Responses to council feedback to proposed construction of UNE solar farm

	Issue	Details of issue	Response
1.	**Additional Information Requested by Council**		
a)	**Large Dimensioned Plan**	Large dimensioned plan which shows the proposed solar installation for Stages 1 and 2 and the title boundaries of the subject site	Please refer to Drawing 251025-000-DRG-EG-0011.
b)	**Dimensioned Typical Drawing**	Dimensioned drawing of typical solar installation, including details of footings.	Please refer to Drawing 251025-000-DRG-EG-0045.
c)	**Details of visual screening**	Details of any visual screening along the northern boundary (given the location of residences further to the north which may have an outlook towards the proposed solar installation).	To assess the potential impacts of both construction and operation to the property, an additional site visit was undertaken on 30 November 2017 to specifically assess potential visual impacts and to identify potential landscaping options to minimise any potential visual impact. The options provided are high level concepts only, and further detailed design would be undertaken to determine what would be required to provide sufficient visual screening for the local residents. Please refer to Landscaping Options Report (Aurecon, 2017).
d)	**Location of proposed battery storage**	Site plan to show location of proposed battery storage for Stage 2 including the provision of dimensioned drawings in relation to the storage unit.	Please refer to Drawing 251025-000-DRG-EG-0010.
e)	**Drawing of meteorological station**	Dimensioned drawing of proposed meteorological station for Stages 1 and 2.	Please refer to Drawing 251025-000-DRG-EG-0045.
f)	**Fixed panels or rotating panels?**	Will the proposed solar installation utilize fixed panels or rotating panels?	The project will use fixed panels.
g)	**Marking of the trees**	Marking of the trees which are proposed to be removed on the site plan (including noting of species).	Please refer to Drawing 251025-000-DRG-EG-0011.

	Issue	Details of issue	Response
h)	**Koala Habitat**	It is noted that the Koala Management Plan prepared for the UNE campus (being 60 Madgwick Drive, Armidale) is referenced in the application. Is the subject site (comprising Lots 478, 794 and 796 in DP755808) considered to be Core or Potential Koala Habitat under SEPP No. 44 (Koala Habitat Protection) 2006? If the subject site is considered to be Core Koala Habitat a Koala Management Plan will need to be prepared which includes the subject site and referral of the application to the Department of Planning and Environment will be required. The current compensatory replacement rate for Koala feed trees is 1:5.	The Koala Plan of Management (UNE 2015), includes a figure of the vegetation survey undertaken to determine core koala vegetation (Page 6 of the plan). Core koala vegetation is located throughout the UNE campus and not within the location of the solar farm. The ecological assessment noted that proposal was subject to SEPP 44 and as such a NSW Assessment of Significance (seven-part tests) was undertaken. Given that patches of more intact native vegetation which can provide alternative foraging and roosting resources for fauna (including tree hollows, fallen timber and denser vegetation) occur to the north, south and west of the study area, the required clearing was considered to be minor in the context of the surrounding vegetation and the scale of impacts are small at a local and regional scale. UNE will offset the eight paddock trees at a ratio of 1:5 as identified by Council.
i)	**Construction Vehicles**	What type of construction vehicles will be accessing the site during the construction phase? In particular what type of heavy vehicles will be accessing the site during this phase, including number and frequency.	The precise type, number and frequency of heavy vehicles will not be known until the contractor is engaged and design and procurement is complete however approximate number of trucks movements over the course of the project are outlined in the SEE Section 5.9.2.
j)	**Barbed Wire Alternatives**	Alternatives to the use of barbed wire (on security fence) to provide a friendlier outcome for wildlife?	As a high voltage installation, a number of health and safety risks may exist within the site. To protect members of the public from such risks, access to the solar farm will need to be restricted and barbed wire fence is required to provide the necessary level of security. Aurecon is involved in many solar farms around Australia and can confirm that barbed wire fence is standard practice for all solar farms that Aurecon is aware of. We propose to apply a scratch barrier (typically 50 cm tall colourbond or similar panel) to the fence to prevent Koala's from being able to climb to the barbed wire section of the fence.

Responses to submissions to proposed construction of UNE solar farm – December 2017

	Issue	Details of issue	Response
Respondent 1			
1.	**General Procedural Matters**		
a)	**Consultation with respondent**	It is our understanding that a requirement of any Development Application is that affected residents be consulted during the SEE assessment process. No such consultation has taken place with us despite our being owner occupiers of an adjacent residential property.	Aurecon acknowledges that 128 Kirby Road was omitted from the SEE. Early consultation with this landowner would have resulted in potential concerns relating to the proposal's construction and operation, being appropriately assessed in the SEE. Each issue raised by the respondent has been addressed in this document.
b)	**Exclusion of property at 128 Kirby Road, Armidale**	In fact, it would seem that the potential effects of the development on our property at 128 Kirby Road has been entirely omitted from the SEE. 128 Kirby Road is clearly an adjacent residential property which is likely to experience some significant impact from the proposed development. This omission is therefore a significant flaw in the SEE.	As per item 1a), Aurecon acknowledges that 128 Kirby Road was omitted from the SEE. It is noted that the residence at this identified property appeared to be located within a highly vegetated area and within undulating terrain which resulted in the property not being visible from the site during the initial site inspection. To assess the potential impacts of both construction and operation to the property, an additional site visit was undertaken on 30 November 2017 to specifically assess potential visual impacts and to identify potential landscaping options to minimise any potential visual impact. This report is included as Attachment 1. The report noted that the house at 128 Kirby Road is situated behind reasonably dense remnant vegetation and is expected to have a limited visual impacts associated with the proposed works. However, the report proposes a number of potential landscaping options which would further mitigate any potential visual impact. The proposed options are described in Attachment 1. The options provided are high level concepts only, and further detailed design would be undertaken to determine what would be required to provide sufficient visual screening for the local residents.
c)	**Development notification proposes site as 303 Cluny Road, Armidale**	The Development Notification you sent also lists the proposed development as being located at 303 Cluny Road, Armidale. From the accompanying SEE this is clearly in error and introduces some considerable confusion as to the actual location of the proposed development.	Council used 303 Cluny Road, which is the address provided by the NSW Government Value General and relates to Property 1843776. Lots 478, 794 and 796, DP755808, on which the solar farm is to be constructed, are located within Property 1843776.

	Issue	Details of issue	Response
2.	**Detailed technical issues with the SEE**		
a)	**No photo montages supplied**	We believe that any SEE of a proposed development requires photo montages to be provided indicating how the proposed development will appear once complete. No such images are included in the SEE you have provided.	A photograph of a row of typical fixed tilt solar panels was provided in Plate 3-7 of the SEE. Due to the complexity of the undulating landscape and the solar farm design, photomontages can be difficult to produce and do not necessarily provide a realistic view of how the constructed solar farm will look. A series of photographs from existing solar farms have been provided in Attachment 2. This solar farm is of 20 MWac capacity, comprising 83,000 solar panels. Stage 1 and Stage 2 of the UNE solar farm will be approximately 3 MWac capacity each and would comprise about 12,000 panels each depending on the solar panel supplier.
b)	**Exclusion of property at 128 Kirby Road, Armidale**	No photographs of any type are included to indicate that 128 Kirby Road is an adjacent property to the proposed development site – particularly Phase 2.	The residence at this identified property appeared to be located within a highly vegetated area and within undulating terrain which resulted in the property not being visible from the site during the initial site inspection. The vegetation was also very evident in the imagery used in the SEE and as such 128 Kirby Road was overlooked in the SEE.
c)	**Not enough mitigation measures suggested for visual impact**	No indication is provided throughout the SEE of any proposed screening of the development in order to mitigate the acknowledged visual impact and the capacity to undertake such an option on UNE land immediately north of the proposed development site.	As discussed item 1b), an additional site visit was undertaken on 30 November 2017 to specifically assess potential visual impacts at both 128 Kirby Road and 209 Clarkes Road. A number of landscaping options to minimise any potential visual impact have been proposed. The proposed options described in Attachment 1 are high level concepts only, and further detailed design would be undertaken to determine the species to be used and what the best option would be to provide sufficient visual screening for the local residents.
d)	**Lack of transparency of timeline**	No indication is provided regarding timescale of the proposed development. When is it proposed to take place and what will be the duration of the construction of both Phase 1 and Phase 2?	Page 19 of the SEE states that the construction of each stage of the solar farm is likely to occur over a period of approximately six months. Stage 1 of the project is expected to commence in 2018 however the final timeline for stage 1 cannot be determined until tenders have been submitted and the Contractor has been selected. Once this process is completed, UNE would notify the neighbouring properties, including 128 Kirby Road, of the commencement of construction and of the construction program. Stage 2 of the project requires further internal UNE approvals and there are no plans for the immediate progression of this work.

	Issue	Details of issue	Response
e)	**Impacts from construction and operation**	The final conclusion of Page ii states that "it is unlikely that the construction and operation of the solar farm will significantly impact the local residences". In the case of 209 Clarkes Road, which is included in the report, this statement is clearly not true on the basis of information provided in the SEE. The report itself points to significant noise, dust and visual impacts both during construction and with ongoing operation of the proposed development. Just as significant, 128 Kirby Road has been entirely omitted from the assessment, so this conclusion simply cannot be sustained for our property on the basis of the SEE	Construction noise: Chapter 5.3.3 of the SEE refers to potential noise impacts. The SEE does not state that there will be significant noise impacts, rather that there will be some construction noise from excavation and piling activities. Construction activities will be limited to daylight hours. • Monday to Friday: 7am to 6pm • Saturdays: 7am to 1pm • No work on Sundays and Public Holidays Mitigation measures will be included in the Contractors CEMP to ensure that noise impacts on the neighbouring residents are minimised. Construction dust: Chapter 5.5.3 of the SEE refers to potential air quality impacts. The construction of the solar farm involves only a moderate amount of earthworks, related to piling, provision of access tracks and some excavation to manage drainage. No ground cover vegetation clearing will be undertaken, which will minimise the potential for generating fugitive dust. Vegetation clearance will be restricted to the removal of the trees identified in the Flora and Fauna assessment, provided in Appendix B of the SEE. There is a potential for some dust to be generated by the movement of the trucks delivering equipment. These activities are considered to be temporary and would be managed in accordance with the CEMP prepared by the Contractor. Construction visual: Chapter 5.14.3 of the SEE refers to potential visual impacts. The SEE acknowledges that the landscape character of the area is rural and that construction of the solar farm would be different to the normal activities experienced at the site. Mitigation measures will be included in the Contractors CEMP to ensure that visual impacts on the neighbouring residents are minimised, particularly during construction. Landscaping is proposed to address the potential visual impacts during operation. General construction activities: A CEMP would be prepared by the Contractor and would outline appropriate measures for mitigating any potential environmental impacts, including noise, dust and visual. In addition, the CEMP would address any specific requirements raised by Council and included in the conditions of approval.

	Issue	Details of issue	Response
			The generation of noise, dust and visual impacts from construction activities are considered to be temporary, with construction likely to occur over a period of six months for each stage. Construction staff would also be inducted into the CEMP and regular pre-start meetings and tool box talks will be used to ensure that the requirements of the CEMP are complied with. <u>Solar farm operation:</u> Chapter 3.5 of the SEE states that although Stage 1 and Stage 2 are both anticipated to operate for 25 years, during this time the number of staff required on site is minimal, with the solar farm able to operate unmanned. Operation and maintenance staff will be required to attend the site periodically to conduct inspections, to undertake scheduled maintenance and to respond to any faults or equipment failure. The potential impacts to the local community, including the properties at 128 Kirby Road and 209 Clarkes Road are considered to be minimal. The solar farm will use fixed tilt panels, which means there are few moving parts and as such the operational noise from the infrastructure will be minimal. Any potential noise generated by maintenance staff, if any, will decrease significantly over the distance of the solar farm and the two properties.
f)	**Impacts from construction and operation**	P8 – Indicates that the residential property at 209 Clarke's Road (400m from the proposed development site) will experience traffic, dust and noise impacts from the construction phase and potential visual impact during operation. Our property 128 Kirby Road has however been omitted from this assessment despite being an equivalent distance from the proposed development.	As discussed in Item 2e) above, the generation of noise, dust and visual impacts from construction activities will be temporary, with construction likely to occur over a period of six months for each stage. Construction staff would also be inducted into the requirements of the CEMP and regular pre-start meetings and tool box talks will be required to ensure that the CEMP is complied with. Once operational, the solar farm will be unmanned and there would be very low levels of noise from the solar farm itself. Operation and maintenance staff will be required periodically to attend the site in order to conduct inspection, maintenance and respond to any faults or equipment failure. The potential impacts from maintenance activities to the local community are considered to be minimal. It is noted that 128 Kirby Road, is separated from the solar farm site by reasonably dense remnant vegetation, which will also likely to reduce these potential impacts further. As discussed previously a number of landscaping options to minimise any potential visual impact have been proposed and will be implemented following construction of the solar farm.

	Issue	Details of issue	Response
g)	**Explanation as to why other options were eliminated from selection**	P10 – On the basis of the assessment, Site 4 would appear to be equally, if not more attractive as a development site. No justification is provided as to why it was rejected beyond the possibility of vandalism(?) which seems somewhat flimsy.	Potential vandalism was only one minor aspect of what was considered in the selection of the site. To determine the best possible location for the highest quality energy output, many factors contributed to finding the most suitable location. These factors took into account, but where not limited to, the proximity to city center and grid connection, topography, slope and size of the Lot for both stage 1 and stage 2 of the project. Site 4 was excluded predominately due to the topography of the land and the size of the Lot. As discussed in Section 2.3.5 of the SEE, the slope of Site 4 property is predominately south facing and there is a potential for increased self-shading, and as a result, the solar farm energy output would be reduced. This is also further discussed in Item 2h). In addition the site would not adequately accommodate stage 2 of the project. For these reasons, and on comparison to the other location assessed, Site 2 was found to be most favourable
h)	**Incorrect slope recorded for potential sites**	P9 and P10 – We believe the slope angles suggested for Site 3 and Site 4 are in error.	The slope gradients have been calculated approximately based on topographic maps of the locality. The slope varies across each site investigated, however, Aurecon consider that the original estimates are approximately in line with the average slope for the majority of each respective area. When identifying slope gradient of the sites, the degree of slope as well at the direction of the slope are both important. The slopes of both Site 3 and 4 are predominately south facing areas, whilst Site 2 is predominately north facing. North facing sites reduce the degree of row to row shading and increases the energy generation of the solar farm.
i)	**Incorrect reference to 'New England Freeway'**	P11 – There is no such road as the New England Freeway!	This was an error in Chapter 2.3.6 only. The New England Highway is correctly shown on all the drawings and the remainder of the text.
j)	**No appendices attached to SEE**	P16 – Refers to a "concept design" and "concept layout" in Appendix A. No Appendix A is included in the SEE report.	Appendix A is attached to the SEE and available on page 71. There are two figures which show the design and layout of the solar farm. Further detailed drawings have also been provided at the request of Council. These have been included in Attachment 3.

	Issue	Details of issue	Response
k)	**Assessment of traffic management required**	P16/P17 – Indicates that transmission lines will intersect Clarkes Road and suggests a 500m trench, 1.5m deep, 0.6m wide with an 8m corridor. If these are indeed the dimensions of such a trench, an assessment of access issues for local residents on Clarkes Rd, Kirby Road and Weirs Road is required.	Chapter 5.9 of the SEE addressed potential traffic and access impacts. Chapter 5.9.3 includes mitigation measures to manage the temporary impacts that may occur to traffic and access. The proposed construction activities will be temporary and only result in short term impacts to local traffic and residents. The Contractors CEMP will also include a Construction Traffic Management Plan (CTMP). The CTMP will include the use of traffic controllers to manage traffic flows while construction activities will be scheduled to avoid peak periods. The CTMP will also include details of residential access and how it will be maintained throughout the works. Although a trench will be excavated through Clarkes Road, access to the properties on Clarkes Road, Kirby Road and Weirs Road will be maintained. Should temporary road closures be required, these will be undertaken in consultation with the Council, and accordance with the CTMP, conditions of approvals and the relevant legislation. Consultation with the residents of the impacted properties will also be undertaken.
l)	**No lists of Threatened species**	P35 – Refers to Appendix B for lists of Threatened species. No Appendix B is included in the SEE report.	Appendix B on page 73 of the SEE includes the ecological assessment. This assessment includes the likelihood of threatened species in the existing study area, vegetation communities and includes an outline of any other potential ecological constraints. This data is provided in the following tables in Appendix B of the SEE: ■ Table 5 - Flora species recorded within the study area ■ Table 6 - Fauna species recorded within the study area ■ Table 7 - Flora likelihood of occurrence Appendix B has also been included in Attachment 4.
m)	**Noise assessment**	P40/41 – Assesses noise receivers but omits 128 Kirby Road despite it being adjacent to the proposed development site. And indeed it is clearly visible on Fig 5-2.	It is acknowledged that 128 Kirby Road, was omitted from the noise assessment, however as discussed in Item 2e) above, construction activities are considered temporary and would be undertaken in accordance with the Contractor's CEMP to minimise potential impacts to the local residences. Construction would only be undertaken during standard construction hours. There would be no operational noise from the solar farm. Operation and maintenance staff will be required to attend the site periodically to conduct inspection, scheduled maintenance and respond to any faults or equipment failure. The potential impacts to the local community are considered to be minimal.

	Issue	Details of issue	Response
n)	**Distance from residential receivers**	P40 – Claims that the nearest residential receiver is 650m away from the proposed development site. This presumably refers to 209 Clarkes Road. However, on P8 the property is a mere 400m from the site. 128 Kirby Road is again omitted.	It is acknowledged that there are conflicting distances identified from 209 Clarkes Road to the site boundary of the solar farm. This has been reassessed using GIS. The distance from each residence at is provided below: ■ 209 Clarkes Road to the property boundary of Stage 1 is 402.5m ■ 128 Kirby Road to the property boundary of Stage 2 is 591.6m This is shown in Attachment 5.
o)	**Glare and glint assessment has not included impact to residents**	P43 – Although a "glint and glare" assessment has been undertaken for approaching aircraft, no assessment of this potential issue has been undertaken for adjacent residential properties or passing vehicles on Clarkes Road.	Photovoltaic panels are designed to reflect as little light as possible (generally around 2% of the light received) to maximise their efficiency, absorb sunlight and convert it to electricity. Minimising the light reflected from solar panels is a goal of panel design, manufacture and installation. The glare from panels is significantly less than that from bodies of water[1]. Due to this, solar farms are not considered to be reflective and potential glint and glare on sensitive receivers is unlikely to be an issue. However, as discussed item 1b), an additional site visit was undertaken on 30 November 2017 to specifically assess potential visual impacts at both 128 Kirby Road and 209 Clarkes Road. A number of landscaping options to minimise any potential visual impact have been proposed. These landscaping measures would also minimise any potential glint and glare impacts at the two identified residences.
p)	**Sedimentation controls to nearby creeks and dams**	P46 – Indicates the potential for sediment laden runoff in the creek line to the north of the proposed development. This creek line enters 128 Kirby Road to the north of the proposed development site and would potentially impact at least two farm dams. Although general mitigation methods are discussed, no assessment of this specific impact has been undertaken.	Chapter 5.6 of the SEE has addressed the potential for construction and operation to cause sedimentation in the nearby creeks which cross the northern boundary of the property. The mitigation measures include the implementation of the Blue Book guidelines as a preliminary approach to controlling these potential impacts and is considered to be the minimum standard for control at any construction site. In addition, a 10-meter exclusion zone around the creek has been proposed, which is shown on the concept design provided in Appendix A and also on Figure 3-1 of the SEE. The Contractors CEMP will also include additional measures which may be required following confirmation of the construction methodologies. The detailed design of the solar farm will also address drainage issues to ensure that impacts to the creek are also effectively managed once the solar farm is operational.

