also continue on the land occupied by the solar farm.

There is an existing TransGrid easement which runs along Orange Grove Road at the southern boundary of the Site. This easement contains existing TransGrid 132kV powerlines on wooden pole structures connecting to the Gunnedah substation approximately 2.3km to the south of the Site (Figure2).

Orange Grove Road is a local road (managed by Gunnedah Shire Council) which runs parallel to the southern border of the Site. The north, east and west boundaries of the Subject lands are defined by neighbouring agricultural lots with some sections of unnamed, unsealed rural roads.

Access to the Site would be from Orange Grove Road a single lane, partly sealed, partly unsealed local road. The section of the road directly south of the Site is un-sealed. Orange Grove Road intersects with Kelvin Road approximately 6.3km west of the Site. All heavy vehicles will access the Site from the Kamilaroi Highway via Blue Vale Road, Old Blue Vale Road, Kelvin Road and Orange Grove Road.

Figure 2 Existing electrical infrastructure in area

An existing unsealed unnamed access road off Orange Grove Road will be used to access the Site. The access road is located near the western boundary and would be upgraded as part of the works.

1.4 Site Description

The Site (Figure 3) comprises a series of barb wire fenced paddocks which have been largely cleared for agricultural purposes (specifically cropping – irrigated cotton, wheat and chickpea) and now contain irrigated crops. The Subject Land surrounding the Site currently contains a number of built structures including agricultural sheds, a temporary residential dwelling and a permanent residential dwelling which is currently under construction.

Figure 3: Field Plan for Project Area

There are several clusters of native vegetation located in the Site. The largest two clusters are in Lot 1 DP 186590 and are roughly 1.51 hectares and 2.96 hectares in area, respectively (Figure 3). Other vegetation on-site includes:

- a row of native trees along the boundary of the Site and Orange Grove Road.

- a row of native trees along the western boundary of Lot 151 DP 754954 and Lot 2 DP801762.
- a sparse group of trees located in lot 153 DP 754954.
- other isolated trees scattered throughout the Site.

Figure 4: View southeast from field B5. Tree patches in fields B7 and B9 are visible in the distance.

A detailed Biodiversity Assessment has been prepared as part of this EIS which provides further details on existing vegetation and biodiversity.

The site is located in the Namoi River catchment and has been identified as flood prone land (Gunnedah Local Environmental Plan [LEP] 2012). Surface hydrology, landform and soils have been heavily modified by the paddock development and irrigation works.

There are no waterways within the Site and waterways on the Subject Land surrounding the Site are limited to a large dam contained in the north-eastern corner of Lot 1 DP 1202625 which has an area of approximately 6.05 hectares. At the time of the site inspection this dam was dry (October 2017). Irrigation channels are

present throughout the Site to facilitate water movement for cropping from five irrigation bores and the storage dam using pumps.

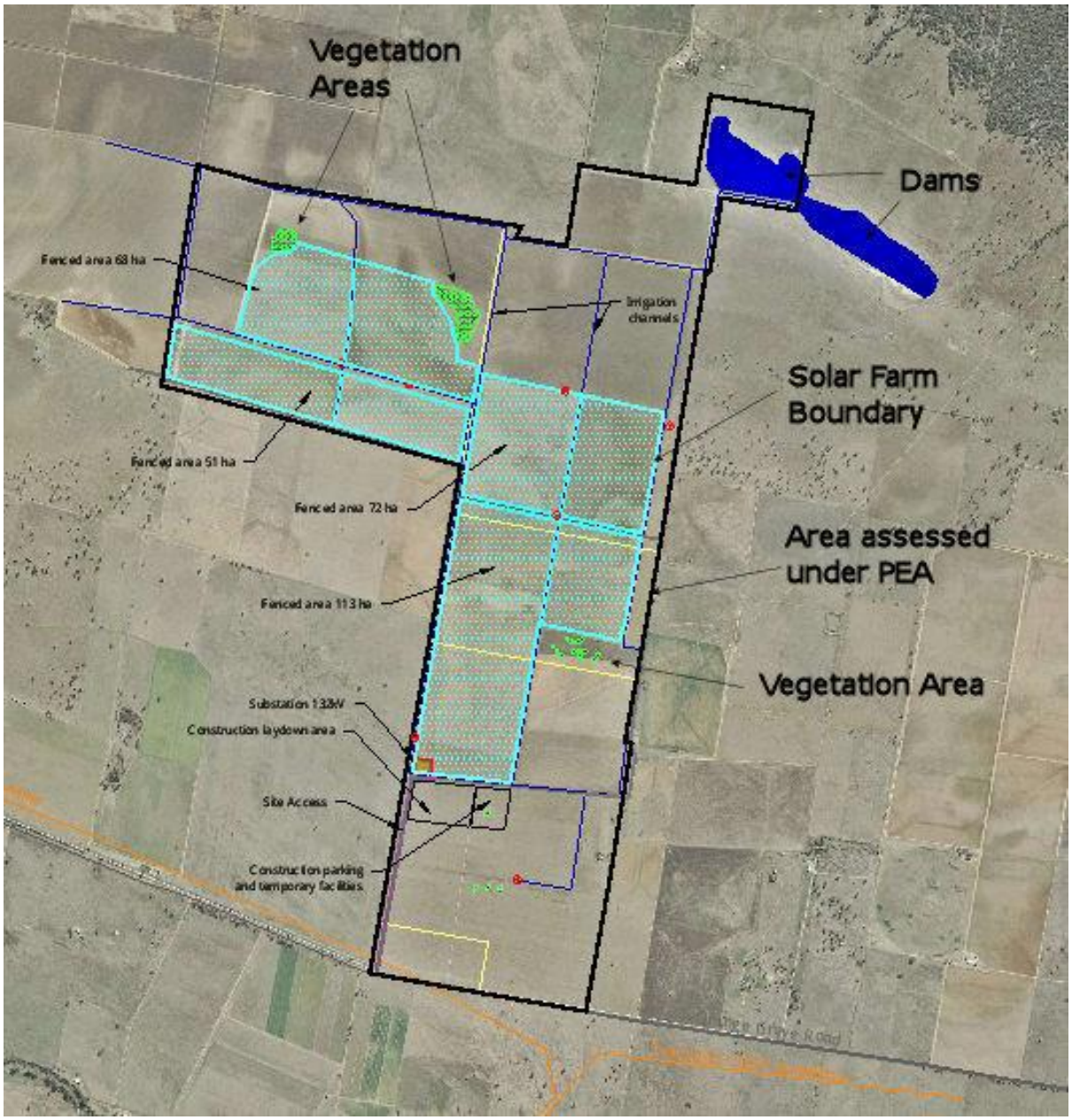


Figure 5: Solar Farm footprint.