[1] https://www.resourcesandenergy.nsw.gov.au/landholders-and-community/renewable-energy/solar-farms

	Issue	Details of issue	Response
q)	**Minimisation of visual impact**	P65 - Visual impacts of the development is assessed on Table 5-10. But again 128 Kirby Road is omitted from this assessment.	As per item 1b), Aurecon acknowledges that 128 Kirby Road was omitted from the SEE. The residence at this identified property appeared to be located within a highly vegetated area and within undulating terrain which resulted in the property not being visible from the site during the initial site inspection. During the site visit on 30 November 2017, it was noted that the house at 128 Kirby Road is situated behind reasonably dense remnant vegetation and as such is expected to have a limited views of the proposed works. A number of potential landscaping options have been provided (See Attachment 1) which would further mitigate any potential visual impact.
r)	**There was no mention of potential implementation of foliage screening presented in the SEE.**	P65 – Despite an identified visual impact, no mention is made in the "Mitigation measures" section of the possibility of screening of the proposed development via tree planting or similar. The availability of UNE land for this purpose would make it possible and this mitigation option should have been considered.	The implementation of vegetation corridors to create a visual barrier between the residents at both 128 Kirby Road and 209 Clarkes Road have been explored and a number of potential landscaping options have been included in the Landscaping Option report provided in Attachment 1 of this document.
s)	**Distance of receivers from site**	P65 – States that the nearest residence is >500m from the proposed development. This again conflicts with information provided on P8 and P40.	As discussed in Item 2n), it is acknowledged that there are conflicting distances identified from 209 Clarkes Road to the site boundary of the solar farm. This has been reassessed using GIS. The distance from each residence is provided below: ■ 209 Clarkes Road to the property boundary of Stage 1 is 402.5m ■ 128 Kirby Road to the property boundary of Stage 2 is 591.6m This is shown in Attachment 5.
t)	**Visual**	P67 – States that the proposed solar farm development will be "a small feature in the landscape". At a proposed 11 hectares or more, this statement is simply not correct.	Aurecon acknowledges that as the site proposed is 11 hectares or more, may not appear to be a 'small feature in the landscape'. This was stated as being a small feature in comparison with the extensive footprint of the rural properties around the site and in comparison to the foot print of the UNE campus. However, as discussed previously, the Landscaping Options report provided in Attachment 1 provides a number of landscaping options to minimise the visual impacts of the solar farm on the two residential properties.
u)	**Missing residence**	P67 – Table 5-11 again omits 128 Kirby Road despite it being an adjacent residential property.	Noted and discussed previously in items 1b), 2b) and 2q).

	Issue	Details of issue	Response
v)	**Visual screening**	P67 – States that open paddocks between the adjacent property and the proposed development would act as a visual buffer. This is clearly not the case. Again, no mention is made of potential screening of the proposed development in order to minimize its visual impact and this option should be considered.	Noted and as discussed previously, a Landscaping Options report has been included as Attachment 1 of this document. A number of landscaping options to minimise any potential visual impact have been proposed. These options are high level concepts only, and further detailed design would be undertaken to determine the species to be used and what the best option would be to provide sufficient visual screening for the local residents.
w)	**Greenhouse gas emission**	P68 – Refers to reductions in greenhouse gas emissions in CO_2 equivalents. The values presented seem very low and/or ill-informed. Are they total values? Or should they be timebound? i.e. 4.35 tonnes year^{-1}. Even so, this still seems like a minimal reduction given the scale of the proposed development.	Aurecon has estimated that the CO_2 emissions avoided by stage 1 of the solar farm will be approximately 3,975 tonnes per annum. It is likely that the incorrect unit (tonnes versus kilotonnes) was used in the calculation. The total CO_2 emissions avoided once both stage 1 and stage 2 are operational is estimated to be approximately 7,950 tonnes per annum.
Respondent 2			
3.	**Technical issues with SEE**		
a)	**Misuse of the land zoned as RU4 – Primary Production**	The site of the proposed development ("the site") and our land is zoned RU4 and the objectives of that zone are as outlined in the annexure. We submit that the creation of a solar power station does not encourage and promote diversity in employment opportunities in relation to rural industry enterprises and we further submit that the proposed development will increase conflict between land users rather than reduce it.	Section 4.2 of the SEE addresses the requirements of the Local Environmental Plans (LEP). Although the proposed location for the new solar farm site is within land zoned RU4 and is neither 'permitted without consent' or 'permitted with consent', the zoning from the *Armidale Dumaresq Local Environmental Plan 2012* is overridden by the *State Environment Planning Policy (Infrastructure) 2007* (Infrastructure SEPP). The 2007 SEPP in Division 4, Clause 34 (1) states, 'Development for the purpose of electricity generating works may be carried out by any person with consent on any land in a prescribed rural, industrial or special use zone'. The land on which the solar farm is to be located is wholly owned by UNE and is currently used for agricultural studies by the University. The University has sufficient land to accommodate any agricultural studies that might have been displaced by the construction of the solar farm.

	Issue	Details of issue	Response
b)	**Rezoning of land**	We would strenuously reject any proposal to re-zone the site for the purposes of enabling this development to occur.	As discussed in Chapter 2 of the SEE, the UNE Energy Management Policy states that the University recognises its responsibility to reduce the environmental impact of its activities and to ensure the sustainability of its operations. UNE has committed to a policy of effective use of energy in the pursuit of its strategic goals. The installation of the solar farm to provide renewable energy to the campus is consistent with the environmental and sustainability objectives of this policy. Stage 1 of the solar farm would supply about 35% of the campus electricity needs. The current use of the land is designated for teaching purposes of agricultural studies, The University has sufficient land to accommodate any agricultural studies that might have been displaced by the construction of the solar farm.
c)	**Other sites preferable**	The proposed development to the site would cover numerous acres. We submit that the development will have a substantial visual effect on the area surrounding it, including our property. In the immediate future there will be substantial increased activity by persons erecting the proposed development. The Applicant's submission (5.14) that the construction phase of the solar farm includes some minor visual impact severely understates the effect approximately 14 or 15 acres of solar panels being constructed has upon the site and its surrounds, particularly the rural residential properties surrounding it	As stated above in Item 2e), to determine the best possible location for highest quality energy output, many factors contributed to finding the most suitable location. These factors took into account, but where not limited to, the proximity to city center and grid connection, topography, slope and size of Lot for stage 1 and stage 2 of the project. The size of land available in Option 2 has been determined to be sufficient for stage 1 and stage 2 of the project. As discussed in Item 2f) above, construction activities are temporary and would be undertaken in accordance with the Contractors CEMP to minimise potential impacts to the local residences. There will be minimal activity at the site once the solar farm is operational. It is acknowledged that visually, the solar farm will not appeal to everyone, UNE is committed to providing landscaping to minimise the potential visual impacts to the local residences. The Landscaping Options report provided in Attachment 1 A number of landscaping options have been proposed. These options are high level concepts only, and further detailed design would be undertaken to determine the species to be used and what the best option would be to provide sufficient visual screening for both local residents and road users

	Issue	Details of issue	Response
4.	**Evidence requested**		
a)	**Studies requested**	It seems to us that there is potential for an increase in the size of the development in due course. On that basis, we submit that there are more appropriate sites listed in the study made available to us, particularly sites 3 and 4. These sites are far distant from any residential properties or in fact non-university owned lands. In addition, there is an electricity substation nearby which could take, we presume, any excess power generated by the system.	The reasons for Sites 3 and 4 being excluded have been provided in the SEE As previously discussed in Items 2g) and 2h) above, to determine the best possible location for the highest quality energy output, many factors contributed to finding the most suitable location. These factors took into account, but where not limited to, the proximity to city center and grid connection, topography, slope and size of the Lot for both present works and potential expansions. Site 4 was excluded predominately due to the topography of the land and the size of the Lot. As discussed in Section 2.3.5 of the SEE, the slope of Site 4 property is predominately south facing which would result in increased levels of self-shading, and as a result, the solar farm energy output would be reduced. This is also further discussed in Item 2h). In addition the site would not adequately accommodate stage 2 of the project. Because of these reasons, and on comparison to the other location assessed, Site 2 was found to be most favourable
b)	**Visual Buffer**	We have not been given much time to formulate our objections in this matter and reserve the right to make further objection. In particular, we request that the Applicant provide us with any scientific studies that they have carried out outlining the effect of the proposed development on native animals, native vegetation and generally on the surrounding lands.	An Ecological Assessment for the UNE Solar Farm is provided in Appendix B in the SEE. This assessment has explored the potential impacts to native animals, native vegetation and generally on the surrounding lands. The Ecological Assessment is provided in Attachment 4.

	Issue	Details of issue	Response
c)	**Other issues**	We wish to say that if the Council does decide to approve the Application in principal we reserve the right to speak against it at any Council meeting and in particular we reserve the right to make submissions in respect of the following matters: A. Buffer zones B. Restrictions on further development C. Compensation in respect of the reduction in value of our land	A. As determined with the property at 128 Kirby Road (above), when considering vegetation screening, the request for a 30m corridor provides significant challenges with the functionality of the solar farm. As the panels will require direct sunlight throughout the day, the use of trees, specifically tall growing native species, could negatively impact the functionality of the farm by causing shade and diminishing the electrical generation potential. Instead, tree planting which maintains a visual filtering of the natural area may be more appropriate UNE is committed to providing landscaping to minimise the potential visual impacts to the local residences. The Landscaping Options report provided in Attachment 1 proposes a number of landscaping options. These options are high level concepts only, and further detailed design would be undertaken to determine the species to be used and what the best option would be to provide sufficient visual screening for both local residents and road users B. The proposed solar farm and proposed future extensions of the solar farm (ie Stage 2) are the only intended expansions in the foreseeable future. Given the boundaries of the property and the maximum amount of energy required for use by the University, potential further expansion other than that identified in the SEE is unlikely. C. The NSW Office of Environment and Heritage (OEH) commissioned Urbis Pty Ltd to undertake an investigation into the potential impact of wind farm developments on property prices in NSW. The report[2] indicates "*that the literature review of Australian and international studies on the impact of wind farms on property values revealed that the majority of published reports conclude that there is no impact or a limited definable impact of wind farms on property values*". There does not appear to be a similar study for solar farms, however, it can be argued that wind farms have more of an impact on the local population from a noise and visual aspect, when compared to solar farms.

[2] www.environment.nsw.gov.au/resources/.../wind-farm-value-impacts-report.pdf - Review of the Impact of Wind Farms on Property Value, 21 July 2016 (Urbis Pty Ltd)

Responses to submissions to proposed construction of UNE solar farm – December 2017

Attachment 1 – Landscape Options Report

UNE Solar Farm

Landscaping Options

University of New England

Reference: 251025

Revision: 1

21 December 2017

aurecon

Bringing ideas to life

Document control record

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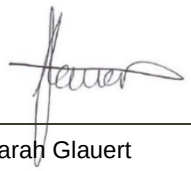
Author signature		Approver signature	
Name	Sarah Glauert	Name	Nicholas Wain
Title	Senior Consultant	Title	Associate, Energy

Contents

Figures

Tables

Plates

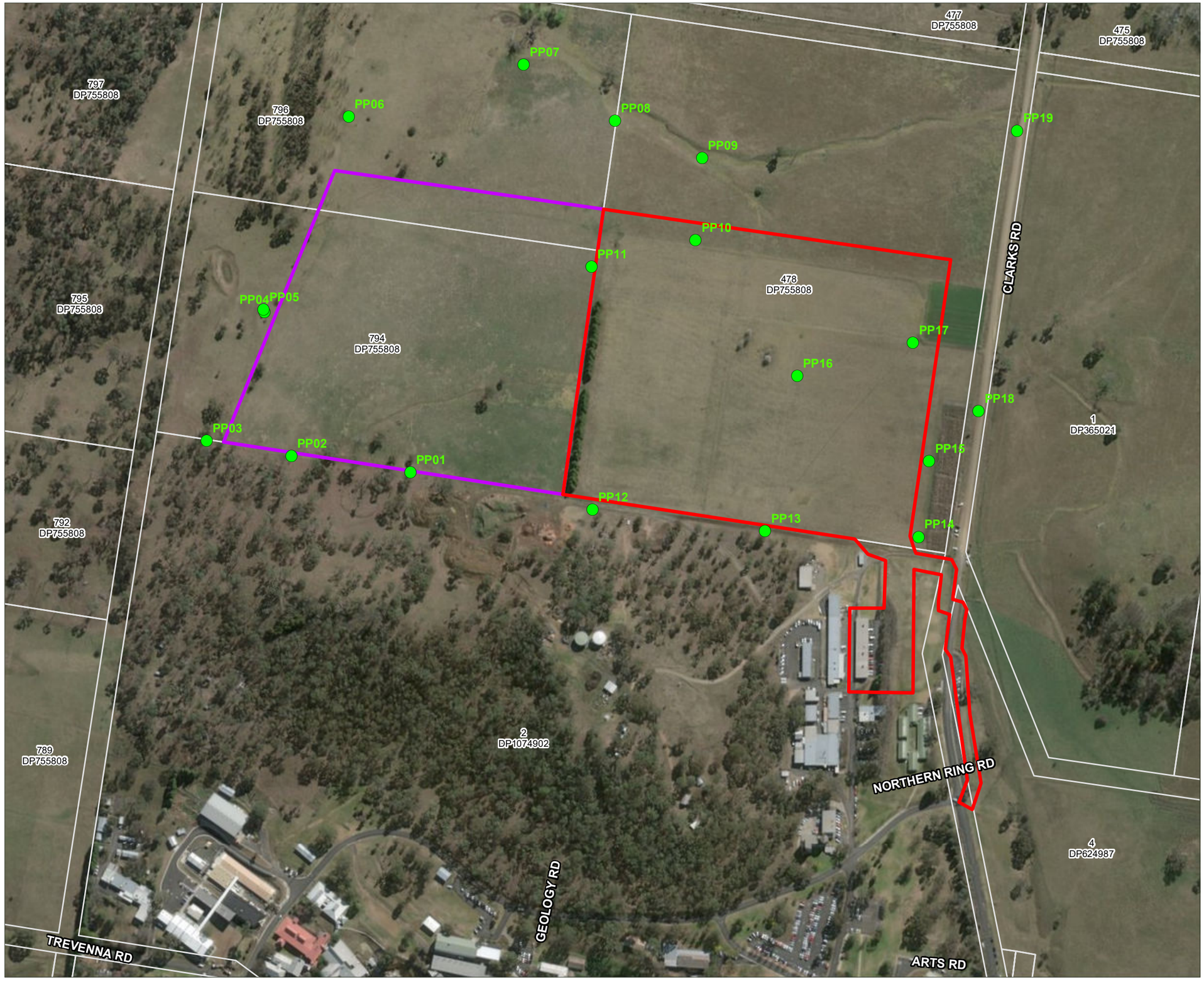
1 Background

This list of landscaping options for the UNE Solar proposal has been developed to address some of the concerns raised during the public review period of the Development Application process.

Two respondents were concerned around the lack of proposed visual mitigation measures and the potential visual impact that the proposed solar farm would have on their properties and road users along Clarks Road.

A site visit was conducted on 30 November 2017 to understand the landscape context in which the proposed solar farm will be situated. The proposed project site and the paddock directly to the north were both traversed on foot and many photographs taken to understand various levels of perceived possible visual impact upon adjoining properties.

Figure 1 shows the location of each respective photo points. Panoramic images were recorded at most of the photo points in order to better represent a visual perspective. Broad notes were taken at each point indicating the degree to which each house was easily visible from that vantage point. No images were specifically taken of the residences however they can be identified in several of the photographs.



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Legend

- Photo Point Locations
- Stage 1
- Stage 2
- Cadastre

Notes:

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A3 scale: 1:4,000

0 85 170 Metres

Job No:

Coordinate System: GDA 1994 MGA Zone 56

UNE Solar Farm Ecological Assessment

Figure 1: Photo Point Locations

2 Current conditions

The proposed solar farm will be situated on a hill which slopes north east at Stage 1 and north west on Stage 2. The closest residential property with visual access over the proposed sites is 187 Clarks Road. This property has a house situated on a hill which slopes to the south west potentially providing a view over much of both Stage 1 and 2. The second residential address which may have some oversight of the proposed solar farm is 128 Kirby Road. This house is situated behind reasonably dense remnant vegetation and is expected to have a limited visual impacts associated with the proposed works.

The southern boundary of 187 Clarks Road which borders the UNE property has some planted native vegetation. The trees appeared to be under 2.5 m tall on average and the age of the plantings was not determined though it is not expected to be over 10 years old. Plate 1 below shows the panoramic view from PP10 at the northern boundary of Stage 1 looking West-North-East. In this image property 187 Clarks Road is easily distinguishable from the surrounding environment.

Plate 1: View from Photo Point 10 at the northern end of Stage 1 looking west-north-east

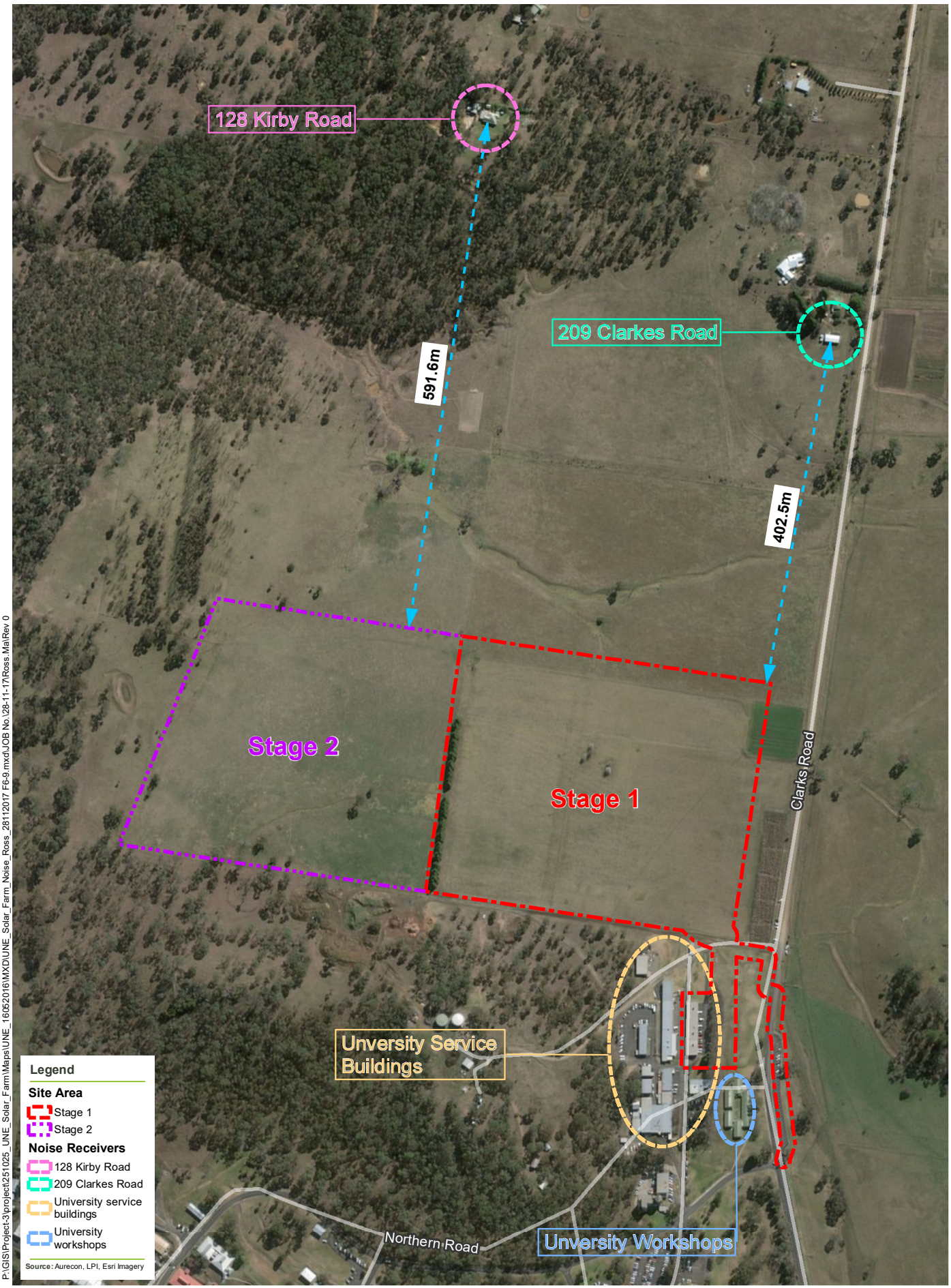
3 Issues and concerns

The location of the potentially affected residences is provided in Figure 2.

The location of the residence at 187 Clarks Road is situated near to the crest of the hill and provides a good vantage point to overlook the proposed solar farm sites.

The proposed solar farm site locations which run from midpoint in the landscape down towards the neighbouring property boundary means that the solar panels will be clearly visible from the vantage point on 187 Clarks Road. The solar panels will also be visible to vehicles driving in a southerly direction down Clarks Road towards the university. Vehicles travelling north along Clarkes Road will have a more restricted view due to the angle of the subject site.

187 Clarks Road has the largest unobstructed view of the proposed Stages while 128 Kirby Road is situated behind reasonably dense remnant vegetation therefore limited visual impacts are expected. Works done to remediate the view for the property at 187 Clarks Road will also enhance the view of property 128 Kirby Road.



1:6,000

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Projection: GDA 1994 MGA Zone 56

Figure 2: Distance to nearest sensitive receivers

4 Landscaping options

Planting options include use of all native species, combination of native and fast growing exotics which can then be removed once natives are of a suitable size or the planting of all exotic species.

All options described below have been designed using native species and in some cases a mixture of native and non-native plantings, however no specific plating regimes have been discussed. It is understood that the use of non-native plants is not often the most desirable approach however if the aim is to provide visual screening in the shortest amount of time this option should be considered. Any non-native species used in plantings must have a successful record of use and removal within the Armidale region prior to be used for this project. No potential weed species should be used. Detailed species selection should be done in consultation with experienced rehabilitation specialists and/or landscape designers.

Option 1 UNE property boundary fencing with native plants

This option utilises the location of the UNE property boundary fence to reduce the time taken to provide visual screening. Planting of native vegetation along the northern and eastern boundaries of the UNE property is shown in Figure 3.

The use of native vegetation will augment landholder planting at the southern end of 187 Clarks Lane property and will provide visual relief from both the houses and the road users. The mix should include a relatively high density planting of fast growing species such as Acacias to provide cover while slower growing species such as Eucalyptus develop. Vegetative species along the eastern boundary would consist mostly of shrubs and small trees to provide dense visual screening.

Option 2 UNE property boundary fence planting with native and exotic species

This option provides planting along the same areas as Option 2 however the addition of fast growing non-native tree species can be included to facilitate taller vegetation until native species have grown to a sufficient height to provide coverage. This option is shown on Figure 4.

Non-native species would be removed once native vegetation had achieved the desired foliage density and heights.

Option 3 Planting along the drainage line in the northern section of the UNE property

This option utilises the existing drainage line located on the UNE property as shown in Figure 5.

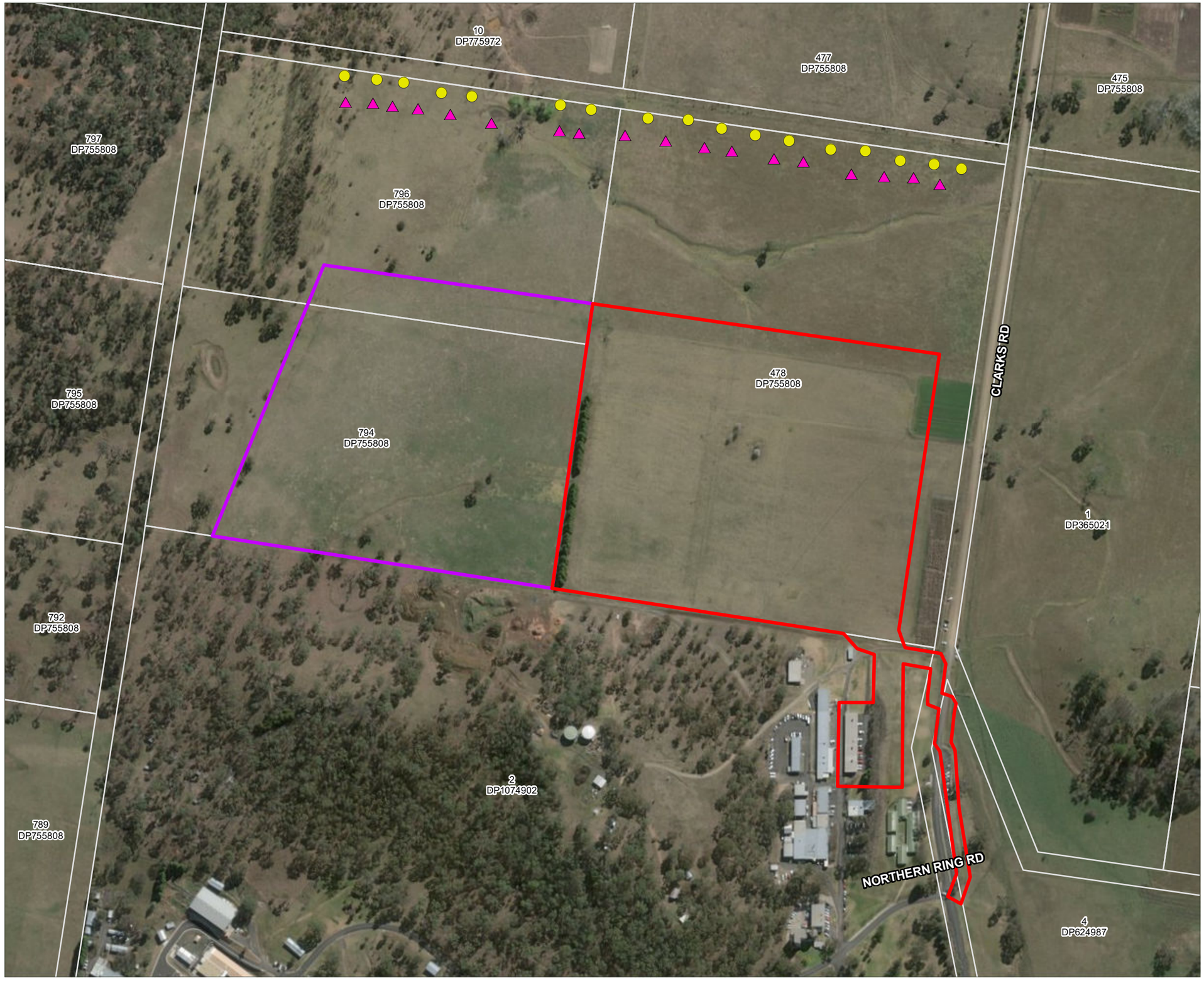
The area would be fenced off from stock and native species planted along the northern and southern riparian areas. There is currently a limited amount of native vegetation growing within the drainage line and active augmentation may also be viewed favourably by concerned members of the public. The retention of existing non-native trees would need to be examined and it is considered they should remain in place, provided they are not actively seeding or spreading vegetatively, until native vegetation is mature enough to replace their role within the ecosystem.

This option includes planting fast growing non-native vegetation along the northern UNE property boundary, but could be replaced with native vegetation.

Option 4 Planting along the northern boundary of the solar farm boundary for each stage

This option can include native, non-native or a combination of both. Limitations of this option include time taken for vegetation to reach sufficient height to provide visual screening for those panels placed on the southern (highest) point in the landscape and increased risk of shading of solar panels at the northern (lowest) point of the project site. Figure 6 outlines the proposed planting location.

This option is not suitable for the project due to potential shading of the solar panels.



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Legend

- Stage 1
- Stage 2
- Cadastre

Option 1 Landscaping Plan

- Shrub planting
- Tree planting

Notes:

Date: 18/12/2017 Version: 1

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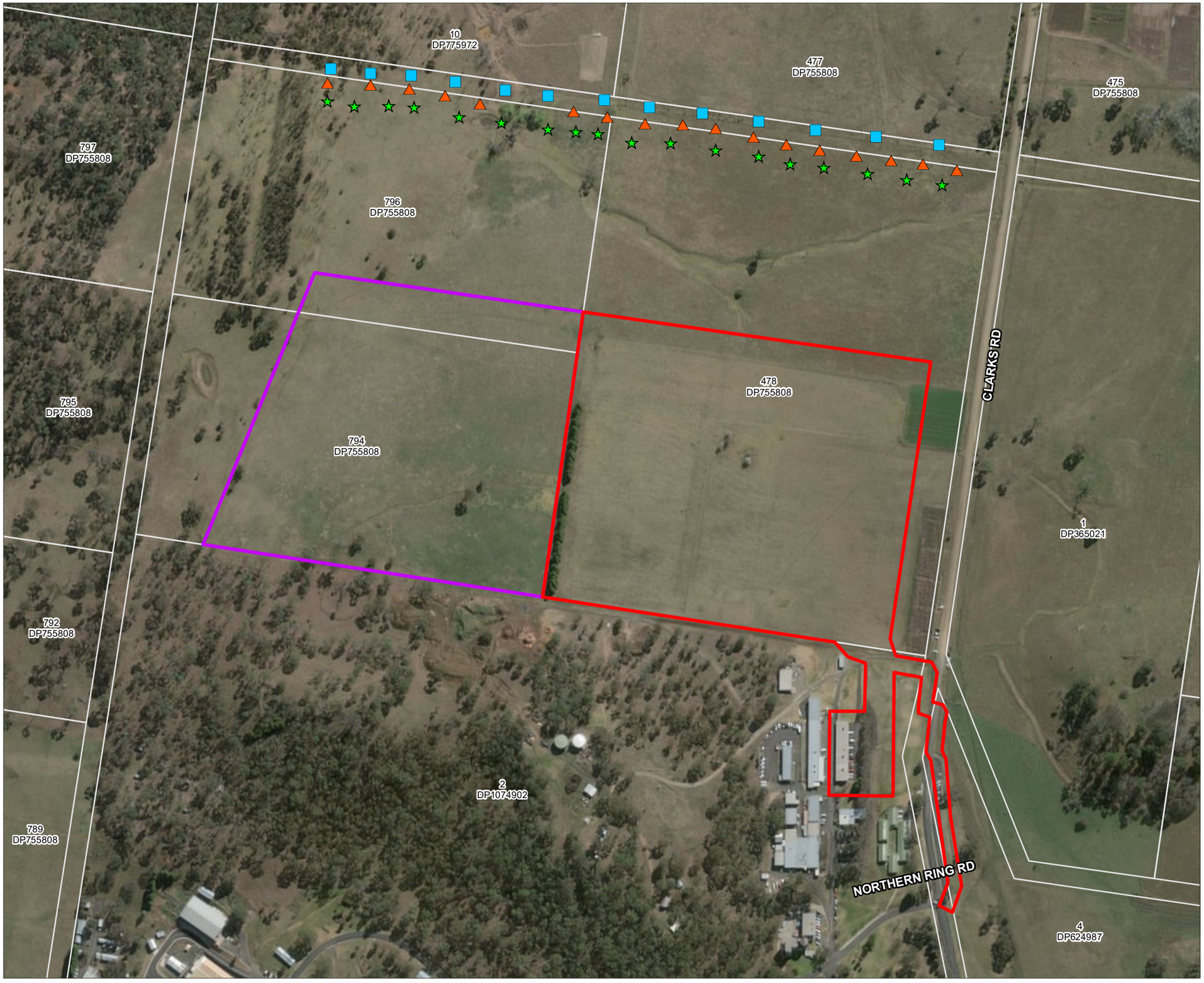
Job No:

Coordinate System: GDA 1994 MGA Zone 56

UNE Solar Farm Ecological Assessment

Figure 3: Option 1 Landscaping Plan



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Legend

- Stage 1
- Stage 2
- Cadastre

Option 2 Landscaping Plan

- Native Shrub Planting
- Native Tree Planting
- Non-Native

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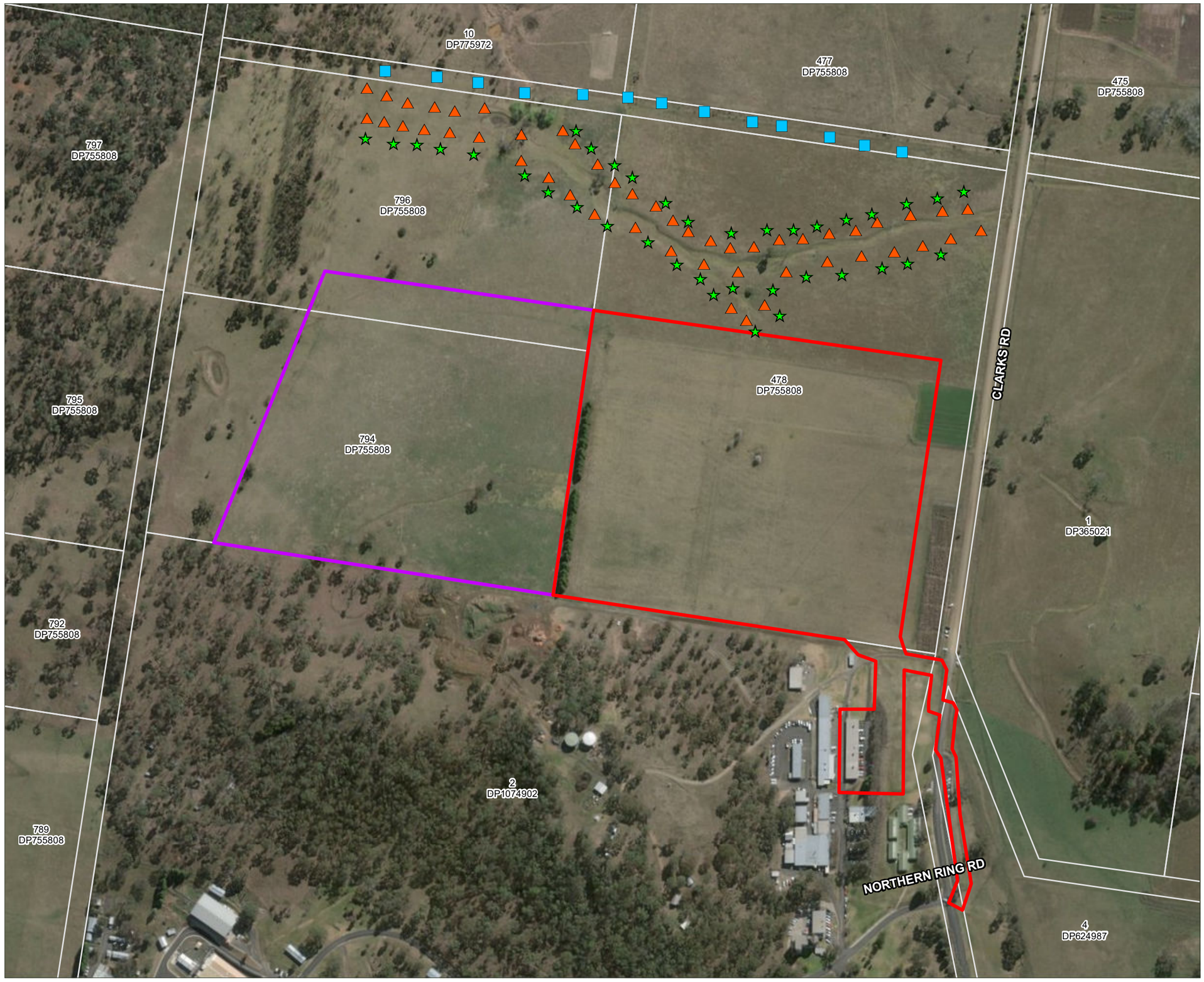
Job No:

Coordinate System: GDA 1994 MGA Zone 56

UNE Solar Farm Ecological Assessment

Figure 4: Option 2 Landscaping Plan



aurecon

Legend

- Stage 1
- Stage 2
- Cadastre

Option 3 Landscaping Plan

- Native Shrub Planting
- Native Tree Planting
- Non-Native Plants

Notes:

Date: 18/12/2017 Version: 1

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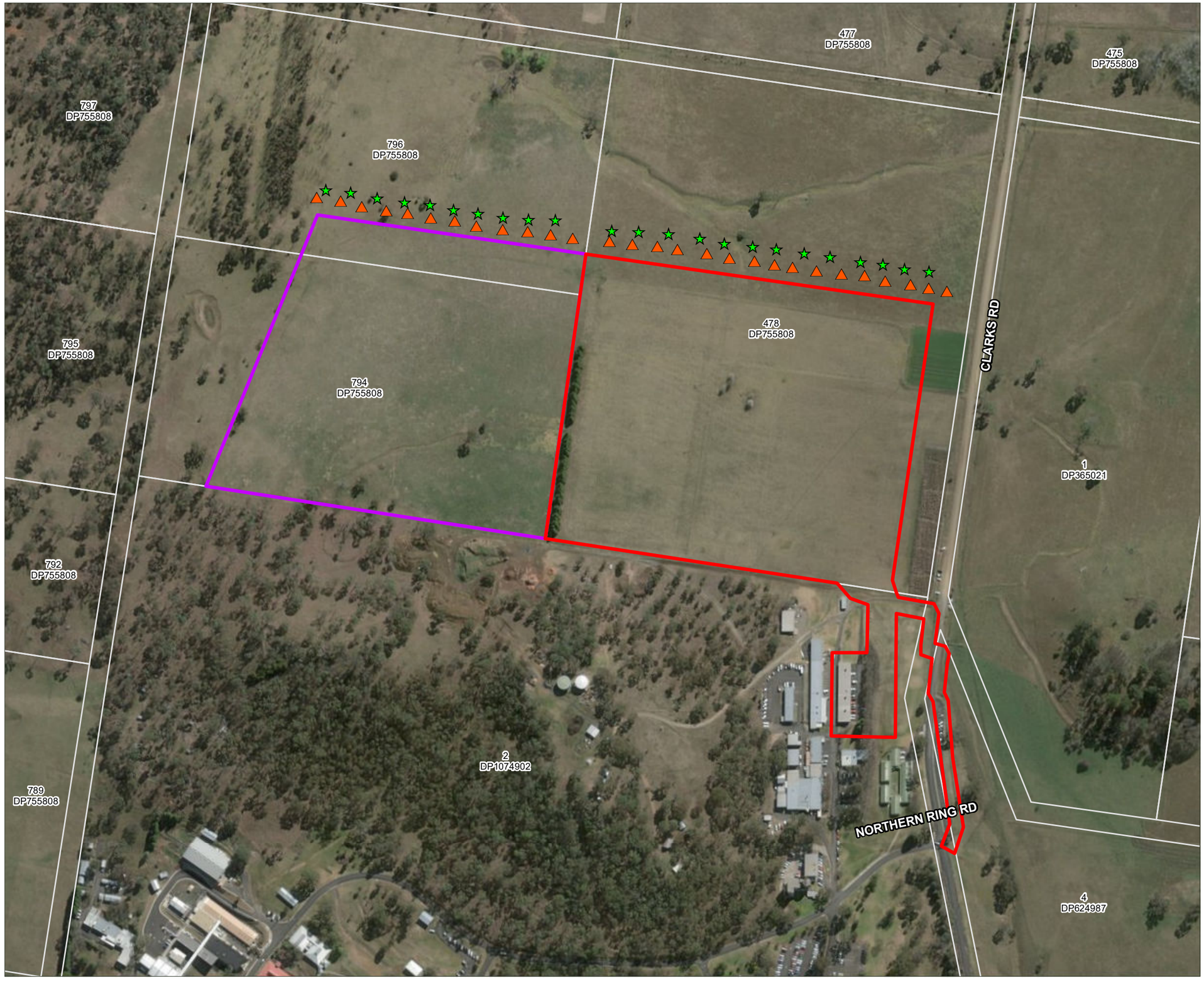
Job No:

Coordinate System: GDA 1994 MGA Zone 56

UNE Solar Farm Ecological Assessment

Figure 5: Option 3 Landscaping Plan



aurecon

Legend

- Stage 1
- Stage 2
- Cadastre

Option 4 Landscaping Plan

- Native shrub planting
- Native tree planting

Notes:

Date: 18/12/2017 Version: 1

Author: ZontaRA P:\GIS\Projects\251025_UNE_Solar_Farm\Figure2.mxd 08/12/2017 13:58

A3 scale: 1:4,000

0 85 170 Metres

Job No:

Coordinate System: GDA 1994 MGA Zone 56

UNE Solar Farm Ecological Assessment

Figure 6: Option 4 Landscaping Plan

5 Plant species

The ecological assessment which was completed for the SEE states that

> "*The floristic composition of the study area has been highly degraded by historical clearing activities and ongoing grazing. The two threatened ecological communities …White box - yellow box - Blakely's red gum grassy woodlands and derived native grasslands and Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion are known to intergrade in the Armadale area and it is stated that all intergrades are collectively included under one of the two communities. A detailed floristic assessment of the bushland surrounding the study area was beyond the scope of this assessment, however the species of paddock tree that remain would suggest that one of these two communities (or more likely an intergrade) once occurred within the study area… There are eight native mature and semi mature paddock trees in the Stage 2 study area including Ribbon Gum Eucalyptus viminalis and Blakelys Red Gum Eucalyptus blakleyi. The Stage 1 study area contains a small stand of exotic Poplar trees Populus sp. and a planted windbreak of Leyland Pine trees Cupressus x leylandii."*

Based on this assessment Table 1 below gives an indication of some of the native species which may have been present prior to historical clearing of the property. There are many other endemic species which are likely to be suitable for use in landscape planting.