1.5 Surrounding Locality

The Proposal is located in an agricultural region on the boundary of the suburbs of Gunnedah and Orange Grove approximately 8 km north-east of the township of Gunnedah in the north-west region of New South Wales.

Gunnedah is the closest town to the Proposal and covers an area of 4,994 km^2. The population of Gunnedah was 9,726 in the 2016 Census (ABS 2016). The main industries are coal mining (14.2%), Supermarket and Grocery Stores (3.3%), cafes,

restaurants and takeaway food services (3.2%), Local Government Administration (3.1%) and secondary Education (2.8%) (ABS 2016).

Settlement of the area dates from 1834, with the land used for agriculture including wheat growing. and sheep farming. Prior to European settlement the Gunnedah people occupied the area (Australian Heritage 2017). Growth in the area took place during the late 1800s, aided by the opening of the railway line in 1879 (Australian Heritage, n.d.).

There are currently 18 buildings/lots, within the town of Gunnedah, listed under Gunnedah Local Environment Plan as Heritage items. No Heritage items have been listed within 1km of the Site (Gunnedah LEP 2012).

The Project has good road access from the Oxley Highway which is 1.9km south of the Site and the Kamilaroi Highway, 6.8km to the south-west of the Site. Additionally, Gunnedah Airport is located approximately 8 km west of the Site and there is a small private, rural airstrip located approximately 4.3 km west of the Site.

The majority of built structures in the region are in the town of Gunnedah which is mostly low density residential areas or large lot residences. Outside the township, built structures include sparsely distributed rural-residences which are usually located some distance from roads.

Residences in proximity to the Site generally occur on large rural properties used for agriculture predominantly grazing and some cropping activities.

Local topography is generally flat with some gentle rises and slopes. However, there are several highpoints in the area including the town of Gunnedah which is located on a hilly region, Black Jack Mountain located south of Gunnedah town, and a large forested area located 1.9km to the north of the Site.

Nearby water courses include the Namoi River which is located approximately 900m south of the Site surrounded by scattered stands of native vegetation. Other natural water courses in the area include: Mooki River; Carroll Creek, Rangria Creek and Kibah Creek which are all tributaries of the Namoi River. There are also several man-made agricultural dams in neighbouring plots.

The environment around the Site is dominated by cleared agricultural land which is the dominant industry in the region. There are also several large mines in the region, the nearest of which is the RocGlen Mine 17km to the north-west of the Site.

1.6 Authorship and acknowledgements

This fauna assessment was prepared by Dr. Arthur White of Biosphere Environmental Consultants Pty Ltd. for Pitt & Sherry.

2 Methodology

2.1 Desktop assessment

A desktop investigation was carried out to identify terrestrial fauna species and habitat that may be affected by the Proposal. This included:

- a search of the Office of Environment and Heritage (OEH) Threatened Species Profiles database (OEH 2017a) for species known or predicted to occur within the Gunnedah region;
- a search of the OEH Atlas of NSW Wildlife database (OEH 2017b) for records of threatened fauna within 10 kilometres radius the locality;
- a search of the Commonwealth Department of the Environment (DotE) Protected Matters database (DotE 2017) for matters of national environmental significance within 10 kilometres of the locality (sourced 7 May 2014);
- a search of the Birdlife Australia database for records of threatened birds within 10 kilometres of the locality (sourced 14 October 2017);

2.2 Previous fauna surveys

No fauna studies have been conducted previously on the site. A fauna survey was completed on an adjoining property in 2011 (North West Ecological) and one threatened species was located, namely *Planigale maculata*, the Common Planigale.

2.3 Fauna Assessment

A fauna assessment was carried out on the entire site on the 26th and 27th of October 2017 by Biosphere Environmental Consultants Pty. Ltd. The assessment commenced with a site familiarisation tour in which all of the roads and tracks on the site were traversed by vehicle. Following this, the site was re-traversed so that areas of potential habitat for threatened species could be mapped. As most of the site consisted of cleared paddocks, there were relatively few areas left that could provide potential habitat for native fauna. Each area was then revisited and traversed on foot.

The assessment included non-threatened species as well as threatened species. No trapping or netting of animals was carried out. All animal species encountered were identified and recorded on map of the site. The assessment components consisted of:

- Arboreal mammals: a search was made of the trees on site and evidence of the presence of arboreal mammals was searched for: these include scratch marks on trees, the presence of used hollows or drays, faecal droppings and chew marks. A particular emphasis was made to search for evidence of

koalas on the site and all Yellow Box and Blakely's Red Gums were fully checked for signs of koala scratches or faecal pellets.

- Terrestrial Mammals: evidence of terrestrial animals was searched for across the site. This included searching for animal tracks, burrows, digging sites and scats.
- Bats: potential food trees for flying foxes were noted. These included trees that either produce edible fruit that flying foxes could eat or produce flowers with edible nectar. For the smaller insectivorous bats, small hollows or loose bark refuge sites on the trees were sought and investigated to see if there were any signs of current or previous occupation by microbats.
- Diurnal Birds: A constant watch was kept for birds using field binoculars. Birds were identified and their location noted on the field map.
- Nocturnal Birds: No night survey work was conducted. Owl, nightjar and frogmouth roosts were searched for during daylight hours and any potential site found was recorded on the site map.
- Reptiles: a hand search for reptiles was carried out in areas where there was ground cover such as fallen bark, branches, logs or scrap timber or metal that could be used as shelter areas by reptiles. Reptiles were not caught unless this was necessary for positive identification. Other reptiles were encountered opportunistically and their location was also recorded on the site map.
- Frogs: A search of the channels and water collection points on site was examined to see if any evidence of frogs could be found. Standing water was netted using a long-handled net and if tadpole were caught they were identified using Anstis (2002). In clay areas near water points, evidence of frog burrows was also searched for and when found recorded on the site map.
- Fish: As there were no permanent open water areas on site no fish surveys were carried out.

2.4 Assessment of impacts

Potential impacts of the Proposal on fauna were assessed in accordance with the Guidelines for Threatened Species Assessment (DEC and DPI, 2005). Given the paucity of potential habitat areas for native species on site, the fauna assessment survey methodology undertaken by Biosphere Environmental Consultants P.L. was considered to be sufficient to identify the habitat of threatened species on site.

2.5 Limitations

The surveys undertaken by Biosphere Environmental Consultants Pty. Ltd. were short in duration and only conducted during one season (spring). The techniques used were observation-based rather than trapping. Accordingly, it is likely the surveys would not have recorded the full range of fauna on site, particularly those species which may only occur seasonally or occasionally.

3 Results

3.1 Threatened fauna previously recorded or predicted to occur

Appendix A provides a summary of the threatened fauna species that are known or considered to have potential to occur within the locality and/or region. The table indicates which of those species have been recorded previously within the local area between 1996 and 2017. The table also provides an assessment of the likelihood of each species occurring within the Project area or immediate surrounds. Only those species with the potential to occur within the project area were assessed further.

3.2 Habitat types, condition and features

Two broad fauna habitat types were recorded within the project area or immediate surrounds:

- White Box, Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland, and
- Cleared Land with Isolated Trees. The location of these habitat types within the study area is shown in Figure 3.

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

This habitat type was probably widespread across the project area prior to agricultural clearing of the land. Land clearing over time has removed most of the woodland vegetation and only three small areas of impoverished woodland remain on site: the tree patches are identified by the paddock in which they occur; namely Tree Patch B1, B7 and B9 (Figure 3). There are a few fallen logs in the Tree Patches B7 and B9.

Cleared Land with Isolated Trees

This habitat type accounts for the majority of the project area. These areas are characterised by paddocks that are either being tilled (Figure 4), sown or sustained

crops of irrigated cotton or chick pea. In the paddocks most of the trees have been removed and all native ground cover has been eliminated. Where trees have been retained they occur as solitary trees that have no neighbouring ground cover or shrub vegetation. Many of the trees on site show signs of die back and heavy insect damage.

There are no rocks large enough to provide habitat for fauna on the site. A large dam is located in field B5 (Figure 6) but this was dry at the time of the fauna assessment. Small pools of water were present in some of the lateral drains around this dam.

Figure 4: Dry dam (reservoir 1)

3.3 Fauna recorded during the surveys

A total of 31 species of vertebrate fauna were recorded during the current (2017) surveys and are listed in Appendix B. This included 26 species of bird (2 of which are non-native), 2 exotic species of mammal, four species of reptile but no species of

frog or fish. No threatened fauna species were recorded within the study area or nearby.

3.4 Migratory species

No migratory species listed under the EPBC Act was recorded nearby the study area during the current surveys. A summary of migratory species recorded within 10 kilometres of the study area and/or locality is provided within Appendix C.

3.5 Endangered populations

No endangered populations are listed under the BC Act within the Gunnedah Shire, as defined within the NSW OEH Threatened Species Profiles database (OEH 2017a).

3.6 Exotic fauna

Four exotic vertebrate species (excluding livestock animals) were recorded within the project area. These including the European Red Fox (*Vulpes vulpes*), Common Myna (*Arcidotheres tristis*), European Starling (*Sturnus vulgaris*) and House Mouse (*Mus musculus*).

4 Potential impacts

In general, the range of potential impacts associated with the Proposal are either associated with the construction or operation of the solar farm. These impacts may arise from direct and indirect impacts on the fauna.

4.1 Direct impacts

4.1.1 Loss of habitat

Most of the project area is already devoid of native vegetation and the solar farm has been located so that maximal use of previously cleared land is utilised.

A number of key threatening processes listed under the BC Act could occur as a result of the habitat removal (and are discussed in more detail below):

• Clearing of native vegetation;

• Loss of hollow bearing trees;

• Removal of dead wood and dead trees; and

Loss of hollow-bearing trees

No trees will be removed top make way for the solar farm. However, the poor condition of the remaining trees (especially in field B1 where mature Blakely's Red Gums are in very poor condition and some show signs of die-back). There are no old trees present and no hollows or stags are evident in these trees.

Removal of dead wood and dead trees

No standing or fallen dead trees will be removed to make way for the solar farm. Very little dead wood occurs on the ground except in tree patches B7 and B9. These two tree areas also contains a few dead stags (which will remain).

4.1.2 Loss of individual animals

The Proposal has the potential to cause mortality of some animals during the removal of fauna habitat. Nocturnal species, species with low mobility, territorial species and some ground-dwelling species (such as lizards and snakes) are particularly susceptible to injury or death during construction and clearing. However, given that no trees or fallen timber will be removed, this impact should be minimal.

It is considered unlikely that wildlife mortality on roads would substantially increase as a result of the Proposal, given there are existing roads currently in operation with low vehicle speed limits, and no new roads would be created.

4.1.3 Animal Injury

In 2016, Harrison *et al*. reviewed the literature for the impact of solar farms on birds and bats in the United Kingdom. They concluded that the studies were not complete but indicated that reflected polarised light from solar panels can cause injury to some birds (particularly water birds). The reflected polarised light appears to be occasionally misinterpreted by water birds as light being reflected from a standing body of water and the birds may attempt to land on the solar panels. Although this is an uncommon occurrence, the potential for birds to be injured exists. Methods to reduce bird impacts were not discussed but it is likely that the establishment of tree buffer zones around the solar farms will discourage water birds from attempting to land there.

Harrison *et al*. (2016) also noted that certain insects are attracted to the reflected polarised light during daylight hours and this may entice some insectivorous birds towards the solar farms. They did not have evidence of injury to insectivorous birds as a result of the concentration of insects around the solar farms.

The boundary fences around the solar farm site may present a barrier to some free-ranging species, such as kangaroos. As the fences will be located in cleared land, they will be an obvious barrier and so animals are unlikely to accidentally run into

them, unless they are startled or chased. Smaller animals will be able to pass under the fences without impediment.

4.2 Indirect impacts

4.2.1 Loss of habitat connectivity

Habitat corridors provide essential pathways for the movement of native fauna and play an important role in ensuring the long-term genetic viability of species. Vegetation connectivity in the surrounds of the project area is highly variable. To the northwest of the project area are the Kelvin Hills. These low ranges are fully vegetated and have a continuous tree cover. Animals, such as koalas, are occasionally reported from these hills but the number of sightings is low but this may under-represent that the actual number of koalas in the hills (Ellis *et al*. 2016).