Table 1: A sample of suitable native plant species

Scientific Name	Common Name	Native Status	Growth form and mature height (m)
Eucalyptus viminalis	Ribbon Gum	Y	Tree (25)
Eucalyptus blakleyi	Blakelys Red Gum	Y	Tree (20)
Eucalyptus pauciflora	Snow Gum	Y	Tree (15)
Eucalyptus stellulata	Black Sallee	Y	Tree (8)
Acacia dealbata	Silver Wattle	Y	Small Tree (8)
Acacia melanoxylon	Blackwood	Y	Tree (10)
Acacia floribunda	White Sally Wattle	Y	Small Tree (6)
Bursaria spinosa	Blackthorn	Y	Shrub
Callitirs endlicheri	Black Cypress Pine	Y	Small Tree
Leptospermum brevipes	Grey Tea Tree	Y	Shrub (4)
Leptospermum polygalifolium	Tantoon	Y	Shrub (4)

All of the options provided above are high level concepts only, detailed design is required to ascertain the required height any vegetation would be required to meet in order to provide sufficient visual screening for both local residents and road users.

6 Conclusion

This landscaping report has provided a four options which could provide visual barriers for the neighbouring properties.

- Option 1 UNE property boundary fencing with native plants
- Option 2 UNE property boundary fence planting with native and exotic species
- Option 3 Planting along the drainage line in the northern section of the UNE property
- Option 4 Planting along the northern boundary of the solar farm boundary for each stage

Option 4 is not suitable due to potential shading of the solar panels, and as a result, reducing the solar farm energy output. This option will not be considered further.

The other three options provided are high level concepts only, and further detailed design would be undertaken to determine the species and location of the plantings to provide sufficient visual screening for local residents.

Due to the slope of the land on which the solar farm is proposed, planting higher in the landscape, on the northern boundary of the UNE property (Options 1 and 2) are likely to provide better visual barriers than planting within the existing drainage line or northern boundaries of the Stages.

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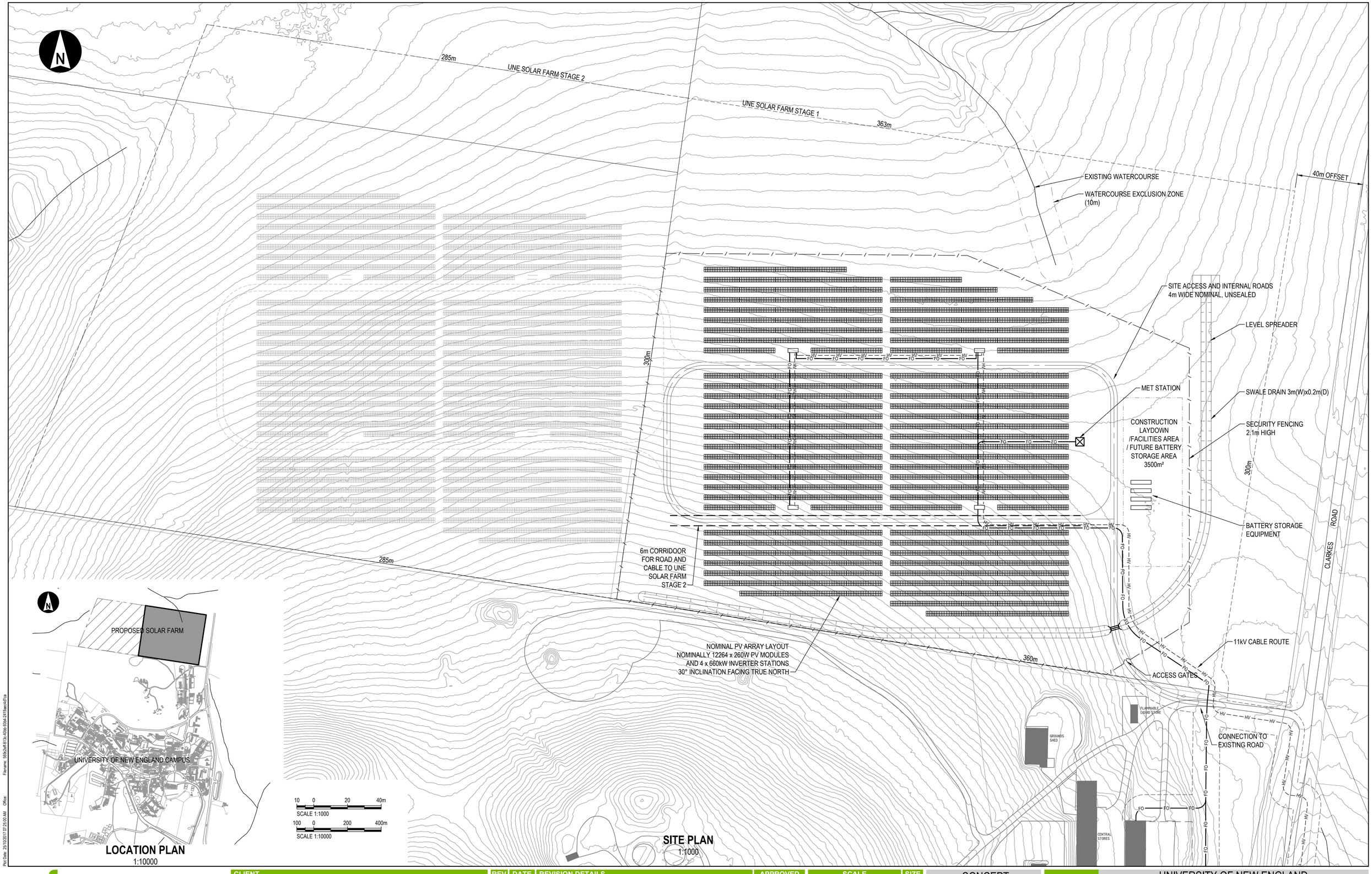
Responses to submissions to proposed construction of UNE solar farm – December 2017

Attachment 2 – Photographs of exiting solar farms

Views of Royalla Solar Farm which is fully constructed and now operational. Royalla solar farm is a 20 MW solar farm located in Canberra and comprises approximately 83,000 solar panels.

Responses to submissions to proposed construction of UNE solar farm – December 2017

Attachment 3 – Revised drawings



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SCALE 1:10000

SITE PLAN
1:1000

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REV	DATE	REVISION DETAILS	APPROVED
A	14.04.16	CONCEPT	LK
B	30.06.17	REVISED DRAWING	LK
C	09.08.17	FIBRE OPTIC CABLE ADDED	LK
D	25.10.17	BATTERY STORAGE MODULES ADDED	LK

SCALE	SIZE
AS SHOWN	A1

DRAWN: P.MCFARLANE
DESIGNED: N.WAIN
CHECKED: P.HOBBS

CONCEPT
NOT FOR CONSTRUCTION

APPROVED
DATE 14.04.16
L.KARABESINIS

PROJECT: UNIVERSITY OF NEW ENGLAND SOLAR FARM

TITLE: SOLAR FARM LAYOUT

DRAWING No.	PROJECT No.	WBS	TYPE	DISC	NUMBER	REV
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797/DP755808

21/DP112693

796/DP755808

795/DP755808

478/DP755808

794/DP755808

UNE SOLAR FARM STAGE 2

UNE SOLAR FARM STAGE 1

792/DP755808

789/DP755808

1/DP365021

CLARKES ROAD

135

290

365

40

206

300

65

721

Eucalyptus sp.

SITE PLAN
1:2000

LEGEND

- LOT BOUNDARIES
- SOLAR FARM STAGE 1
- SOLAR FARM STAGE 2
- TREES TO BE REMOVED

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SCALE 1:2000

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SCALE	SIZE
AS SHOWN	A1

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DESIGNED: N.WAIN
CHECKED: P.HOBBS

CONCEPT
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APPROVED
DATE 14.04.16
L.KARABESINIS

PROJECT: UNIVERSITY OF NEW ENGLAND SOLAR FARM

TITLE: PROPERTY SETBACKS

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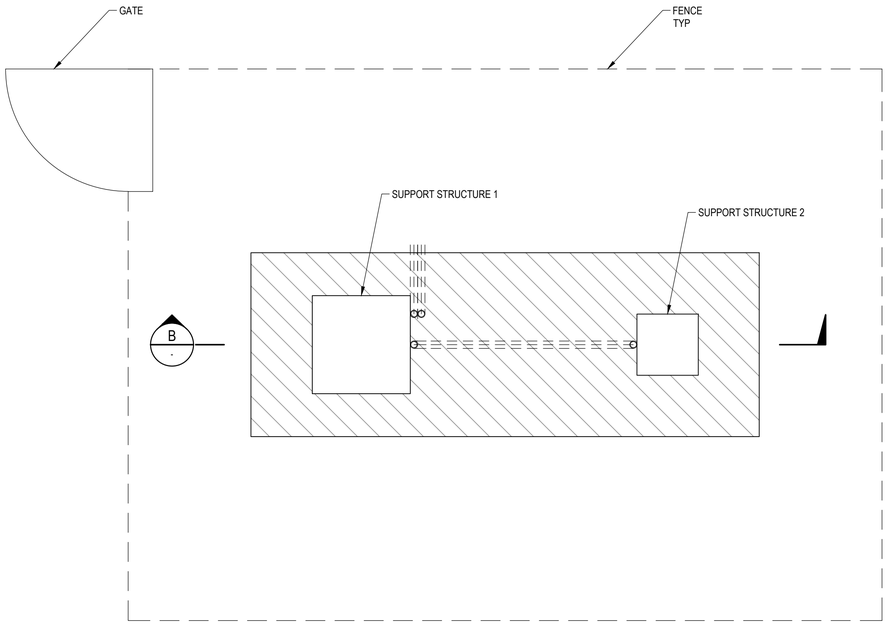
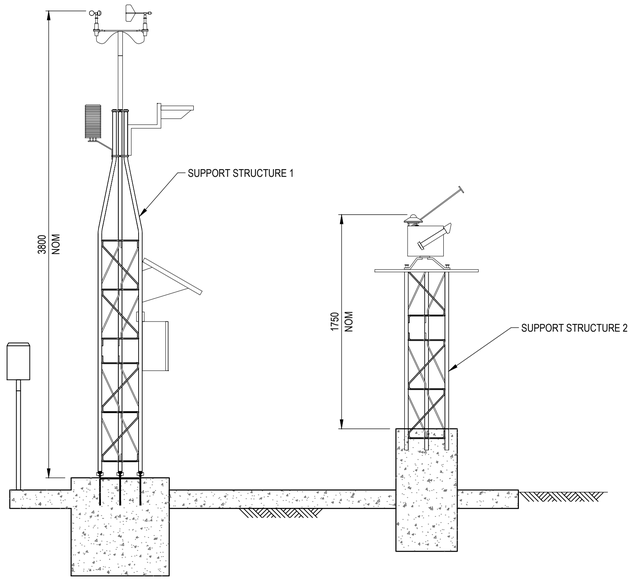


TYPICAL METEOROLOGICAL STATION
PLAN
1:25

TYPICAL BATTERY STORAGE CONTAINER
NTS



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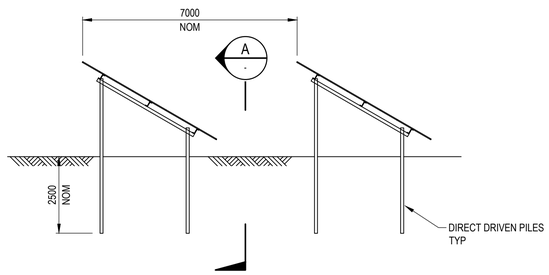

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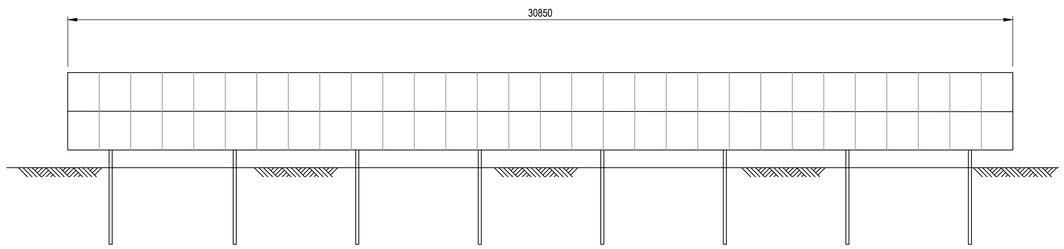

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SCALE 1:100

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SCALE	SIZE
AS SHOWN	A1

DRAWN: J.NELSON
DESIGNED: N.WAIN
CHECKED:

CONCEPT
NOT FOR CONSTRUCTION

APPROVED
DATE

PROJECT: UNIVERSITY OF NEW ENGLAND SOLAR FARM

TITLE: DEVELOPMENT APPLICATION
DETAILS

DRAWING No. 251025 – 0000 – DRG – EG – 0045 – A

PROJECT No.	WBS	TYPE	DISC	NUMBER	REV
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Responses to submissions to proposed construction of UNE solar farm – December 2017

Attachment 4 – Ecological assessment (June 2017)

University of New England Solar Farm

Ecological Assessment

University of New England

22 June 2017
Revision: C
Reference: 251499

Document control record

Document prepared by:

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Document ID			**Project number**		251499	
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Client		University of New England	**Client contact**			
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A	3 June 2016	Draft Report	Ed Cooper	Heather Tilley		Mike Luger
B	21 June 2016	Final Report	Ed Cooper	Heather Tilley		Mike Luger
C	22 June 2017	Final Report 2	Ed Cooper	Heather Tilley		Mike Luger
Current revision		**C**				

Approval			
Author signature		Approver signature	
Name	Ed Cooper	Name	Mike Luger
Title	Ecologist	Title	Technical Director

University of New England Solar Farm

Date 22 June 2017
Reference 251499
Revision C

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Contents

Appendices

Figures

Tables

Abbreviations and definitions

Abbreviation	Description
APZ	Asset Protection Zone
DoE	Commonwealth Department of the Environment
EP&A Act	*NSW Environmental Planning and Assessment Act 1979*
EPBC	*Environment Protection and Biodiversity Conservation Act 1999*
ISEPP	*State Environmental Planning Policy (Infrastructure) 2007*
KTP	Key Threatening Process
LGA	Local Government Area
Locality	The area within 10 km of the study area
NP&W Act	*National Parks and Wildlife Act 1974*
NBN	National Broadband Network
NES	National Environmental Significance
NSW	New South Wales
NV Act	*NSW Native Vegetation Act 2003*
OEH	NSW Office of Environment and Heritage
Study area	The area to be directly and indirectly impacted by the proposal
TSC	*Threatened Species Conservation Act 1995*

1 Background and introduction

1.1 Background

Aurecon has been engaged to prepare an Ecological Assessment Report (EA) for the proposed University of New England (UNE) solar farm. This report details the ecology assessment for a proposed site at the UNE campus, Armidale, New South Wales (NSW).

1.2 Licensing

The field work component of this EA was conducted in accordance with a *National Parks and Wildlife Act 1974* (NP&W Act) Section 132 (c) Scientific Licence (SL100772). The licence permits the undertaking of biodiversity assessments, Species Impacts Statements (SIS), ecological surveys and abiotic sampling as part of flora and fauna survey work.

1.3 Introduction and project description

The proposed solar farm is located approximately 500 metres north of the UNE campus and to the west of Clarks Road. The location of the proposed activity are shown in Figure 1 and Figure 2. The main elements of the proposal include the construction and installation of:

- A solar photovoltaic array.
- Connection to the existing grid (by way of underground cabling).
- Associated drainage infrastructure.
- Access roads.

Additional details on the specifications of the solar photovoltaic array and associated infrastructure are provided within the body of the Statement of Environmental Effects (SEE). The proposal would be undertaken in two stages, the first being the eastern 3 MW installation, the second being the western 3 MW installation. The study area for this assessment includes all of the required clearing associated with Stage 1 and Stage 2 (the proposal) (Figure 2).

1.4 Study area overview

The study area is located within a large, historically cleared paddock to the north of the UNE campus. To the immediate north and east of the study area are further cleared areas, characterised by exotic grasses and isolated remnant native trees. Beyond this, and to the south and west of the study area are areas of more intact native vegetation, with greater structural complexity but still subject to grazing practices. The study area itself has been previously used by UNE as a demonstration site for agricultural land practices. As such, the vegetation has been significantly altered from its pre-disturbance state.