To the south of the project area is the Namoi River corridor. The river corridor is extensively wooded although the tree canopy is disrupted in places. For animals like koalas, there are local areas where the species appears to be more highly concentrated such as near Curlewis and Carrol.

Kelvin Hills and the Namoi River corridor vegetation areas are disconnected by a 5 to 10 kilometer wide zone of extensively-cleared agricultural land. This agricultural zone has severed habitat connectivity to the northwest of Gunnedah and terrestrial species (and especially arboreal) species are precluded from crossing this area. Only the more mobile or flying species are able to cross and the small tree stands in the agricultural areas may provide important stop-off (and feeding) stations for dispersing birds and bats.

Mobile terrestrial animals such Eastern Grey Kangaroos (*Macropus giganteus*) would be capable of crossing the agricultural land but would not remain on site because of the lack of cover vegetation.

4.2.2 Predation by feral animals

The European Red Fox (*Vulpes vulpes*) was recorded within the project area and throughout the locality. Foxes are a key threatening process under the BC Act, Predation by the European red fox and Predation by feral cats. The small loss of habitat in field B1 is unlikely to result in an increase of these feral species. Few terrestrial species occur in field B1 and the establishment of solar panels there will not assist native species or foxes.

4.2.3 Edge effects

Most of the habitats within the project area are already impacted by edge effects (light, noise, dust, etc.) associated with the establishment of agricultural land. The

further removal of the trees in field B1will clear the last of the trees from this paddock but will not result in increase in dust, noise or light. The emplacement of the solar panels will provide greater ground coverage than currently exists which should suppress wind-blown dust but could facilitate weed growth in the paddock. For this reason a Weed Management Plan will also be developed to prevent unwanted vegetation becoming established in the project area.

4.2.4 Noise and Air Quality

There will be some increase in noise and air quality impacts during the construction of the solar farm. However, once the construction is completed, both noise and dust levels will be reduced. The main source of noise during the operation of the solar farm will occur near the sub-station to be established on site. Noise and air quality impacts will be highly localised to the solar farm footprint and will not be a factor that will negatively impact on native fauna.

4.2.5 Artificial lighting

No additional artificial lighting is proposed during the construction and operation of the solar farm. No night work will occur during the construction of the solar farm and no night work is proposed during the operation of the farm. During the operation of the solar farm night lighting will be negligible and mainly associated with support buildings near the entrance to the site. All night lights will be directed downwards so that they do not impacts on nocturnal species.

4.2.6 Changes to hydrology

Some minor land re-surfacing will occur during the establishment of the solar farm. In general, most of the earth works proposed will be minor and will consist of levelling out minor undulations in the ground surface. These changes will not alter the general hydrology of the project area.

4.3 Cumulative impacts

Cumulative impacts are the successive, incremental and combined impacts (both positive and negative) of an activity on society, the economy and the environment (Franks *et al*., 2010). They can arise from the compounding activities of a single operation given the interaction of that operation with past, current and future activities that may or may not be related to the existing development. Cumulative impacts may also arise through the interaction of one development with other types of activities and industries, such as grazing and broad scale agriculture. In relation to the Proposal, the cumulative impacts are considered to be the total impact on the environment that would result from incremental impacts (including both direct and indirect impacts) of the Proposal, added to other existing impacts. The main

cumulative impact associated with the Proposal is the loss of the 15 trees in field B1. The proposed impact avoidance, mitigation and offset measures described in Sections 5 and 6 of this report are likely to assist with the maintenance of regional fauna biodiversity in the short-term and to potentially enhance it in the medium to long-term once rehabilitation and revegetation programmes become more established.

4.4 Significance of impacts on threatened fauna listed under the BC Act

A total of 15 species of threatened fauna were considered to have potential to occur within the project area or immediate surrounds (Appendix A). For these species assessments were undertaken to determine the significance of potential impacts. Assessment Approach In accordance with the Draft Guidelines for Threatened Species Assessment (DSEWPC 2011a,b) six questions require consideration and assessment in relation to each threatened species that could be impacted by the Proposal:

1. How is the proposal likely to affect the lifecycle of a threatened species and/or population?

2. How is the proposal likely to affect habitat for a threatened species, population or ecological community?

3. Does the proposal affect any threatened species or populations that area at the limit of its known distribution?

4. How is the proposal likely to affect current disturbance regimes?

5. How is the proposal likely to affect habitat connectivity?

6. How is the proposal likely to affect critical habitat?

The potential impacts for each species of threatened fauna is provided in Appendix D. For species where the ecology or habitat requirements are similar, they have been grouped and assessed together.

In relation to 6, the Proposal would not impact on any area of critical habitat. No area of critical fauna habitat occurs near the study area as designated by the Register of Critical Habitat held by the Commonwealth Minister of the DotE (DotE, 2009), Register of Critical Habitat held by the Director-General of the OEH (OEH 2017), or the Register of Critical Habitat held by the Director-General of the DPI-Fisheries (DPI-Fisheries, 2014).

Summary

In summary, the conclusions of the assessment were that the modification would be unlikely to significantly impact any threatened species given:

• the relatively small area of potential habitat that would be impacted;

• this habitat area is not used by many native species, with the exception of flying animals. There are few old growth features observed in the trees and there is scant ground cover available. This area is also highly isolated from other treed areas.

• habitat fragmentation within the locality would be insignificant as a result of the removal of the trees in field B1,

• to assist those species that do occur in the local area, Vegetation Management Plan will be developed to protect and enhance the tree areas in fields B7 and B9 which will be excluded from the solar farm footprint,

• impact avoidance and mitigation measures would be implemented.

4.5 Significance of impacts on threatened fauna listed under the EPBC Act

This report identifies potential impacts from the Proposal on threatened fauna listed under the EPBC Act and assessed whether the identified impacts would likely result in a significant impact on any Matters of National Environmental Significance. The conclusion of this assessment is that the proposed Modification is not likely to have a significant impact on any threatened fauna (see Appendix D).

4.6 State Environmental Planning Policy No. 44 – Koala Habitat Protection

There are two important definitions that apply when considering Koala habitat under SEPP 44:

• "core koala habitat" means an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings and historical records of a population; and

• "potential koala habitat" means areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.