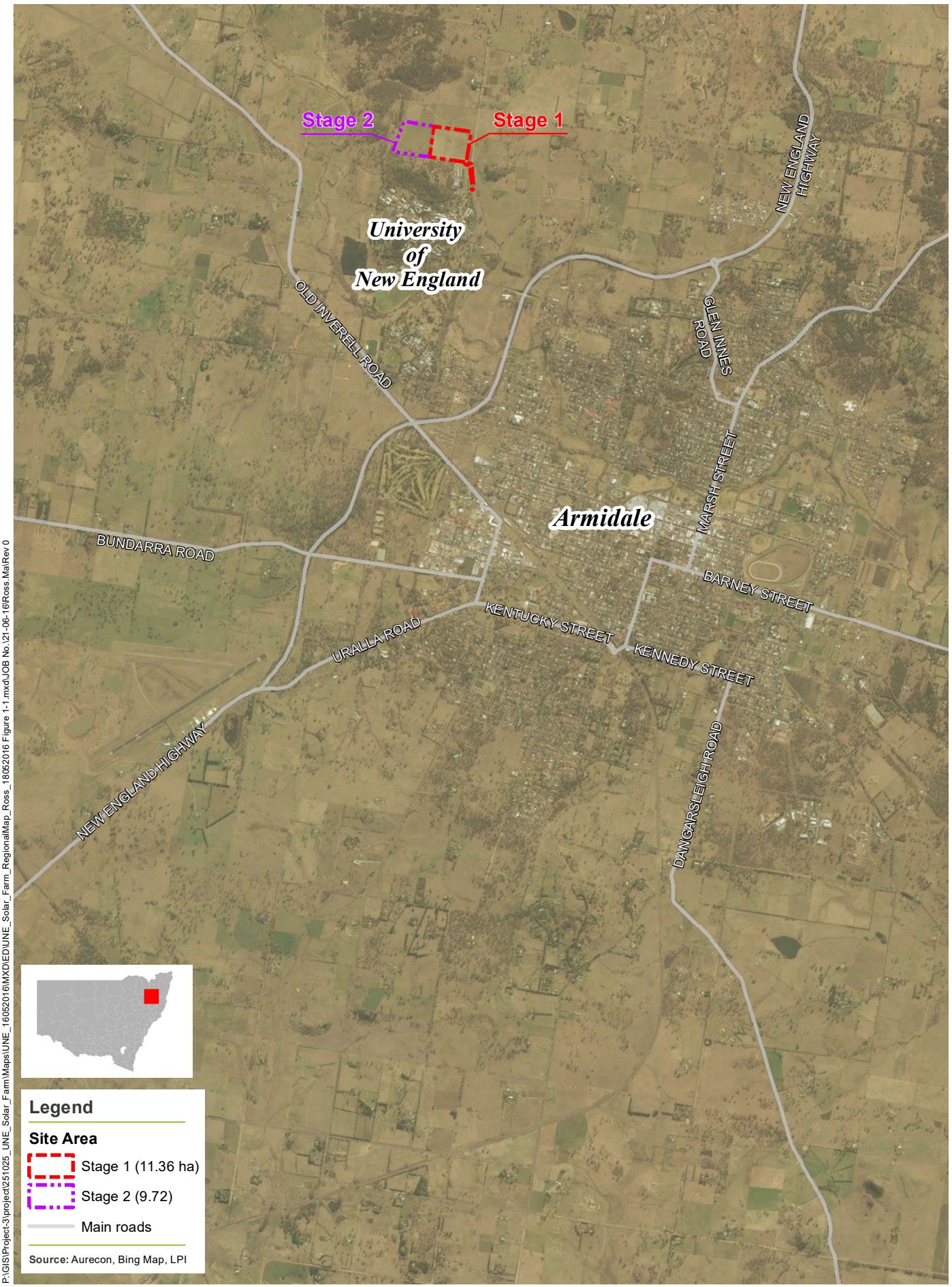
The study area incorporates two areas for the purpose of the development application. The Stage 1 study area includes the initial solar farm installation and is located to the east, with the Stage 2 study area located to the west for the purpose of the secondary solar farm instillation. Unless otherwise stated, the term study area relates to both the Stage 1 and Stage 2 proposals.

Plate 1 Typical vegetation within the Stage 1 study area

Plate 2 Typical vegetation within the Stage 2 study area

Table 1 - Summary of land details

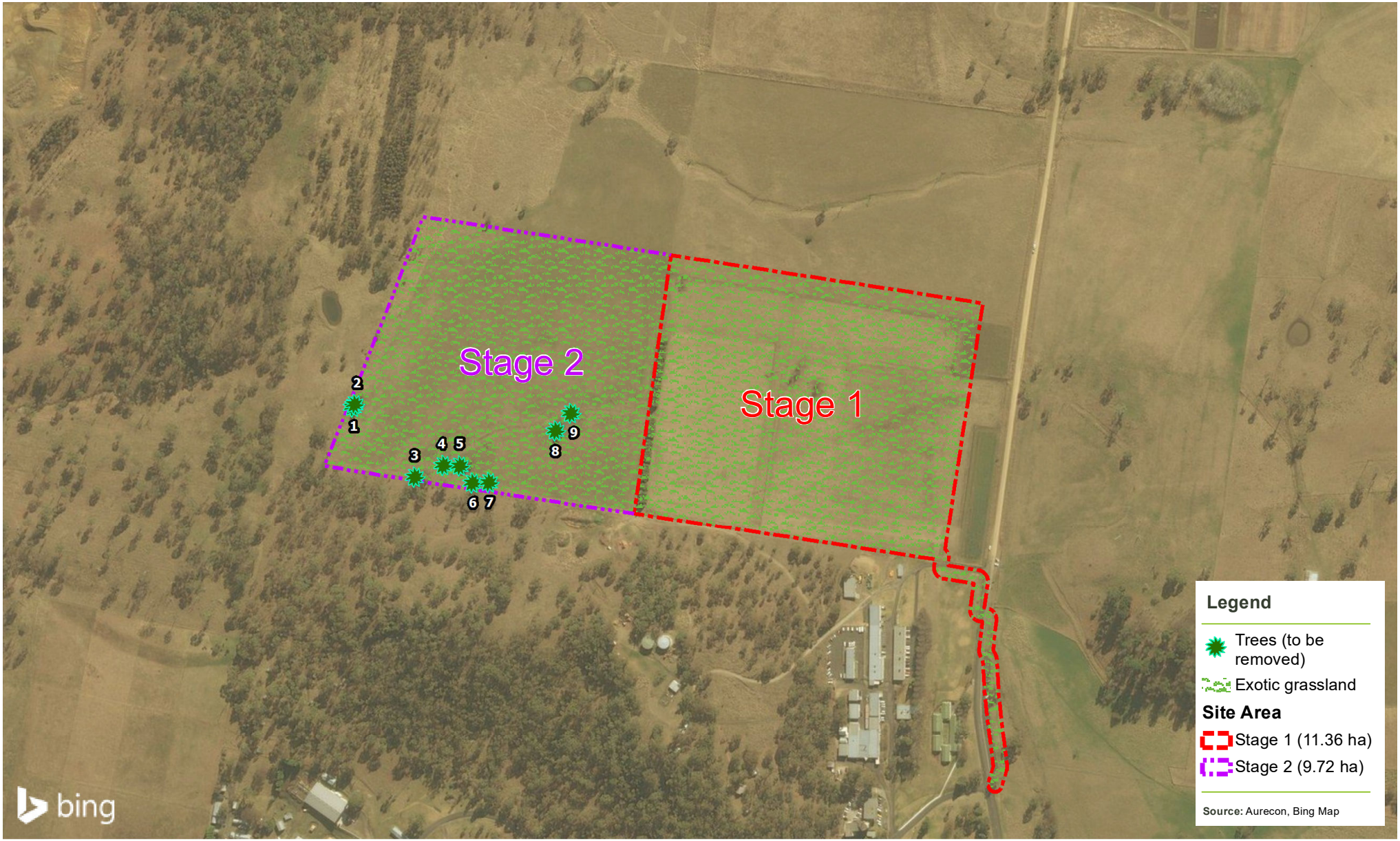
Attribute	Site Details
Lot and Deposited Plans (DP)	Lot 794 DP 755808 Lot 478 DP 755808
Address	187 – 223 Clarks Road, Armidale Region NSW 2350
Site coordinates	-30.480037, 151.642707
Local Government Area (LGA)	Armidale Dumaresq Council
Catchment Management Area (CMA)	Northern Rivers
Primary existing land use	Rural paddock
Current zoning	RU4 Primary Production Small Lots



Projection: GDA 1994 MGA Zone 56

UNE Solar Farm **SEE**

Figure 1: Study area overview



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Projection: GDA 1994 MGA Zone 56

UNE Solar Farm **SEE**

Figure 2: Ecological features

2 Aims and objectives

The aims and objectives of this ecological assessment are to:

- Determine the likelihood of threatened species and populations utilising the study area.
- Determine the vegetation communities present at the site and its conservation significance.
- Assess the presence and quality of threatened flora and fauna habitat on site.
- Outline any other potential ecological constraints on site.
- Determine the significance of the proposed impacts on *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Threatened Species Conservation Act 1995* (TSC Act) on listed threatened biota.
- Recommend safeguards and management measures to avoid or minimise potential impacts to biodiversity.
- Outline any further responsibilities under NSW and Federal Government legislation and guidelines.

3 Legislative context

A detailed assessment of the Commonwealth, state and local Government legislation relating to the proposal is provided in the main body of the SEE. A summary of the legislation relevant to this report is provided below.

3.1 Commonwealth legislation

3.1.1 Environment Protection and Biodiversity Conservation Act 1999

Under the Commonwealth EPBC Act, it is an offence to undertake an action which may have a significant impact on a matter of National Environmental Significance (NES) without approval from the Department of Environment (DoE), which administers the Act. Matters of NES include:

- World heritage properties.
- National heritage places.
- Wetlands of international significance.
- Great Barrier Reef Marine Park.
- Commonwealth marine areas.
- Listed threatened ecological communities.
- Listed threatened species (flora and fauna).
- Listed migratory species.

Where it is determined that an action is likely to have a significant impact on Matters of NES through the preparation of a Significant Impact Criteria (SIC) assessment, the action must be referred to the DOE for further assessment.

Relevance to the proposal

Threatened biota listed under the EPBC Act has been previously recorded or is predicted to occur within the locality. The significance of potential impacts on threatened biota considered likely to occur within the study area must therefore be assessed.

3.2 NSW State legislation

3.2.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) provides the framework for decision-making under the NSW planning system. The Act includes in its objectives the proper management of natural resources and the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities and their habitats.

Relevance to the proposal

Section 5A of the EP&A Act outlines the ecological heads of consideration that must be addressed when deciding whether a proposal will have a significant impact on threatened biota. The proposal will be determined under Part 4 of the EP&A Act as a standard development application with Armidale Dumaresq Council adopting the role of consent authority.

3.2.2 State Environmental Planning Policy 44 (Koala Habitat Protection)

Schedule 1 of SEPP 44 outlines the Local Government Areas (LGA) to which it applies. Armidale Dumaresq LGA is included on this list. Clause 6 de`fines land to which SEPP 44 applies and states that it applies to land:

> *(a) That is land to which this Policy applies, and*
>
> *(b) That is land in relation to which a development application has been made, and*
>
> *(c) That:*
>
> > *(i) Has an area of more than 1 hectare, or*
> >
> > *(ii) Has, together with any adjoining land in the same ownership, an area of more than 1 hectare, whether or not the development application applies to the whole, or only part, of the land.*

If the proposed activity satisfies these clauses then the consent authority must be satisfied whether or not the land comprises potential or core Koala habitat by way of an appropriate ecological assessment.

Relevance to the proposal

The study area covers an area greater than one hectare and Armidale Dumaresq Council is identified on Schedule 1 as land to which the policy applies. Bushland within the UNE campus has been identified as core habitat for Koala and a Plan of Management has been prepared. The implications of the project must therefore be assessed to ensure that they are not inconsistent with this Plan of Management.

3.2.3 Threatened Species Conservation Act 1995

The TSC Act provides for the protection of all threatened plants and animals native to NSW and their habitats (including endangered populations and ecological communities, and their habitats).

The potential impact of a proposal on any threatened species, populations or communities is assessed using an Assessment of Significance (also known as a seven part test) under Section 5A of the EP&A Act. If the impacts are found to be 'significant' a Species Impact Statement (SIS) must be prepared and submitted to and approved by the Chief Executive of the Office of Environment and Heritage (OEH).

Relevance to the proposal

Threatened biota listed under the TSC Act has been previously recorded or is predicted to occur within the locality and may have habitat within the study area. The significance of potential impacts on threatened biota considered likely to occur within the study area must therefore be assessed.

3.2.4 Native Vegetation Act 2003

The *Native Vegetation Act* 2003 (NV Act) provides for the protection of native vegetation, outside of urban areas and particularly with regards to agricultural production. There are definitions of key thresholds for native understorey vegetation condition to which the NV Act applies. There are also exemptions to the Act based on the location of clearing (urban areas), land zoning and the purpose of clearing (routine agricultural management).

Relevance to the proposal

The study area is not defined as an urban area, it is not zoned residential and the purpose of clearing is not routine agricultural maintenance, therefore the NV Act applies. Any clearing of native vegetation, as defined under the Act, will require the preparation of a Property Vegetation Plan or development consent from NSW Local Land Services.

4 Methods and survey assessment techniques

The assessment was undertaken in two stages. A preliminary desktop investigation which involved literature and database reviews as well as a field survey which included site inspections and a rapid assessment to determine the ecological values of the study area.

4.1 Literature and database review

4.1.1 Australian Government

The DoE operates the Protected Matters Search Tool which is used to help determine whether matters of NES or other matters protected under the EPBC Act are likely to occur within a 10 kilometre radius of the study area.

4.1.2 NSW Government

The Atlas of NSW Wildlife (BioNet) is the OEH's database of flora and fauna records. A search of BioNet database was undertaken to obtain details of threatened flora and fauna sightings within a 10 kilometre radius of the study area.

The NSW Department of Primary Industries (DPI) WeedWise website was queried to identify any listed noxious weeds under the *Noxious Weeds Act 1993* within the Armidale Dumaresq Council area.

The OEH Vegetation Information System (VIS) mapping through the Spatial Information eXchange (SIX) Vegetation Map Viewer was investigated to determine any previous vegetation mapping of the area.

4.2 Flora and fauna field survey

A field investigation of the study area was undertaken on 10 May 2016 by an Aurecon ecologist. The focus of the field investigation was to determine whether the ecological values of the study area contain any EPBC Act or TSC Act threatened species, populations or ecological communities (biota), or whether the study area supports suitable habitat for threatened biota considered likely to occur. Vegetation within the study area was surveyed using the random meander technique (Cropper 1993) over five person hours.

The field survey included a floristic assessment to determine the vegetation community present, as well as a search for threatened flora and fauna species. The habitat assessment included recording the quality and presence of habitat for threatened fauna (eg hollow-bearing trees, fallen logs etc). All of the native trees with a diameter at breast height (DBH) of greater than 200 mm within the proposed Stage 1 and Stage 2 study area were identified to species level and the attributes recorded.

5 Results and discussion

5.1 Literature and database review

The database searches identified the following features in proximity to the study site:

- 37 threatened fauna species have been previously recorded or are predicted to occur within the locality (including 15 EPBC Act listed species and 37 TSC Act listed species).
- 14 threatened flora species have been previously recorded or are predicted to occur within the study area (including 13 EPBC Act listed species and 11 TSC Act listed species).

The consolidated results of the database searches is provided in Appendix 3.

5.2 Regional vegetation mapping

The study area and surrounding vegetation has been previously mapped by a number of different mapping projects. The highest resolution mapping appears to be associated with the *Vegetation Map for the Northern Rivers CMA* (VIS ID 524) (Northern Rivers Catchment Management Authority [NRCMA] 2005). Under this mapping project, the study area is mapped as cleared land, however native vegetation communities have been mapped in the surrounding areas. Table 2 outlines the native vegetation communities that have previously been mapped in the immediate vicinity of the study area.

Table 2: Native vegetation communities previously recorded near the study area.

NRCMA 2005 community	EPBC Act equivalent	TSC Act equivalent	Location
Yellow Box-Blakely's Red Gum (map unit 163)	*White box - yellow box - Blakely's red gum grassy woodlands and derived native grasslands*	*White box yellow box Blakely's red gum woodland*	To the immediate south and west of the study area.
Snow Gum - Mountain/Manna Gum (map unit 132)	Not listed	*Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion*	Approximately 200 metres to the east of the study area
Silvertop Stringybark (map unit 198)	Not listed	Not listed	Approximately 400 metres to the north of the study area.

The floristic composition of the study area has been highly degraded by historical clearing activities and ongoing grazing. The two threatened ecological communities listed above (*White box - yellow box - Blakely's red gum grassy woodlands and derived native grasslands* and *Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion*) are known to intergrade in the Armadale area and it is stated that all intergrades are collectively included under one of the two communities. A detailed floristic assessment of the bushland surrounding the study area was beyond the scope of this assessment, however the species of paddock tree that remain would suggest that one of these two communities (or more likely an intergrade) once occurred within the study area. Assessing the vegetation observed against the final determination for these communities is therefore a focus of this assessment.

5.3 Regional soil mapping

The study area is located north of the extent of the *Soil Landscapes of the Armidale 1:100,000 Sheet* (King 2009). Extrapolation of the mapped landscapes to the south of the study area make it likely that the study area is on the transition of the Middle Earth and Bald Knob landscapes. Middle Earth soil landscape is characterised by undulating plains, rises and footslopes on Sandon Beds with a local relief of 0–30 metres at an elevation of 910–1120 metres. Bald Knob soil landscape is characterised by rolling to occasionally steep low hills crests and rises with common basalt rock outcropping. The local relief is 20–90 metres at an elevation of 940–1260 metres. The soil type, slope, aspect and elevation are all highly influential on the vegetation observed.

5.4 Field surveys

5.4.1 Vegetation communities

The vegetation of the study area was found to be consistent with one non-native vegetation type described as *Exotic grassland* which includes a number of isolated native paddock trees within the Stage 2 study area.

Exotic grassland (19.95 hectares)

This community was recorded across the entire study area and was comprised predominantly of exotic and native grasses and ground cover species including Yorkshire Fog *Holcus lanatus,* Perennial Ryegrass *Lolium perenne*, Praire Grass *Bromus catharticus*, Cocksfoot *Dactylis glomerata*, Speargrass *Austrostipa scabra,* Red Grass *Bothriochloa macra,* Windmill Grass *Chloris truncata* and Common Couch *Cynodon dactylon*.

Native and exotic groundcover species included: Kidney Weed *Dichondra repens*, *Leucochrysum albicans var. albicans,* Tufted Bluebell *Wahlenbergia communis*, Fleabane *Conyza bonariensis*, Catsear *Hypochoeris radicata*, Spear Thistle *Cirsium vulgare*, Cudweed *Gamochaeta calviceps*, Dandelion *Taraxacum officinale*, Slender Celery *Cyclospermum leptophyllum*, Argentine Peppercress *Lepidium bonariense* and Umbrella Sedge *Cyperus eragrostis*.

There are eight native mature and semi mature paddock trees in the Stage 2 study area including Ribbon Gum *Eucalyptus viminalis* and Blakelys Red Gum *Eucalyptus blakleyi*. The Stage 1 study area contains a small stand of exotic Poplar trees *Populus* sp. and a planted windbreak of Leyland Pine trees *Cupressus x leylandii*.

Condition and status

This vegetation within the Stage 1 study area is considered to be in poor condition owing to historical and ongoing disturbances such as broad scale clearing and ongoing grazing. The vegetation within the Stage 2 study area is considered to be in poor to moderate condition based on the presence of some scattered native canopy species, albeit with a degraded groundcover assemblage.

As previously noted, it is likely that prior to the commencement of historical clearing, vegetation within the study area may once have been representative of an intergrade of *White box yellow box Blakely's red gum woodland* (Box-gum Woodland) and *Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland*. Disturbances including historical broad scale clearing and ongoing grazing have left the floristic composition of this vegetation in relatively poor condition.

Clause 11 of the TSC Act Final Determination (NSW Scientific Committee 2002) for Box-gum Woodland states that *Disturbed remnants are still considered to form part of the community including remnants where the vegetation, either understorey, overstorey or both, would, under appropriate management, respond to assisted natural regeneration, such as where the natural soil and associated seed bank are still at least partially intact.* Based on the lack of native indicative species in the canopy and groundcover within the study area, and the likely historical disturbance of soil seed bank from agricultural land management and weed recruitment, the vegetation within the study area is not considered to meet this definition.

The Commonwealth conservation advice for Box-gum Woodland (TSSC 2006) outlines that the community may be present as a derived native grassland where the canopy has been cleared but the understorey and groundcover remains relatively intact. In order to be eligible for listing, a number of condition thresholds must be met including greater than 50 per cent native cover in the perennial understorey vegetation and greater than 12 native non grass species in the understorey or greater than 20 mature trees per hectare. The vegetation within the study area did not satisfy any of these condition thresholds and therefore it is not eligible for listing under the EPBC Act.

Ribbon Gum-Mountain Gum-Snow Gum Grassy Forest/Woodland does not occur as a derived native grassland. The level of historical disturbance and loss of canopy has reduced the function such that it no longer represents this ecological community. Subsequently, this vegetation is not eligible for listing under the TSC Act.

Exotic species

A number of exotic species were recorded within the study area, some of these have been listed as noxious weeds within the New England Tablelands County Council Local Control Authority area. The name, control class and legal requirements for these noxious weed are outlined in Table 3. Appropriate environmental safeguards to minimise the spread of these species have been provided in Section 7.

Table 3 - Noxious weeds recorded within the study area

Common Name	Scientific Name	Control Class	Legal Requirement
African boxthorn	*Lycium ferocissimum*	4	*The plant must not be sold, propagated or knowingly distributed*
Blackberry	*Rubus fruticosus* species aggregate	4	*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*

5.4.2 Threatened species

No threatened flora or fauna species were recorded during field surveys. Following the site inspection and habitat assessment, an assessment of the likelihood of occurrence of each threatened species was undertaken (Appendix 3). This assessment determined that Koala have a moderate to high likelihood of occurring within the study area based on the known resident population on the UNE

campus and the presence of suitable feed trees. All threatened flora have a low likelihood of occurrence based on the level of historical disturbance and lack of suitable habitat.

A large number of bird species were attributed a low-moderate likelihood of occurrence. This acknowledges that these species can forage and disperse through a wide range of habitat types, however their highly mobile nature, often large home ranges and lack of key nesting or roosting resources make the likelihood of impact low.

5.4.3 Habitat assessment

Under the TSC Act, habitat for a threatened species is defined as *an area or areas occupied, or periodically or occasionally occupied by a species, population or ecological community and includes any biotic or abiotic component.* In general terms, fauna habitat is often separated into three; forms, breeding, foraging and dispersal. Breeding habitat may be present in the form of tree hollows (small and large), wet soaks, accumulations of leaf litter and detritus, rock outcrops, termite mounds and many other features. Foraging habitat is typically comprised of intact areas of native vegetation that provide flower, fruit and seed resources for nectiverous and frugivorous birds, bats and arboreal mammals. Areas of aquatic habitat provide foraging resources for a number of aquatic and terrestrial species. In turn, these herbivorous species provide feeding resources for raptors, larger reptiles, forest owls and terrestrial mammals. Dispersal habitat varies for each group of species but is typically comprised of intact vegetation that may or may not comprise foraging habitat, which bridges two areas of foraging or breeding habitat. Depending on the level of mobility and home range of the species, this habitat may be highly sensitive to disturbance or not sensitive at all.

Within the study area, breeding and roosting resources for threatened species previously recorded or predicted to occur within the locality were limited. No tree hollows were recorded within the isolated paddock trees within the Stage 2 study area. The majority of Eucalypt trees in the study area had some level of colonisation by Mistletoes *Amyema* sp. which provide foraging resources for a number of nectiverous birds. The eucalypts also provide some foraging resources for nectiverous birds and bats when in flower. Partly smooth-barked eucalypts can provide marginal roosting habitat for microbats that can utilise small gaps under decorticating bark.

A Wedge-tailed Eagle was observed foraging over bushland to the south of the study area suggesting that feeding resources for raptors and owls occur here. The paddock trees provide opportunistic perching resources for common bids with species including Grey Butcherbird, Australasian Raven, and Laughing Kookaburra observed. The exotic grassland provides foraging resources for common birds and Australasian Pipit, Welcome Swallow and Australian Magpie were noted.

The study area does not provide any habitat for threatened flora and the study area does not support an area of critical habitat as defined under the TSC Act.

5.4.4 Tree data table

The following table outlines those trees within the study area that may require removal or trimming, including:

- Two Ribbon Gum *Eucalyptus viminalis*
- Six Blakelys Red Gum *Eucalyptus blakelyi*
- One stag.

See Figure 2 for tree locations and Appendix 1 for site photographs.

Table 4 – Native trees to be removed

Tree #	Species	DBH (cm)	Height (m)	Canopy spread (m)	Habitat value	Photo
1	*Eucalyptus blakelyi*	30	5	6	Mistletoe Koala feed tree Winter flowering eucalypt	
2	*Eucalyptus blakelyi*	20	5	4	Mistletoe Koala feed tree Winter flowering eucalypt	
3	*Eucalyptus viminalis*	60	25	18	Koala feed tree Winter flowering eucalypt (early)	

Tree #	Species	DBH (cm)	Height (m)	Canopy spread (m)	Habitat value	Photo
4	*Unknown Stag*	N/A	N/A	N/A	No hollows observed	
5	*Eucalyptus blakelyi*	80	8	8	Koala feed tree Winter flowering eucalypt	
6	*Eucalyptus blakelyi*	70	10	5	Mistletoe Koala feed tree Winter flowering eucalypt	

Tree #	Species	DBH (cm)	Height (m)	Canopy spread (m)	Habitat value	Photo
7	*Eucalyptus blakelyi*	25	8	6	Koala feed tree Winter flowering eucalypt	
8	*Eucalyptus viminalis*	60	16	10	Koala feed tree Winter flowering eucalypt(early)	
9	*Eucalyptus blakelyi*	Multiple 25	6	4	Mistletoe Koala feed tree Winter flowering eucalypt	

6 Impact assessment

The following section assesses the potential impacts associated with the key aspects of the proposal.

6.1 Clearing of native vegetation

The proposal will require the potential clearing of some non-native vegetation. The non-native vegetation (Exotic grassland) to be removed is not consistent with any ecological communities currently listed under the TSC Act or EPBC Act. Amongst this non-native vegetation is a total of eight semi-mature and mature native eucalypt trees that will also be removed (see Table 4). These trees do not provide important habitat resources for threatened fauna beyond foraging resources that are widely available surrounding the study area. Therefore no further assessment is required.

6.2 Removal of threatened species

No threatened flora or fauna species were recorded within the study area. The likelihood of occurrence assessment determined that Koala have a moderate-high likelihood of occurring within the study area based on the presence of a known population on the UNE campus. A large number of bird species were attributed a low-moderate likelihood of occurrence. This acknowledges that these species can forage and disperse through a wide range of habitat types, however their highly mobile nature, often large home ranges and lack of key nesting or roosting resources make the likelihood of impact low. Fauna is dynamic and it is possible, albeit unlikely, that one of these threatened species could be utilising the study area when vegetation is to be cleared. Recommendations regarding clearing supervision and unexpected threatened species finds have been provided in Section 7. Based on the assessment undertaken, it is considered unlikely that the proposal would result in the direct removal of any threatened species.

6.3 Removal of fauna habitat

The proposal would result in the removal of exotic grassland vegetation which provides limited habitat for any threatened species. Amongst this vegetation is a total of eight native paddock trees that provide some feeding resources for Koala, and some marginal habitat for threatened birds that utilise an array of habitat types.

The likelihood of occurrence assessment determined that one threatened species previously recorded or predicted to occur within the 10 kilometre locality (Koala) are likely to reside within the study area. The proposal would result in a minor loss of preferred feed trees for this species (two Ribbon Gum and six Blakely's Red Gum). The clearing of these trees also represents a minor loss of potential habitat for nectiverous and insectivorous bird and bat species that forage within the study area.

Assessments of significance (EPBC act and TSC Act) were undertaken for Koala and these assessments are included in Appendix 4 and Appendix 5. In summary they determined that a

significant impact is unlikely and referral to the Commonwealth Department of the Environment and/or preparation of a Species Impact Statement are not required.

The proposal is subject to SEPP 44 which states that a Koala Plan of Management must be prepared and the proposal must be consistent with it. The aims and objectives of the UNE Koala Management Plan (UNE 2015) are:

- To satisfy the conditions for development approval under the NSW SEPP 44.
- To enable Koalas to continue to utilise the woodland on the UNE site after a dwelling and associated infrastructure are constructed.
- To increase the university's capacity to support a greater number of Koalas in the future and at least marginally assist in increasing the overall abundance of Koalas on the UNE site.

The proposal is broadly consistent with these aims and objectives. The response strategies within the plan of management include compensatory planting for feed trees that are removed as a part of a development proposal. Recommendations regarding this compensatory planting are made in Section 7.

Patches of more intact native vegetation providing alternative foraging and roosting resources for fauna (including tree hollows, fallen timber and denser vegetation) occur to the north, south and west of the study area. The required clearing is minor in the context of the surrounding vegetation and the scale of impacts are small at a local and regional scale, therefore assessments of significance for species assigned a low-moderate likelihood of occurrence (as defined above) were not deemed necessary.

6.4 Direct mortality of fauna

Based on the highly limited potential roosting and breeding habitat within the study area, it is unlikely that there would be direct mortality of fauna during construction and operation of the proposal. Resident fauna are most likely to be birds nesting in branch forks that will readily move on once clearing commences. Recommendations to minimise and manage fauna distress and mortality are provided in Section 7.

6.5 Edge effects

The study area is comprised of a mixture of native and exotic grasses and ground cover species in a cleared pasture landscape. In its current condition, this vegetation has been affected by a number of edge effects including recruitment of exotic and noxious species and a lack of native diversity from grazing. The proposal is unlikely to increase the impacts of these edge effects.

6.6 Loss of connectivity

The study area is within a broader area of farming properties which have been historically cleared for agricultural purposes. There are small patches of more intact woodland surrounding the study area, typically on steeper, less fertile slopes that were not as attractive for agriculture. The vegetation removal associated with this proposal is limited to previously cleared vegetation and isolated paddock trees and will therefore not contribute to any loss of connectivity to aerial species. Terrestrial species may experience a slight loss of connectivity as the existing fencing is in poor condition in places and the proposal would install a fauna proof perimeter fence. This is considered to be a minor loss based on the unsuitability of open paddocks as connecting habitat for a large number of terrestrial species based on increased probability of predation.

6.7 Sedimentation and erosion

No significant waterways traverse the study area therefore sensitive environments for erosion and sedimentation are limited. A small mapped drainage channel occurs in the north of the study area and will be avoided by the proposal. Recommendations to manage erosion and sedimentation have been made in Section 7 and provided these are implemented the impacts would be negligible.

6.8 Key threatening processes

The proposal is likely to have a minor contribution to four key threatening processes (KTPs) including:

- *Clearing of native vegetation* - EPBC Act and TSC Act (eight native trees only).
- *Forest Eucalypt dieback associated with over-abundant psyllids and bell miners* – TSC Act only.
- *Infection of native plants by Phytophthora cinnamomi* – TSC Act only.
- *Predation and hybridisation by feral dogs (Canis lupus familiaris)* – TSC Act only.
- *Predation by the European Red Fox (Vulpes vulpes)* – EPBC Act and TSC Act.
- *Invasion of native plant communities by exotic perennial grasses* – TSC Act only (already in operation).
- *Removal of dead wood and dead trees* – TSC Act only (one stag).

The required clearing of native vegetation is limited to eight mature and semi-mature paddock trees which do not provide significant habitat value for threatened biodiversity. Likewise, the stag to be removed does not contain hollows or provide potential habitat for fauna. Numerous exotic species are already prolific within the study area therefore it is unlikely the proposal would significantly exacerbate these KTPs. Recommendations relating to these have been made in Section 7 and therefore the risks associated with these KTPs would be low.

7 Recommended safeguards and management measures

The following recommendations would minimise potential impacts (direct and indirect) of the proposal on biodiversity:

- No clearing of native vegetation is to be undertaken outside of the study area which includes eight identified paddock trees and 19.95 hectares of exotic grassland (refer to Figure 2).
- Temporary exclusion fencing should be erected along the southern boundary of the Stage 2 study area to ensure that the risk of inadvertent additional clearing and Koala access during construction is minimised.
- Where feasible, native trees should be retained and protected during construction.
- In accordance with the Koala Plan of Management (UNE 2015), locally sourced feed tree species should be planted at an offset ratio of 2:1 for all native trees removed. These trees should be planted in the bushland to the south of the study area to infill canopy gaps.
- Clearing of native vegetation (the eight mature and semi mature paddock trees) should be supervised by a qualified and appropriately experienced ecologist. This supervision will include, but not be limited to a visual check for resident fauna (particularly Koala) prior to felling and capture and relocation of any displaced fauna.
- Perimeter fencing should be designed to prevent access to the solar farm by Koala and other arboreal mammals to prevent fauna becoming stranded in the facility. Likewise it should not contain barbed wire or other elements that provide a risk of entanglement.
- If Koala are observed within the study area during construction, works should cease and the animal allowed to move on at its own pace. Alternatively, if the animal is injured or disinclined to leave then a wildlife carer should be contacted.
- Plant and equipment used during construction should be free from vegetative material and soil that may contain weed seeds or soil-borne diseases prior to entering the site. Plant and machinery that is involved in earth moving should be washed-down onsite, no closer than 10 metres from native vegetation to be retained (south of the study area) to prevent spread of weeds.
- Erosion and sediment control measures are to be implemented prior to commencement of construction to minimise indirect impacts to the surrounding vegetation and the drainage channel in the north of the study area.
- Stockpiles and ancillary facilities should be located within areas of exotic pasture vegetation and at least 10 metres from native vegetation to be retained (south of the study area).
- Refuelling and storage of chemicals should be undertaken at least 10 metres from native vegetation to be retained (south of the study area) and the drainage channel

8 Conclusions

This ecological assessment has reviewed and assessed the ecological attributes of the proposal. The assessment determined that:

- The study area contains 19.95 hectares of exotic grassland which is not equivalent to any threatened ecological community under the TSC Act or the EPBC Act.
- No threatened flora species were recorded during the site visit or are considered likely to occur within the study area.
- No threatened fauna species were recorded within during the site visit. One threatened fauna species, Koala, is considered to have a moderate to high likelihood of occurrence within the study area. Significance assessments determined that the proposal would not have a significant impact on Koala therefore a referral to the Commonwealth Department of the Environment or preparation of a Species impact Statement is not recquired.
- No critical habitat listed under the TSC Act occurs within the study area
- No hollow-bearing trees were recorded within the study area, and none will be removed by the proposal.
- Clearing of native vegetation for Stage 2 of the proposal will require the preparation of a Property Vegetation Plan or development consent from NSW Local Land Services as it is subject to the provisions of the NV Act.
- The proposal is broadly consistent with the aims and objectives of the Koala Plan of Management prepared in accordance with SEPP 44 (UNE 2015).

Providing the recommendations outlined in Section 7 are followed, the proposed activity is unlikely to significantly impact any threatened species, endangered populations or ecological communities and their habitat. As such, no further ecological assessment is required.

9 References

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Office of Environment and Heritage (OEH) 2011, Atlas Search, BioNet the website for the Atlas of NSW Wildlife
http://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx

Threatened Species Scientific Committee, 2006. Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

UNE 2015. Koala Plan of Management.

Appendix 1 – Site photos

Plate 3: Proposed location of the Stage 1 solar farm (looking south)

Plate 4: Proposed location of the Stage 1 solar farm (looking west)

Plate 5: Proposed location of the Stage 1 solar farm (looking north east)

Plate 6: Exotic trees to be removed (Stage 1)

Plate 7: Planted row of Leyland Pine to be removed (Stage 1)

Plate 8: Proposed location of the Stage 2 solar farm (looking north west)

Plate 9: Proposed location of the Stage 2 solar farm (looking north east)

Plate 10: Proposed location of the Stage 1 underground cabling (looking north)

Plate 11: Proposed location of the Stage 1 underground cabling (looking south)

Appendix 2 – Flora and fauna recorded within the study area

Table 5 - Flora species recorded within the study area

Family	*Scientific Name*	Common Name
Native Species		
Asteraceae	*Euchiton sphaericus*	Star Cudweed
Asteraceae	*Leucochrysum albicans var. albicans*	
Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell
Convolvulaceae	*Dichondra repens*	Kidney Weed
Geraniaceae	*Erodium crinitum*	Blue Crowfoot
Geraniaceae	*Geranium solanderi var. solanderi*	
Juncaceae	*Juncus usitatus*	
Myrtaceae	*Eucalyptus blakelyi*	Blakely's Red Gum
Myrtaceae	*Eucalyptus viminalis*	Ribbon Gum
Oxalidaceae	*Oxalis perennans*	
Poaceae	*Austrostipa scabra*	Speargrass
Poaceae	*Bothriochloa macra*	Red Grass
Poaceae	*Chloris truncata*	Windmill Grass
Poaceae	*Cynodon dactylon*	Common Couch
Poaceae	*Elymus scaber*	Common Wheatgrass
Poaceae	*Eragrostis leptostachya*	Paddock Lovegrass
Poaceae	*Panicum effusum*	Hairy Panic
Poaceae	*Poa labillardierei var. labillardierei*	Tussock
Poaceae	*Poa sieberiana*	Snowgrass
Poaceae	*Rytidosperma racemosum*	Wallaby Grass
Poaceae	*Sporobolus creber*	Slender Rat's Tail Grass
Poaceae	*Themeda triandra*	
Exotic Species		
Apiaceae	*Cyclospermum leptophyllum*	Slender Celery
Asteraceae	*Bidens pilosa*	Cobbler's Pegs
Asteraceae	*Carduus nutans subsp. nutans*	Nodding Thistle
Asteraceae	*Cirsium vulgare*	Spear Thistle
Asteraceae	*Conyza bonariensis*	Fleabane
Asteraceae	*Gamochaeta calviceps*	Cudweed
Asteraceae	*Hypochaeris radicata*	Catsear
Asteraceae	*Sonchus asper*	Prickly Sowthistle
Asteraceae	*Taraxacum officinale*	Dandelion
Brassicaceae	*Hirschfeldia incana*	Buchan Weed

Family	*Scientific Name*	Common Name
Brassicaceae	*Lepidium bonariense*	Argentine Peppercress
Caryophyllaceae	*Cerastium vulgare*	Mouse-ear Chickweed
Caryophyllaceae	*Paronychia brasiliana*	Chilean Whitlow Wort, Brazilian Whitlow
Caryophyllaceae	*Polycarpon tetraphyllum*	Four-leaved Allseed
Cupressaceae	*Cupressus x leylandii*	Leyland Cyperuss
Cyperaceae	*Cyperus eragrostis*	Umbrella Sedge
Fabaceae (Faboideae)	*Medicago polymorpha*	Burr Medic
Fabaceae (Faboideae)	*Trifolium arvense*	Haresfoot Clover
Fabaceae (Faboideae)	*Trifolium glomeratum*	Clustered Clover
Fabaceae (Faboideae)	*Trifolium repens*	White Clover
Gentianaceae	*Centaurium tenuiflorum*	Branched Centaury, Slender centaury
Geraniaceae	*Erodium cicutarium*	Common Crowfoot
Malaceae	*Cotoneaster franchetii*	
Malvaceae	*Malva neglecta*	Dwarf Mallow
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow
Myrsinaceae	*Anagallis arvensis*	Scarlet Pimpernel
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues
Poaceae	*Anthoxanthum odoratum*	Sweet Vernal Grass
Poaceae	*Briza minor*	Shivery Grass
Poaceae	*Bromus catharticus*	Praire Grass
Poaceae	*Dactylis glomerata*	Cocksfoot
Poaceae	*Digitaria sanguinalis*	Crab Grass
Poaceae	*Ehrharta erecta*	Panic Veldtgrass
Poaceae	*Eleusine tristachya*	Goose Grass
Poaceae	*Eragrostis cilianensis*	Stinkgrass
Poaceae	*Eragrostis curvula*	African Lovegrass
Poaceae	*Festuca pratensis*	Meadow Fescue
Poaceae	*Holcus lanatus*	Yorkshire Fog
Poaceae	*Lolium perenne*	Perennial Ryegrass
Poaceae	*Paspalum dilatatum*	Paspalum
Poaceae	*Paspalum urvillei*	Vasey Grass
Poaceae	*Pennisetum clandestinum*	Kikuyu Grass
Poaceae	*Phalaris aquatica*	Phalaris