Three Schedule 2 Koala feed trees occur in the Gunnedah area, namely River Red Gum *Eucalyptus camaldulensis,* White *Box Eucalyptus albens* and Poplar Box *Eucalyptus populnea.* The project site contains no Schedule 2 Koala feed trees. The Project Site therefore does not contain "potential Koala habitat".

In 2015 Gunnedah Shire Council has prepared a Koala Management Strategy (Gunnedah 2015) where primary and secondary habitat has been mapped in the Gunnedah focal area. Blakely's Red Gum *Eucalyptus blakelyi* is listed as a secondary food tree for koalas and that tree species does occur on the project land. The project site therefore contains secondary potential koala habitat. The main areas

of secondary koala habitat are the tree stands in fields B7 and B9 which will be protected and enhanced under the proposed Vegetation Management Plan.

There are no historic or current observations of koalas within the Project Site. The isolation of the few tree areas on the solar farm sites means koalas may not be able to see them, or if they attempt to traverse the surrounding cleared farmland to reach these trees, they would be highly susceptible to predation by foxes, dogs or other predators. The poor condition of the trees and their exposure to adverse weather means that if koalas were able to reach these trees they could not remain there for long.

4.7 Migratory species

Twelve migratory bird species listed under the EPBC Act have been recorded within the locality or predicted to occur in the Protected Matters database (Appendix C). There are no records of any of these species being recorded in the project area. The current survey did not detect any of these species but the limited nature of the survey does not preclude their presence from time to time. The Proposal is not likely to significantly impact any listed migratory species under the EPBC Act, on the basis of the following:

• no 'important habitat' exists within the Proposal area for any listed migratory species;

• the Proposal would not result in an invasive species that is harmful to any migratory species becoming established in an area of important habitat; and

• the Proposal would not disrupt the life cycle of an ecologically significant proportion of any population of any migratory species.

5 Mitigation measures

A number of impact avoidance and mitigation measures are proposed to alleviate any potential impacts on native species that occur in or over the project area.

5.1 Vegetation Management plan

A Vegetation Management Plan (VMP) will be prepared that will establish measure that will:

- protect the trees in fields B7 and B9 during the construction of the solar farm;
- enhance the habitat values of the trees areas in fields B7 and B9; and

- replace the trees lost from field B1 by selective replanting in the buffer zones around the site, and
- key components of the VMP include delineation of areas to be cleared of native remnant vegetation to ensure that only those areas designated for clearing are cleared, pre-clearance surveys, fauna management measures and vegetation conservation in the treed areas in field B7 and B9.

5.2 Weed management

A weed management plan will be developed to prevent unwanted plants from becoming established in and around the solar farm; the plan will be developed in conjunction with the proposal to establish the tree buffers areas. A variety of weed control measures will be employed, including the following:

• regular site inspections and communication with lessees and authorities;

• annual control of weeds

5.3 Animal pest management and monitoring

A variety of animal pest management and monitoring procedures, including the following:

• the maintenance of a clean, rubbish-free environment in order to discourage scavenging and reduce the potential for colonisation of these areas by non-endemic fauna (e.g. introduced rodents, predators and birds);

• monitoring of feral animals (including pigs, foxes, dogs, rabbits and newly established exotics species) every two years;

• undertaking pest animal control where necessary;

• domestic pets prohibited in the solar farm; and

• employees and contractors are not permitted to encourage fauna through feeding.

5.4 Rehabilitation

At the completion of the life of the solar farm, the site will be rehabilitated to either arable agricultural land with/without replanted tree habitat areas.

5.5 Other fauna protection and management measures

Other fauna protection and management initiatives include the following:

• morning trench inspections to clear animals from any trenches that have been left open overnight; these animals will alter be released in safe nearby habitat areas;

• checking trees that are to be removed for nests or other fauna and relocating that fauna to safe habitat areas;

•setting speed limits (20 km per hour on roads and tracks);

• installing warning signs on roads and tracks in the vicinity of the solar farm to reduce potential vehicle strikes;

• the maintenance of a clean, rubbish-free area; and

• preparation of procedures which detail how to care for animals found at risk of harm or injured at the solar farm site.

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Appendix A: Likelihood of occurrence of threatened fauna

Scientific Name	Common Name	Conservation Status		Known or predicted occurrence in region		Records from the locality		Survey Records	Potential occurrence in the Modification area or immediate surrounds
		TSC Act	EPBC Act	NSW OEH Database	Protected Matters	Wildlife Atlas NSW	Birdlife Aust.		
Anthrochaera phrygia	Regent Honeyeater	CE	CE	Yes	-	No	No	No	Opportunistic habitat available to Regent Honeyeaters when Yellow Box and Blakely's Red Gum is in flower.
Lathamus discolour	Swift Parrot	E	CE	Yes	-	No	No	No	Larger trees stands possible stopping points for Swift Parrots in migration.
Calidris ferruginea	Curlew Sandpiper	E	CE	Yes	-	No	No	No	Reservoir 1 could provide ephemeral habitat when it contains water.
Grantiella picta	Painted Honeyeater	V	V	Yes	-	No	No	No	Opportunistic habitat available to Painted Honeyeaters when Yellow Box and Blakely's Red Gum is in flower.
Rostratula australis	Australian Painted Snipe	E	E	Yes	-	No	No	No	No habitat available.
Hieraaetus morphnoides	Little Eagle	V	-	Yes	-	No	No	No	No habitat available. Insufficient tree cover.
Maccullochella peelii	Murray Cod	V	V	Yes	-	No	No	No	No habitat available.
Litoria booroolongensis	Booroolong Frog	E	E	Yes	-	No	No	No	No riparian habitat available.

Scientific Name	Common Name	Conservation Status		Known or predicted occurrence in region		Records from the locality		Survey Records	Potential occurrence in the Modification area or immediate surrounds
Phascolarctos cinereus	Koala	V	V	Yes	-	No	No	No	Larger tree stands contains secondary food trees, but trees are inaccessible to koalas.
Chalinolobus dwyeri	Large Pied Bat	V	V	Yes	-	No	No	No	No habitat available. Insufficient tree cover.
Dasyurus maculatus maculatus	Spotted-tail Quoll	V	-	Yes	-	No	No	No	No habitat available. Insufficient tree cover or ground cover available.
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	Yes	-	No	No	No	Larger tree stands may provide habitat for these bats.
Pteropus poliocephalus	Grey-headed Flying Fox	V	V	Yes	-	No	No	No	Opportunistic habitat available to Grey-headed Flying Foxes when Yellow Box and Blakely's Red Gum is in flower.
Aprasia parapulchella	Pink-tailed Worm-lizard	V	V	Yes	-	No	No	No	No habitat available.
Uvidicolos sphyrurus	Border Thick-tailed Gecko	V	V	Yes	-	No	No	No	No habitat available.

CE = Critically Endangered

E = Endangered

V = Vulnerable

Appendix B Fauna Detected On Site

Class	Common Name	Scientific Name	TSC Act	EPBC Act
Mammalia	House Mouse	*Mus musculus*	I	-
	Red Fox	*Vulpes vulpes*	I	-
Aves	White-faced Heron	*Ardea pacifica*	P	
	Pacific Black Duck	*Anas superciliosa*	P	
	Australian Maned Duck	*Chenonetta jubata*	P	
	Black-shouldered Kite	*Elanus axillaris*	P	
	Brown Falcon	*Falco berigora*	P	
	Black Falcon	*Falco subniger*	P	
	Nankeen Kestrel	*Falco cenchroides*	P	
	Pied Currawong	*Strepera graculina*	P	-
	Magpie	*Cracticus tibicens*	P	
	Grey Butcherbird	*Cracticus torquatus*	P	
	Australian Raven	*Corvus coronoides*	P	
	Peaceful Dove	*Geopelia striata*	I	
	Crested Pigeon	*Ocyphaps lophotes*	P	
	Musk Lorikeet	*Glossopitta roncinna*	P	
	Eastern Rosella	*Platycercus exemius*	P	
	Cockatiel	*Nymphicus hollandicus*	P	
	Sulphur-crested Cockatoo	*Cacatua galerita*	P	
	Galah	*Eolophus rosiecapilla*	P	
	Little Corella	*Cacatua sanguinea*	P	
	Superb Fairy Wren	*Malrus cyaneus*	P	
	Noisy Miner	*Manorina melanocephala*	P	
	Welcome Swallow	*Hirundo neoxena*	P	
	Fairy Martin	*Petrochelidon ariel*	P	
	Brown Songlark	*Cincloramphus curalis*	P	
	Common Starling	*Sturnus vulgaris*	I	
	Australasian Pipit	*Anthus novaeseelandiae*	P	
Reptiles	Eastern Brown Snake	*Pseudonaja textilis*	P	
	Inland Snake-eyed Skink	*Cryptoblepharus pannosus*	P	
	Grass Skink	*Lampropholis guichenoti*	P	
Frogs	Nil			
Fish	Nil			

Note: P = protected, V = vulnerable, I = introduced, M = migratory.

Appendix C: Migratory Species known or potential occurrence within the study area and/or locality.

Scientific Name	Common Name	Conservation Status		Known or predicted occurrence in region	Records from the Locality		Current Survey
		TSC Act	EPBC Act	Protected Matters	Wildlife Atlas	Birdlife Australia	
Apus pacificus	Forked-tailed Swift	-	M	✓	-	-	-
Hirundapus caudacutus	White-throated Needletail	-	M	✓	-	-	-
Actitis hypoleucos	Common Sandpiper	-	M	✓	-	-	-
Calidris acuminata	Sharp-tailed Sandpiper	-	M	✓	-	-	-
Monarcha melanopsis	Black-faced Monarch	-	M	✓	-	-	-
Motacilla flava	Yellow Wagtail	-	M	✓	-	-	-
Myiagra cyanoleuca	Satin Flycatcher	-	M	✓	-	-	-
Pandion haliaetus	Osprey	-	M	✓	-	-	-
Rhipidura rufifrons	Rufous Flycatcher	-	M	✓	-	-	-
Rostratula benghalensis	Painted Snipe	E	M	✓	-	-	-

Note: E = endangered, M = migratory.

Appendix D: Assessments of Significance

Birds

Two of the threatened species that have been recorded within 10 kilometres of the project area have been excluded from this assessment as there is no habitat available for these birds in the project area. Those species were the Little Eagle and Australian Painted Snipe.

Wetland-associated Birds

One threatened wetland bird species has the potential to occur in the project area:

• Curlew Sandpiper *Calidris ferruginea*

Habitat for both of this bird is extremely limited and confined to the area around Reservoir 1(Figure 2).

1. How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Curlew Sandpipers are known or predicted to occur in the region (Appendix A) but were not detected during the fauna assessment in November 2017. Habitat for this species is limited to the area around Reservoir 1. Reservoir 1 will be excluded from the development footprint and is detached from the rest of the project area. The proposed establishment of the solar farm is unlikely to affect the lifecycle of these threatened species.

2. How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

No water bodies would be directly impacted by the proposal.

3. Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The Curlew Sandpiper is distributed around most of the Australian coastline (including Tasmania). It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are mainly of birds pausing for a few days during migration. They are not at the limit of their distribution at Gunnedah (OEH 2017a).

4. How is the proposal likely to affect current disturbance regimes?

As indicated in 4.2 the construction and operation of the solar farm would not result in a significant change to existing disturbance regimes, given impacts would be limited already cleared agricultural land and the loss of trees that will occur will occur in areas not frequented and out of reach of these birds. No dams will be affected by the project and the distribution of Curlew Sandpipers will not be impacted.

5. How is the proposal likely to affect habitat connectivity?

As indicated in 4.2 the construction and operation of the solar farm would not result in an adverse impact on habitat connectivity for these birds. Reservoir 1 provides potential habitat for these birds and it will be conserved and protected during the construction and operation of the solar farm .

6. How is the proposal likely to affect critical habitat?

No area of critical fauna habitat occurs near the project area as designated by the Register of Critical Habitat held by the Commonwealth Minister of the DotE (DotE, 2014), Register of Critical Habitat held by the Director-General of the OEH (OEH 2017), or the Register of Critical Habitat held by the Director-General of the DPI-Fisheries (DPI-Fisheries, 2017).

Woodland Birds

One threatened woodland bird has the potential to occur within the project area:

- Painted Honeyeater *Grantiella picta*

1. How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Painted Honeyeaters have been recorded or are predicted to occur in the region (Appendix A) but n were not detected on site during the fauna assessment carried out in November 2017. Habitat for these birds is restricted to the remaining stands of mature eucalypts and these trees will be retained in fields B7 and B9 and conserved. The proposed establishment of the solar farm is unlikely to affect the lifecycle of these threatened species.