Family	*Scientific Name*	Common Name
Poaceae	*Setaria parviflora*	
Poaceae	*Vulpia myuros*	Rat's Tail Fescue
Rosaceae	*Rosa rubiginosa*	Sweet Briar
Rosaceae	*Rubus fruticosus sp. agg.*	Blackberry complex
Salicaceae	*Populus nigra*	Lombardy Poplar
Solanaceae	*Lycium ferocissimum*	African Boxthorn
Verbenaceae	*Verbena bonariensis*	Purpletop
Verbenaceae	*Verbena bonariensis*	Purpletop
Verbenaceae	*Verbena officinalis*	Common Verbena

Table 6 - Fauna species recorded within the study area

Common Name	Scientific Name	Observation Type
Birds		
Eastern Spinebill	*Acanthorhynchus tenuirostris*	Heard
Australian Pipit	*Anthus novaeseelandiae*	Observed and heard
Wedge-tailed Eagle	*Aquila audax*	Observed
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	Heard
White-winged Chough	*Corcorax melanorhamphos*	Observed and heard
Australian Raven	*Corvus coronoides*	Observed and heard
Australian Magpie	*Cracticus tibicen*	Observed and heard
Grey Butcherbird	*Cracticus torquatus*	Observed
Galah	*Eolophus roseicapillus*	Observed and heard
Musk Lorikeet	*Glossopsitta concinna*	Observed and heard
Magpie-lark	*Grallina cyanoleuca*	Observed and heard
Welcome Swallow	*Hirundo neoxena*	Observed
Superb Fairy-wren	*Malurus cyaneus*	Observed and heard
Willie Wagtail	*Rhipidura leucophrys*	Observed
Common Myna	*Sturnus tristis*	Observed and heard
Mammals		
European cattle	*Bos taurus*	Observed
Rabbit	*Oryctolagus cuniculus*	Scat
Sheep (feral)	*Ovis aries*	Observed

Appendix 3 - Likelihood of occurrence tables

Table 7 - Flora likelihood of occurrence

Scientific name	Common name	EPBC	TSC	Most recent record	Count	Likelihood of occurrence	Rationale for likelihood	Habitat
Bertya ingramii	Narrow-leaved Bertya	EN	E1	#		Low	This species is associated with rocky habitat or thin soils along cliff edges. Known populations are in a relatively discreet area Oxley Wild Rivers National Park. No habitat within the study area.	Bertya ingramii is known from three small populations in the Oxley Wild Rivers National Park separated by approximately 2.3 kilometre. The first population is in the Dangar Falls area about 20 kilometre south-east of Armidale, the second in Mihi Gorge, and the third location is undisclosed. Grows among rocks or in thin soils close to cliff-edges in dry woodland with she-oaks, wattles and tea-trees. Flower august to November.
Callistemon pungens		VU		#		Low	The existing disturbances have removed all shrubs from the study area. Furthermore, this species has not been previously recorded within the locality.	*Callistemon pungens* occurs in south-east Queensland and the northern tablelands of northeast NSW. In NSW, it occurs from near Inverell to the eastern escarpment in New England, along rocky watercourses usually with sandy granite (or occasionally basalt) creek beds, and generally among naturalised species.
Dichanthium setosum	Bluegrass	VU	V	2008/#	9	Moderate	This species is known to tolerate a moderate level of disturbance, however the study area has been exposed to more than a moderate level of disturbance.	*Dichanthium setosum* grows in woodland and grassland. It occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW (NSW OEH 2013a), extending west to Narrabri (Ayers et al. 1996). *Dichanthium setosum* is associated with heavy basaltic black soils and red-brown loams with clay subsoil.
Diuris pedunculata	Small Snake Orchid	EN	E1	#		Low	Unlikely to occur within modified, grazed groundcover vegetation of the study area.	Confined to NSW. It was originally found scattered from Tenterfield south to the Hawkesbury River, but is now mainly found on the New England Tablelands, around Armidale, Uralla, Guyra and Ebor. The Small Snake Orchid grows on grassy slopes or flats. Often on peaty soils in moist areas. Also on shale and trap soils, on fine granite, and among boulders. It flowers during August-October.

Scientific name	Common name	EPBC	TSC	Most recent record	Count	Likelihood of occurrence	Rationale for likelihood	Habitat
Eucalyptus nicholii	Narrow-leaved Black Peppermint	VU	V	1976/#	1	Low	Only nine native trees occur within the study area. This is not an inconspicuous species and it was not recorded.	This species is widely planted as an urban street tree and in gardens but is quite rare in the wild. It is confined to the New England Tablelands of NSW, where it occurs from Nundle to north of Tenterfield, largely on private property. Grows in dry grassy woodland, on shallow and infertile soils, mainly on granite.
Eucalyptus rubida subsp. barbigerorum	Blackbutt Candlebark	VU	V	1907/#	2	Low	The study area is south of the southern extent of this species, this is not an inconspicuous species and it was not recorded.	Known from scattered populations on the New England Tablelands from Guyra to the Tenterfield area. Most populations occur on private property however the species is recorded in Barayamal and Guy Fawkes National Parks.
Euphrasia arguta		CE	E4A	#		Low	This species was recently rediscovered approximately 100 kilometres south of the study area, before which it had not been recorded on the Northern Tablelands for over 100 years. It is unlikely to occur within the study area based on historical disturbances.	Grows in grassy areas near rivers.
Haloragis exalata subsp. velutina	Tall Velvet Sea-berry	VU	V	#		Low	No suitable riparian habitat within the study area.	Found in damp areas near watercourses.
Lepidium hyssopifolium	Aromatic Peppercress	EN	E1	1958	1	Low	More typically associated with the Southern Tablelands however some older records are located further north. Unlikely to occur within the study area.	Associated with introduced weedy species that tend to populated areas that receive little maintenance and are generally allowed to lie as derelict pasture. Original habitat is eucalypt woodland with grassy groundcover, low open casuarina woodland with a grassy ground cover and tussock grassland.

Scientific name	Common name	EPBC	TSC	Most recent record	Count	Likelihood of occurrence	Rationale for likelihood	Habitat
Pelargonium sp. Striatellum (G.W.Carr 10345)	Omeo Stork's Bill	EN		#		Low	No suitable ephemeral lake habitat present within the study area.	Pelargonium sp. Striatellum (G.W.Carr 10345) is a tufted perennial herb. It has a basal leaf rosette and leafy flowering stems which grow to 15 cm tall, with fleshy and often extensively branched rhizomes giving rise to individual plants (ramets) in clonal colonies. The species is known to occur in habitat usually located just above the high water level of irregularly inundated or ephemeral lakes. During dry periods, the species is known to colonise exposed lake beds. Pelargonium sp. Striatellum (G.W.Carr 10345) occurs within the South Eastern Highlands and South East Corner IBRA Bioregions and the Hawkesbury-Nepean, Murrumbidgee, Southern Rivers and North East Natural Resource Management Regions.
Prasophyllum petilum	Tarengo Leek Orchid	EN	E1	#		Low	Typically associated with the Southern Tablelands and ACT. Unlikely to occur within the degraded pasture of the study area.	Known from two sites in the NSW Southern Tablelands; at Boorowa and Captains Flat; and at Hall in the Australian Capital Territory.Plants can be very cryptic when growing in small numbers and within tall grasses
Prasophyllum sp. wybong	A Leek Orchid	CE		#		Low	Unlikely to occur within the degraded pasture of the study area.	Leek orchids are generally found in shrubby and grassy habitats in dry to wet soil. Prasophyllum sp. Wybong is known to occur in open eucalypt woodland and grassland. Prasophyllum sp. Wybong is endemic to NSW. It is known from seven populations in eastern NSW near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell and Tenterfield. Prasophyllum sp. Wybong occurs within the Border Rivers (Gwydir, Namoi, Hunter), Central Rivers and Central West Natural Resource Management Regions. The species occurs within the Sydney Basin, New England Tablelands, Brigalow Belt South and NSW South Western Slopes Interim Biogeographic Regionalisation for Australia Bioregions.

Scientific name	Common name	EPBC	TSC	Most recent record	Count	Likelihood of occurrence	Rationale for likelihood	Habitat
Swainsona sericea	Silky Swainson-pea		V	1993	1	Low	This species is known to be sensitive to grazing pressure and weed invasion, both of which are prevalent within the study area.	Grassland and eucalypt grassy woodland, sometimes with Callitris species. Silky Swainson-pea has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on the
Thesium australe	Austral Toadflax	VU	V	1972/#	1	Low	No favourable conditions or large stands of Kangaroo grass within the study area.	Found in very small to large populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Thesium australe is a root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass. It is often found in damp sites in association with Themeda australe, but also found on other grass species at inland sites. Occurs on clay soils in grassy woodlands or coastal headlands.

Table 8 - Fauna likelihood of occurrence

Scientific name	Common name	EPBC	TSC	Most recent record	Count	Likelihood of occurrence	Rational for likelihood	Habitat
Birds								
Anthochaera phrygia	Regent Honeyeater	CE	E4A	1993/#	3	Low-moderate	Although there are some potential winter foraging resources within the study area, these isolated paddock trees represent a negligible area of habitat in the context of the locality.	A semi-nomadic species occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises*: E. microcarpa, E. punctata, E. polyanthemos, E. mollucana, Corymbia robusta, E. crebra, E. caleyi, C. maculata, E. mckieana, E. macrorhyncha, E. laevopinea* and *Angophora floribunda*. Nectar and fruit from the mistletoes *A. miquelii*, A. pendula, A. cambagei are also eaten during the breeding season. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and sheoaks. Also nest in mistletoe haustoria. An open cup-shaped nest is constructed of bark, grass, twigs and wool by the female.
Calidris ferruginea	Curlew Sandpiper	CE	E1	#		Low	This species is only rarely observed on the tablelands and west of the Great Divide.	The Curlew Sandpiper is a small, highly-gregarious, migratory shorebird with a medium-length, down-curved bill and longish black legs. The Curlew Sandpiper is distributed around most of the coastline of Australia. It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. The Curlew Sandpiper breeds in Siberia and migrates to Australia for the non-breeding period, from August to April
Chthonicola sagittata	Speckled Warbler		V	1989	7	Low	This species typically prefers more heavily timbered woodlands than the vegetation	This species occurs in eucalypt and cypress woodlands on the hills and tablelands of the Great Dividing Range. They prefer woodlands with a

Scientific name	Common name	EPBC	TSC	Most recent record	Count	Likelihood of occurrence	Rational for likelihood	Habitat
							within the study area. The groundcover condition and ongoing grazing does not provide suitable inter-tussock spaces for nesting birds.	grassy understorey, often on ridges or gullies. The species is sedentary, living in pairs or trios and nests on the ground in grass tussocks, dense litter and fallen branches. They forage on the ground and in the understorey for arthropods and seeds. Home ranges vary from 6-12 hectares.
Circus assimilis	Spotted Harrier		V	1987	2	Low-moderate	This species is likely to fly over the study area, which does contribute to the mosaic of foraging habitat that this species would use. In the context of the locality, the study area presents a very small area of foraging habitat for this highly mobile species.	The Spotted Harrier is found throughout Australia but rarely in densely forested and wooded habitat of the escarpment and coast. Preferred habitat consists of open and wooded country with grassland nearby for hunting. Habitat types include open grasslands, acacia and mallee remnants, spinifex, open shrublands, saltbush, very open woodlands, crops and similar low vegetation. The Spotted Harrier is more common in drier inland areas, nomadic part migratory and dispersive, with movements linked to the abundance of prey species. Nesting occurs in open or remnant woodland and unlike other harriers, the Spotted Harrier nests in trees.
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)		V	2012	3	Low – moderate	This species typically prefers more heavily timbered woodlands than the vegetation within the study area. In the context of the locality, the study area presents a very small area of foraging habitat for this highly mobile species.	Lives in eucalypt woodlands, especially areas of relatively flat open woodland typically lacking a dense shrub layer, with short grass or bare ground and with fallen logs or dead trees present.
Daphoenositta chrysoptera	Varied Sittella		V	1995	2	Low – moderate	This species typically prefers more heavily timbered woodlands that are characterised by rough barked species than the vegetation within the study area. In the context of the locality, the study area presents a very small area	The Varied Sittella is a sedentary species which inhabits a wide variety of dry eucalypt forests and woodlands, usually with either shrubby understorey or grassy ground cover or both, in all climatic zones of Australia. Usually inhabit areas with rough-barked trees, such as stringybarks or ironbarks, but also in mallee and acacia woodlands, paperbarks or mature Eucalypts. The Varied Sittella feeds on arthropods gleaned from bark, small branches and

Scientific name	Common name	EPBC	TSC	Most recent record	Count	Likelihood of occurrence	Rational for likelihood	Habitat
							of foraging habitat for this highly mobile species.	twigs. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.
Ephippiorhynchus asiaticus	Black-necked Stork		E1	2003	3	Low	The study area provides marginal potential foraging habitat with limited connectivity to better quality wetland habitat.	Found in swamps, mangroves and mudflats. Can also occur in dry floodplains and irrigated lands and occasionally forages in open grassy woodland. Nests in live or dead trees usually near water.
Erythrotriorchis radiatus	Red Goshawk	VU	E4A	#		Low	Prefers denser vegetation near permanent waterbodies.	Occur in forest and woodland habitat near permanent water. In NSW prefer Melaleuca swamp forest and open eucalypt woodland. Require greater than 20 m tall trees for nesting.
Falco subniger	Black Falcon		V	2013	3	Low-moderate	This species is likely to fly over the study area, which does contribute to the mosaic of foraging habitat that this species would use. The study area does not provide nesting habitat therefore in the context of the locality, the study area presents a very small area of foraging habitat for this highly mobile species.	Mainly occur in woodlands and open country where can hunt. Often associated with swamps, rivers and wetlands. Nest in tall trees along watercourses.
Glossopsitta pusilla	Little Lorikeet		V	1995	1	Low – moderate	No suitable nesting tree hollows were identified within the study area. The native paddock trees do provide some foraging resources for this species however these are minor in the context of the bushland surrounding and the broader locality.	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes.

Scientific name	Common name	EPBC	TSC	Most recent record	Count	Likelihood of occurrence	Rational for likelihood	Habitat
Grantiella picta	Painted Honeyeater	VU	V	1993/#	3	Low	No suitable habitat within the study area.	Found mainly in dry open woodlands and forests, where it is strongly associated with mistletoe. Often found on plains with scattered eucalypts and remnant trees on farmlands.
Hieraaetus morphnoides	Little Eagle		V	2013	9	Low-moderate	This species is likely to fly over the study area, which does contribute to the mosaic of foraging habitat that this species would use. The study area does not provide nesting habitat therefore in the context of the locality, the study area presents a very small area of foraging habitat for this highly mobile species.	The Little Eagle is most abundant in lightly timbered areas wit open areas nearby providing an abundance of prey species. It has often been recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland and forests.
Lathamus discolor	Swift Parrot	EN	E1	#		Low-moderate	Although there are some potential winter foraging resources within the study area, these isolated paddock trees represent a negligible area of habitat in the context of the locality.	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany Eucalyptus robusta, Spotted Gum Corymbia maculata, Red Bloodwood C. gummifera, Mugga Ironbark E. sideroxylon, and White Box E. albens. Commonly used lerp infested trees include Grey Box E. microcarpa, Grey Box E. moluccana and Blackbutt E. pilularis. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.

Scientific name	Common name	EPBC	TSC	Most recent record	Count	Likelihood of occurrence	Rational for likelihood	Habitat
Lophoictinia isura	Square-tailed Kite		V	1993	6	Low	More typically associated with foraging resources within ridge and gully forests rather than grassy woodlands.	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by Eucalyptus longifolia, Corymbia maculata, E. elata, or E. smithii. Individuals appear to occupy large hunting ranges of more than 100 km2. They require large living trees for breeding, particularly near water with surrounding woodland /forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)		V	2007	4	Low-moderate	This species has a wide range of habitat characteristics and could not be excluded from visiting the study area on occasion. The habitat present is considered marginal due to its cleared nature, and greater areas of more intact vegetation occurs in the surrounding area. The loss of marginal foraging resources for this species is therefore considered negligible.	This species lives in a wide range of temperate woodland habitats, and a range of woodlands and shrublands in semi-arid areas.
Ninox connivens	Barking Owl		V	1996	3	Low-moderate	This species may fly over the study area, which provides marginal foraging resources. The study area does not provide nesting habitat therefore in the context of the locality, the study area presents a very small area of foraging habitat for this highly mobile species.	Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country. Territories are typically 2000 ha in NSW habitats.
Ninox strenua	Powerful Owl		V	1980	1	Low	This species prefers more heavily wooded vegetation containing suitable nesting resources for arboreal mammals	The Powerful Owl occupies wet and dry eucalypt forests and rainforests. It may inhabit both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the

Scientific name	Common name	EPBC	TSC	Most recent record	Count	Likelihood of occurrence	Rational for likelihood	Habitat
							(i.e. tree hollows). No such habitat occurs within the study area. No suitable roosting resources were recorded within the study area.	limbs of dense trees in gully areas. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm. It has a large home range of between 450 and 1450 ha.
Pandion haliaetus	Osprey		V	#		Low	This species occurs in more coastal areas.	Found in coastal waters, inlets, estuaries and offshore islands. Occasionally found 100 km inland along larger rivers. It is water-dependent, hunting for fish in clear, open water. The Osprey occurs in terrestrial wetlands, coastal lands and offshore islands. It is a predominantly coastal species, generally using marine cliffs as nesting and roosting sites. Nests can also be made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.
Petroica boodang	Scarlet Robin		V	2005	18	Low-moderate	This species has a wide range of habitat characteristics and could not be excluded from visiting the study area on occasion. The habitat present is considered marginal due to its cleared nature, and lack of habitat logs and woody debris. Additional areas of more intact vegetation occur in the surrounding area. The loss of marginal foraging resources for this species is therefore considered negligible.	During the breeding season the Scarlet Robin is found in eucalypt forests and temperate woodlands, often on ridges and slopes. During autumn and winter it moves to more open and cleared areas. It has dispersive or locally migratory seasonal movements. The Scarlet Robin forages amongst logs and woody debris for insects which make up the majority of its diet. The nest is an open cup of plant fibres and cobwebs, sited in the fork of a tree (often a dead branch in a live tree, or in a dead tree or shrub) which is usually more than 2 m above the ground. It is conspicuous in open and suburban habitats.
Stagonopleura guttata	Diamond Firetail		V	2012	2	Low	This species has a wide range of habitat characteristics and could not be excluded from visiting the study area on occasion. The habitat present is considered	Found in a range of habitat types including open eucalypt forest, mallee and acacia scrubs. Often occur in vegetation along watercourses.