2. How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The mature eucalypts in the conserved tree stands in the project area will be included in a vegetation buffer zone. The management of the buffer zone will improve the habitat value of these trees. The proposal will not adversely affect the habitat of these species.

3. Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Painted Honeyeaters have a wide distributions in NSW and none are at the limit of their known distribution (OEH 2017a).

4. How is the proposal likely to affect current disturbance regimes?

As indicated in 4.2 the construction and operation of the solar farm would not result in a significant change to existing disturbance regimes, given impacts would be limited already cleared agricultural land and the minor loss of trees that will occur. The trees that may provide habitat are located in the tree stands in field B7 and B9 and will be conserved.

5. How is the proposal likely to affect habitat connectivity?

As indicated in 4.2 the construction and operation of the solar farm would not result in an adverse impact on habitat connectivity for these birds. The mature eucalypts in the tree stands fields B7 and B9 in the project area will remain and be conserved and potential movement corridors will be retained. All potential habitat for these birds will be conserved and protected during the construction and operation of the solar farm .

6. How is the proposal likely to affect critical habitat?

No area of critical fauna habitat occurs near the project area as designated by the Register of Critical Habitat held by the Commonwealth Minister of the DotE (DotE, 2014), Register of Critical Habitat held by the Director-General of the OEH (OEH 2017), or the Register of Critical Habitat held by the Director-General of the DPI-Fisheries (DPI-Fisheries, 2017).

Regent Honeyeater and Swift Parrot

The following birds are considered to have the potential to occur within the project area:

• Swift Parrot *Lathamus discolor*

• Regent Honeyeater *Anthochaera phrygia*

1. How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Swift Parrot is a non-breeding autumn-winter migrant to mainland Australia (breeds in Tasmania), where they forage primarily on nectar from winter flowering plants (OEH 2017a). Similarly, within NSW the Regent Honeyeater is known to breed in the Capertee Valley and the Bundarra-Barraba regions during spring and summer, but can move large distances during the non-breeding season to forage on winter nectar resources (OEH 2017a). Both species would forage lerp and/or insects when nectar resources are scarce.

Suitable vegetation for these species within the project area is limited to the two stands of mature eucalypts that occur in the project area (in fields B7 and B9). These trees will be retained and conserved. The proposed establishment of the solar farm is unlikely to affect the lifecycle of these threatened species.

2. How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The mature trees in the two tree stands on site will be retained and included in a vegetation buffer zone. The management of the buffer zone will improve the habitat value of these trees. The proposal will not adversely affect the habitat of these species.

3. Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Within the project area, neither of these species are at the limits of their known distribution (OEH 2017a).

4. How is the proposal likely to affect current disturbance regimes?

As indicated in 4.2 the construction and operation of the solar farm would not result in a significant change to existing disturbance regimes, given impacts would be limited already cleared agricultural land and the loss of the few paddock trees that will occur will occur in areas not frequented by these birds. The trees that may provide habitat for Swift Parrots and Regent Honeyeaters are located in the two mature tree stand areas in fields B7 and B9 in the project area and will be conserved.

5. How is the proposal likely to affect habitat connectivity?

As indicated in 4.2 the construction and operation of the solar farm would not result in an adverse impact on habitat connectivity for these birds. The trees that may provide habitat for Swift Parrots and Regent Honeyeaters are located in the two tree stand areas on the site and will be conserved. The creation of vegetation buffer zones should enhance potential movement corridors for these birds.

6. How is the proposal likely to affect critical habitat?

No area of critical fauna habitat occurs near the project area as designated by the Register of Critical Habitat held by the Commonwealth Minister of the DotE (DotE, 2014), Register of Critical Habitat held by the Director-General of the OEH (OEH 2017), or the Register of Critical Habitat held by the Director-General of the DPI-Fisheries (DPI-Fisheries, 2017).

<u>Mammals</u>

Two of the threatened species that have been recorded within 10 kilometres of the project area have been excluded from this assessment as there is no habitat available for these birds in the project area. Those species were the Spotted-tail Quoll and Large-eared Pied Bat.

Three threatened mammal species have the potential to occur in the project area:

• Koala *Phascolarctos cinereus*

• Corben's Long-eared Bat *Nyctophilus corbeni*

• Grey-headed Flying Fox *Pteropus poliocephalus*

Koala

Potential habitat for the koala (*Phascolarctos cinereus*) occurs within the project area.

1. How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Koala is known to occur widely in the Gunnedah region and records exist within 10 kilometres of the proposed location of the solar farm (Appendix A). Gunnedah Shire Council has prepared a Koala Management Plan (Gunnedah 2015) that details the many koala sightings in the area as well as mapping the areas of primary and secondary koala habitat. The location of the proposed solar farm falls within the region demarcated as having secondary habitat for koalas.

A search for koalas was carried out on the site in October 2017. The search involved a visual inspection of the trees on the property for signs of koalas (such as scratch marks on the trees, droppings or direct sightings). No evidence of the presence of koalas on the site could be found. The owners of the property were also interviewed and they have never seen koalas on the site.

The reason why koalas appear to be absent from the property despite the presence of a limited number of secondary food trees is that the trees are too few and are too isolated from known koalas areas. The three main tree stands on the site (Figure) are all widely separated from each other (by more than 500 metres of open field) and are quite small (with between 12 and 39 potential food trees present). The distance between tree areas means that koalas would be forced to make a long overland crossing in order to reach the trees. Most koala fatalities to feral predators occur when koalas are on the ground , and in general, koalas survive better in areas where they do not need to come to the ground at all. The historic clearance of the woodland on this site has undoubtedly removed large areas of potential koala habitat and has left the few remaining stands of trees out of reach to the remaining koalas that are focussed along the Namoi River corridor.

2. How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The only potential habitat for koalas on the site is the three tree stands noted in Figure . The proposed solar farm layout would result in the loss of the tree patch between fields B1 a and B1b (Figure). The more substantial tree areas in fields B7 and B9 will remain and will be protected from damage during the construction of the solar farm.

The loss of the trees in the area between fields B1a and B1b will not adversely affect the local community population as these trees are already out of range of koalas and are not used by the local population. Similarly, these trees are not part of a koala movement corridor and their loss will not interfere with koala movements in the local area.

3. Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The Koala has a broad but fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia (OEH 2014a). The species is not at the limits of its known distribution.

4. How is the proposal likely to affect current disturbance regimes?

As indicated in 4.2 the construction and operation of the solar farm would not result in a significant change to existing disturbance regimes, given impacts would be limited already cleared agricultural land and the loss of trees that will occur will occur in areas not frequented and out of reach to koalas.

5. How is the proposal likely to affect habitat connectivity?

As indicated in 4.2 the construction and operation of the solar farm would not result in a significant impact to koala habitat connectivity. The areas to be impacted are not in a koala movement koalas are unable to reach these areas.

6. How is the proposal likely to affect critical habitat?

No area of critical fauna habitat occurs near the study area as designated by the Register of Critical Habitat held by the Commonwealth Minister of the DotE (DotE, 2014), Register of Critical Habitat held by the Director-General of the OEH (OEH 2017), or the Register of Critical Habitat held by the Director-General of the DPI-Fisheries (DPI-Fisheries, 2017).

Grey-headed Flying-fox

The Grey-headed Flying-fox (*Pteropus poliocephalus*) has the potential to occur within the project area.

1. How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The Grey-headed Flying-fox is known to occur in the region and records exist for the locality. The species was not been recorded during the fauna assessment conducted in November 2017. Grey-headed Flying-foxes feed on nectar and pollen of native trees as well as fruits, and occur in a wide range of habitats (OEH 2017a). During the day individuals aggregate in camps, which are important for mating, giving birth and rearing young. Camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy (OEH 2017a). The Grey-headed Flying-fox can travel large distances (up to 50 km) from their camp to forage (OEH 2017a). No camps were observed within or near the study area.

The significant habitat trees available to the flying foxes are the those that occur in the two tree stands in fields B7 and B9 in the project area. These trees may provide nectar for flying foxes when in flower. These trees will be retained and conserved. The proposed establishment of the solar farm is unlikely to affect the lifecycle of these bat.

2. How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The mature trees in the two mature tree stands will be retained and included in a vegetation buffer zone. The management of the buffer zone will improve the habitat value of these trees. The proposal will not adversely affect the habitat of these species.

3. Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The Grey-headed Flying-fox occurs in a 200 km broad band along the east coast of Australia from Bundaberg, QLD to Melbourne, VIC (OEH 2017a). Thus, the species is not at the limits of its known distribution.

4. How is the proposal likely to affect current disturbance regimes?

As indicated in 4.2 the construction and operation of the solar farm would not result in a significant change to existing disturbance regimes, given impacts would be limited already cleared agricultural land and the loss of the few paddock trees that will occur will occur in areas not frequented by these

bats. The trees that may provide habitat for flying foxes are located in the two mature tree stands in fields B7 and B9 will be conserved.

5. How is the proposal likely to affect habitat connectivity?

As indicated in 4.2 the construction and operation of the solar farm would not result in an adverse impact on habitat connectivity for these bats. The trees that may provide habitat for Grey-headed Flying Foxes are located in the two mature tree stand areas and will be conserved. The creation of vegetation buffer zones should enhance potential movement corridors for these bats.

6. How is the proposal likely to affect critical habitat?

No area of critical fauna habitat occurs near the study area as designated by the Register of Critical Habitat held by the Commonwealth Minister of the DotE (DotE, 2014), Register of Critical Habitat held by the Director-General of the OEH (OEH 2017), or the Register of Critical Habitat held by the Director-General of the DPI-Fisheries (DPI-Fisheries, 2017).

Corben's Long-eared Bat

Corben's Long-eared Bat (*Nyctophilus corbeni*) has the potential to occur within the project area.

1. How is the proposal likely to affect the lifecycle of a threatened species and/or population?

Corben's Long-eared Bat has not been recorded in the immediate vicinity of the project site and was not detected during the recent fauna assessment carried out in October 2017. These bats will often seek shelter in small terminal or mid-branch hollows. The only trees on the project area that have such hollows are in the two mature tree stands that occur in fields B7 and field B9 in the project area. These trees will be retained and conserved. The proposed establishment of the solar farm is unlikely to affect the lifecycle of these threatened species.

2. How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The mature trees in the two tree stands will retained and includes in a vegetation buffer zone. The management of the buffer zone will improve the habitat value of these trees. The proposal will not adversely affect the habitat of these species.

3. Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

Corben's Long-eared Bat is widely distributed around the western slopes an semi-arid of New South Wales; its distribution coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species (OEH 2017a). Thus, the species is not at the limits of its known distribution.

4. How is the proposal likely to affect current disturbance regimes?

As indicated in 4.2 the construction and operation of the solar farm would not result in a significant change to existing disturbance regimes, given impacts would be limited already cleared agricultural land and the loss of the few paddock trees that will occur will occur in areas not frequented by these bats. The trees that may provide habitat for Corben's Long-eared Bat are located in the two mature tree stands in fields B7 and B9 in the project area and will be conserved.

5. How is the proposal likely to affect habitat connectivity?

As indicated in 4.2 the construction and operation of the solar farm would not result in an adverse impact on habitat connectivity for these flying foxes. The trees that may provide habitat for them is located in the two mature tree stands on site and will be conserved. The creation of vegetation buffer zones should enhance potential movement corridors for these bats.

6. How is the proposal likely to affect critical habitat?

No area of critical fauna habitat occurs near the study area as designated by the Register of Critical Habitat held by the Commonwealth Minister of the DotE (DotE, 2014), Register of Critical Habitat held by the Director-General of the OEH (OEH 2017), or the Register of Critical Habitat held by the Director-General of the DPI-Fisheries (DPI-Fisheries, 2017).

Reptiles

Two threatened species of legless lizard have the potential to occur in the project area:

- Pink-tailed Worm Lizard *Aprasia parapulchella*
- Striped Legless Lizard *Delma impar*

Habitat does not exist for either species on the project site and so neither species is further assessed for potential impacts.

Frogs

No threatened frogs occur within the project area. The Booroolong Frog *Litoria booroolongensis* has been recorded in the vicinity of Gunnedah but there is no habitat for this species on the project site.

Fish

No threatened fish species occur within the project area. The Murray Cod *Maccullochella peelii* has been recorded in waterways in the Gunnedah area but there are no suitable waterways on the project site for this fish species.