Scientific name	Common name	EPBC	TSC	Most recent record	Count	Likelihood of occurrence	Rational for likelihood	Habitat
							marginal due to its cleared nature, and greater areas of more intact vegetation occurs in the surrounding area. The loss of marginal foraging resources for this species is therefore considered negligible.	
Tyto novaehollandiae	Masked Owl		V	1997	21	Low	This species prefers wooded vegetation containing suitable nesting resources for arboreal mammals (i.e. tree hollows). No such habitat occurs within the study area. No suitable roosting resources were recorded within the study area.	The Masked Owl may be found across a diverse range of wooded habitat that provide tall or dense mature trees with hollows suitable for nesting and roosting. It has mostly been recorded in open forests and woodlands adjacent to cleared lands. They nest in hollows, in trunks and in near vertical spouts or large trees, usually living but sometimes dead. The nest hollows are usually located within dense forests or woodlands. Masked Owls prey upon hollow-dependent arboreal marsupials, but terrestrial mammals make up the largest proportion of the diet. It has a large home range of between 500 to 1000 ha.
Amphibians								
Litoria booroolongensis	Booroolong Frog	EN	E1	#		Low	No suitable aquatic or riparian habitat within the study area.	The species is restricted to NSW and north-eastern VIC, predominantly along the western-flowing streams of the Great Dividing Range. The most recent records occur on the south-west slopes of NSW. The species is found in upland rivers, montane creeks and lowland rivers and creeks, particularly in permanent rocky western-flowing streams and rivers on the slopes and tablelands of NSW , with some fringing vegetation cover such as ferns, sedges or grasses. The Booroolong Frog is often found in daylight on rocks by the waters edge or sheltering under rocks or amongst vegetation. Breeding occurs in spring and early summer when eggs are laid in submerged rock crevices. Tadpoles

Scientific name	Common name	EPBC	TSC	Most recent record	Count	Likelihood of occurrence	Rational for likelihood	Habitat
								develop in slow-flowing connected or isolated pools and metamorphose in late summer to early autumn.
Litoria castanea	Yellow-spotted Tree frog	EN	E4A	1958/#	1	Low	No suitable aquatic or riparian habitat within the study area.	The Yellow-spotted Tree Frog has only recently (2010) been recorded in the wild again. Before this it had not been recorded in the wild since the 1970s. It has a disjunct distribution, being recorded on the New England Tableland and on the southern highlands from Lake George to Bombala. There are unconfirmed reports from near Bathurst and Orange. Found in large permanent ponds, lakes and dams with an abundance of bulrushes and other emergent vegetation. It shelters during autumn and winter under fallen timber, rocks, other debris or thick vegetation.
Mammals								
Aepyprymnus rufescens	Rufous Bettong		V	1990	1	Low	This species is very rare in inland areas and typically inhabits more coastal vegetation types. Likewise they shelter in tall tussock grasses which do not occur within the study area.	Occurs in a variety of habitats for coastal eucalypt forest, through tall, wet sclerophyll, to low, dry open woodland. Only occurs in areas with a sparse or grassy understorey, adjacent to areas of dense undergrowth.
Chalinolobus dwyeri	Large-eared Pied Bat	VU	V	#		Low	The study area does not contain any roosting resources and provides only marginal foraging resources for this species. Greater areas of more suitable habitat occur in the broader locality.	Occurs from the Queensland border to Ulladulla, with largest numbers from the sandstone escarpment country in the Sydney Basin and Hunter Valley. Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands. Forages on small, flying insects below the forest canopy. Roosts in colonies of between three and 80 in caves, Fairy Martin nests and mines, and beneath rock overhangs, but usually less than 10 individuals. Likely that it hibernates during the cooler months. The only known existing maternity roost is in a sandstone cave near Coonabarabran.

Scientific name	Common name	EPBC	TSC	Most recent record	Count	Likelihood of occurrence	Rational for likelihood	Habitat
Dasyurus maculatus	Spotted-tailed Quoll	EN	V	2006/#	3	Low	Spotted-tailed Quolls have been sighted in open country however they require large areas of relatively intact vegetation to provide sufficient foraging resources. Although the species could potentially utilise the study area on occasion for dispersal, the proposal would not result in the loss of any habitat for the species.	Occurs along the east coast of Australia and the Great Dividing Range. Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests. Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas. Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage. Seventy per cent of the diet is medium-sized mammals, and also feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage. The home range of a female is between 180 and 1000 ha, while males have larger home ranges of between 2000 and 5000 ha. Breeding occurs from May to August.
Falsistrellus tasmaniensis	Eastern False Pipistrelle		V	2010	1	Low	The study area does not contain any roosting resources and provides only marginal foraging resources for this species. Greater areas of more suitable habitat occur in the broader locality.	Distribution extending east of the Great Dividing Range throughout the coastal regions of NSW, from the Queensland border to the Victorian border. Prefers wet high-altitude sclerophyll and coastal mallee habitat, preferring wet forests with a dense understorey but being found in open forests at lower altitudes. Apparently hibernates in winter. Roosts in tree hollows and sometimes in buildings in colonies of between 3 and 80 individuals. Often change roosts every night. Forages for beetles, bugs and moths below or near the canopy in forests with an open structure, or along trails. Has a large foraging range, up to 136 ha. Records show movements of up to 12 km between roosting and foraging sites.
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat		V	2010	1	Low	The study area does not contain any roosting resources and provides only marginal foraging resources for this species. Greater areas of more suitable	Occurs from Victoria to Queensland, on both sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred kilometres to their wintering sites,

Scientific name	Common name	EPBC	TSC	Most recent record	Count	Likelihood of occurrence	Rational for likelihood	Habitat
							habitat occur in the broader locality.	where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways.
Petauroides volans	Greater Glider	EN		#		Low	Glider species rely on an abundance of suitable tree hollows for nesting and no not typically leave areas of vegetation that have at least a semi intact canopy.	The distribution of the Greater Glider includes the ranges and coastal plain of eastern Australia, where it inhabits a variety of eucalypt forests and woodlands. Presence and density of Greater Gliders is related to soil fertility, eucalypt tree species, disturbance history and density of suitable tree hollows
Petaurus norfolcensis	Squirrel Glider		V, E2	1995	1	Low	Glider species rely on an abundance of suitable tree hollows for nesting and no not typically leave areas of vegetation that have at least a semi intact canopy.	Wagga Wagga and Barrenjoey peninsula (north syd): Sparsely distributed along the east coast and immediate inland areas as far west as Coonabarabran in the northern part of the state and as far west as Tocumwal along the southern border of the state. Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow-bearing trees and a mix of eucalypts, banksias and acacias. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked. They live in family groups of 2-10 individuals and maintain home ranges of 0.65 and 10.5 ha, varying according to habitat quality and food resource availability. Family groups occupy multiple hollows over time.
Petrogale penicillata	Brush-tailed Rock-wallaby	VU	E1	#		Low	Typically occurs in areas with much higher levels of outcropping.	Occurs along the Great Dividing Range south to the Shoalhaven, and also occurs in the Warrumbungles and Mt Kaputar. Habitats range from rainforest to open woodland. It is found in areas with numerous ledges, caves and crevices, particularly where

Scientific name	Common name	EPBC	TSC	Most recent record	Count	Likelihood of occurrence	Rational for likelihood	Habitat
								these have a northerly aspect. Individuals defend a specific rock shelter, emerging in the evening to forage on grasses and forbs, as well as browse in drier months. Home sizes range from 2-30 ha.
Phascolarctos cinereus	Koala	VU	V, E2	2014/#	42	Moderate -high	A known population of Koala occur within the UNE campus. A number of barriers to Koala movement may limit their use of the vegetation within the study area, such as distance and barbed wire fencing. Notwithstanding, preferred feed trees occur within the Stage 2 study area therefore their presence cannot be discounted.	Pittwater LGA and Hawks nest: In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region. Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. Primary feed trees include Eucalyptus robusta, E. tereticornis, E. punctata, E. haemostoma and E. signata. They are solitary with varying home ranges. In high quality habitat home ranges may be 1-2 ha and overlap, while in semi-arid country they are usually discrete and around 100 ha.
Pteropus poliocephalus	Grey-headed Flying-fox	VU	V	2008/#	2	Low – moderate	These are generalist foragers that typically feed on fruits in wet sclerophyll forest, rainforest and riparian thickets. They are also know to forage on eucalypt nectar and could utilise the trees within the study area on occasion. More intact vegetation occurs in the surrounding area therefore the loss of marginal foraging resources for this species is therefore considered negligible.	Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies (camps), commonly in dense riparian vegetation. Bats commute daily to foraging areas, usually within 15 km of the day roost although some individuals may travel up to 70 km.
Scoteanax rueppellii	Greater Broad-nosed Bat		V	1992	1	Low	The study area does not contain any roosting resources and provides only marginal foraging resources for this species. Greater areas of more suitable habitat occur in the broader locality.	Occurs along the Great Dividing Range, generally at 500 m but up to 1200 m, and in coastal areas. Occurs in woodland and rainforest, but prefers open habitats or natural or human-made openings in wetter forests. Often hunts along creeks or river corridors. Flies slowly and directly at a height of 30 m or so to catch beetles and other large, flying

Scientific name	Common name	EPBC	TSC	Most recent record	Count	Likelihood of occurrence	Rational for likelihood	Habitat
								insects. Also known to eat other bats and spiders. Roosts in hollow tree trunks and branches.
Reptiles								
Underwoodisaurus sphyrurus/ *Uvidicolus sphyrurus*	Bells Turtle/Namoi River Snapping Turtle	VU	V	#	0	Low	No aquatic or riparian habitat within the study area.	In NSW, currently found only in the upper reaches of the Namoi and Gwydir River systems, on the escarpment of the North West Slopes. The species occurs in shallow to deep pools in upper reaches or small tributaries of major rivers in granite country. Occupied pools are most commonly less than 3 m deep with rocky or sandy bottoms and patches of vegetation. It most typically uses narrow stretches of rivers 30 - 40 m wide. Most surrounding habitat has been converted to grazing land.
Elseya belli/ Wollumbinia belli	Border Thick-tailed Gecko	VU	V	#	0	Low	No suitable granite outcropping or scree slopes within the study area.	Found only on the tablelands and slopes of northern NSW and southern Queensland, reaching south to Tamworth and west to Moree. Most common in the granite country of the New England Tablelands, occuring at sites ranging from 500 to 1100 m elevation. This species often occurs on steep rocky or scree slopes, especially granite. Favours forest and woodland areas with boulders, rock slabs, fallen timber and deep leaf litter. Occupied sites often have a dense tree canopy that helps create a sparse understorey.

Appendix 4: NSW Assessment of significance (seven-part tests)

Koala *Phascolarctos cinereus*

The Koala is an arboreal marsupial that has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. They are most active at night and although they spend the majority of their time feeding amongst the canopy, they will cross open ground when moving between trees. As a species they have a relatively broad feeding preferences, however they will typically only browse from a select number of species in any one area.

The UNE campus is home to a population of Koala and is considered core habitat as defined under SEPP 44. The vegetation within the study area is predominantly of little value for Koalas due to the cleared and grazed nature. The Stage 2 study area contains a total of eight mature and semi-mature paddock trees including two Ribbon Gum and six Blakely's Red Gum, both of which are recognised as a preferred feed tree species. No Koala were recorded during the site assessment and no signs of Koala (scats, scratch marks etc.) were recorded. A partially intact barbed wire fence occurs between the bushland to the south and the vegetation within the study area, which may potentially limit connectivity between the bushland and the study area. Notwithstanding, it is plausible that Koala may utilise foraging resources within the study area.

In the case of a threatened species, whether the action proposed 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.

Koala have been previously recorded within the UNE campus, to the south of the study area, and in the greater locality. Potential foraging resources within the study area (Stage 2) include eight mature and semi-mature native paddock trees. The removal of these trees represents the extent of the required habitat removal. Koala have home ranges that vary based on the quality of habitat but are typically from two hectares to several hundred hectares in size. Females have a single young per year, breeding annually from the age of 2. Foraging habitat for the species occurs to the south, west and north of the study area and connectivity amongst these areas is intact. It is unlikely that the proposal would remove foraging and breeding resources such that the known population within the UNE Campus is placed at risk of extinction.

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable, the study area does not occur within one of the three endangered populations of Koala in NSW.

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The proposal will involve the removal of eight mature and semi mature native paddock trees that provide feeding resources for Koala. To the south of the study area is a bushland patch that extends to the west and north. Assuming that the surrounding bushland within the locality contains similar values to the study area, the total extent of habitat to be removed is negligible in the context of the bushland within the locality.

The study area is comprised predominantly of exotic and native grasses within a historically cleared paddock. Similar landscapes occur to the north east and east of the study area. The trees to be removed occur on the northern boundary and to the north of a more intact vegetation patch. There is an existing corridor of vegetation that occurs to the south, west and north of the study area which would not be impacted by the proposal. The proposal is therefore unlikely to significantly increase the level of fragmentation or isolation of this habitat.

The vegetation within the UNE campus provides core habitat for a known population of Koala, therefore it is of high importance for the species. The vegetation within the study area is on the northern boundary, and to the north of this vegetation, and is on the disturbed interface that transitions into open paddock. The required clearing is limited to eight mature and semi mature trees, of species that are relatively widespread within the UNE Camps and in surrounding bushland. It is unlikely that these specific trees are important to the survival of the species based on their location on the disturbed interface, and the limited amount of feeding resources they provide.

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Critical habitats are areas of land that are crucial to the survival of particular threatened biota. Under sections 53-55 of the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for Koala.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

There is a recovery plan prepared by the Department of Environment and Climate Change. The objectives of this plan, relevant to the proposal include:

- Conserve Koalas in their existing habitat:
  - Identify and conserve habitat important for Koala conservation
  - Assess the impact of habitat loss and fragmentation on Koala populations
  - Integrate Koala habitat conservation into local and state government planning processes
  - Develop appropriate road risk management in Koala habitat
  - Implement strategies which minimise the impacts of dogs on Koala populations

  - Develop and implement strategies to reduce the impact of fires on Koala populations.
- Rehabilitate and restore Koala habitat and populations:
  - Revegetate and rehabilitate selected sites
  - Make appropriate use of translocation.

The proposal is not entirely consistent with these objectives, however, the proposal is not considered likely to significantly interfere with the recovery of the species for the following reasons:

- The required clearing is limited to eight mature and semi-mature paddock trees which is a small amount in the context of the locality
- The vegetation to be cleared is on the edge of an existing patch and will not affect the condition of habitat to be retained
- Although mitigation measures are not considered as a part of this impact assessment, the proposal will include revegetation of appropriate species to improve habitat to be retained. This is consistent with recovery objective 2.

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

There are 16 Key Threatening Processes (KTPs) listed on the TSC Act. Of these, the following are relevant to the proposal relating to Koala:

- Clearing of native vegetation
- Forest Eucalypt dieback associated with over-abundant psyllids and bell miners
- High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition
- Predation and hybridisation of feral dogs (*Canis lupus familiaris*)
- Predation by the European red fox (*Vulpes vulpes*).

The proposal would involve clearing of native vegetation in the form of eight mature and semi-mature paddock trees. The proposal is unlikely to exacerbate or bring into effect the other KTPs listed above.

Conclusion

The proposal would have the following impacts on Koala:

- Loss of eight mature and semi-mature feed trees
- Increase in the impact of one KTP

Overall the proposal is considered unlikely to result in a significant impact on a local population of arboreal mammals, as:

- The required clearing is small in the context of the available feeding resources within the locality
- The species are mobile and potential feeding resources to be removed is not considered limiting
- The proposal would not further isolate or fragment a population of the species or its habitat
- There will not be any adverse effects on critical habitat (directly or indirectly)
- The habitat proposed to be removed is not important to the long-term survival of the species
- The proposal would not significantly impact the recovery of the species.

Therefore a SIS is not required.

Appendix 5: Commonwealth significant impact criteria assessment

Koala *Phascolarctos cinereus*

This significant impact criteria assessment has been prepared based on the *EPBC Act referral guidelines for the vulnerable Koala* (Commonwealth of Australia 2014). These guidelines require the classification of the geographic context based on the location of the study area in relation to the 800 millimeter isohyet. Based on the nearest Bureau of Meteorology weather station (Armidale Airport) the study area receives an average of 759.6 millimeters of rainfall annually (BOM 2016). For the purpose of this assessment the study area is therefore defined as an inland area.

Would the action lead to a long-term decrease in the size of an important population of a species?

The loss of eight mature and semi mature paddock trees that provide potential feeding habitat for these species is unlikely to lead to a long term decrease in the size of the population. No evidence of Koala use was observed during the field survey and additional, higher condition foraging resources occur to the south, west and north of the study area.

Would the action reduce the area of occupancy of the species?

The known population of Koala occurs within the UNE campus. The habitat to be removed is located on the northern boundary of this vegetation and will leave the majority of available resources intact. It is possible that Koala may utilise the trees within the study area on occasion therefore the proposal could have a small reduction in the area of potential occupancy of the species.

Would the action fragment an existing population into two or more populations?

The proposed removal of habitat is on the edge of a patch of bushland with relatively good connectivity (in the context of the locality) to the north. The proposal would not fragment or further isolate the existing population.

Would the action adversely affect habitat critical to the survival of a species?

The assessment criteria outlined in Table 4 of the *referral guidelines for the vulnerable Koala* have been applied when considering whether the study area constitutes habitat critical to the survival of the species. In summary, the vegetation within the study area is considered critical to the survival of the species, as outlined in Table 9.

Table 9: Critical habitat assessment criteria

Attribute	Score[1]	Justification
Koala occurrence	1	No evidence of Koalas within the study area when the site was assessed. This included searches for scats, scratch marks and animals.
Vegetation composition	2	The vegetation is classified as an open woodland (according to the Specht system) and contains 2 feed tree species.
Habitat Connectivity	2	There are no barriers that reduce surrounding habitat below 1000 ha.

Attribute	Score[1]	Justification
Key existing threats	2	The location of the vegetation to be cleared, away from roads on the university campus make it unlikely that there are significant risks to the population such as dog attacks and vehicle strike.
Recovery value	0	The habitat to be removed is very small in size and degraded from historical land practices therefore it is of low value for the recovery of the species.
Total	**7**	

[1] a score of 0 being low and 2 being high

Although the study area is considered to contain habitat critical to the survival of the species, in accordance with the criteria in Figure 2 of the *referral guidelines for the vulnerable Koala* (i.e achieves a score >5), the proposal would not adversely affect habitat critical to the survival of the species. This figure outlines a number of examples of clearing that would and would not trigger the need for a referral. The clearing of eight mature and semi mature paddock trees (covering an area no greater than 0.25 hectares) with a value score of 7 is well below the threshold for an adverse effect.

Would the action disrupt the breeding cycle of an important population?

Female Koala have a single young annually from the age of two years. Threats to the lifecycle of the species include loss of habitat resources and increased risk of predation or vehicle strike. It is unlikely that the proposal would increase the risk of predation or vehicle strike on the existing population. A total of eight mature and semi mature feed trees would be lost which, although a loss in foraging habitat for the species, is unlikely to disrupt the breeding cycle of the population.

Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The proposal would remove a total of eight mature and semi mature feed trees. Additional foraging resources for the species occur to the south, west and north of the study area and would be retained. The population of Koala on the UNE campus is not at carrying capacity, likewise the proposal would not introduce any new threats to the population, and therefore it is unlikely that the impacts associated with the proposal would lead to the decline of the species.

Would the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

Invasive and aggressive native species that pose a threat to Koala include:

- Dog *Canis familiaris*

The action is unlikely to result in increased activity of domestic dogs within the population of Koala on the UNE campus.

Would the action introduce disease that may cause the species to decline?

Koala are carriers of Chlamydia and are known to or be negatively affected by the introduction of *Phytophthora cinnamomi*. The species is known to suffer from the effects of Chlamydia when placed at increased levels of stress from loss of foraging habitat and increased predatory risk. The small scale nature of habitat loss make it unlikely that the population will be placed at an increased level of stress. Likewise, it is unlikely that the proposal would introduce *Phytophthora cinnamomi* into the surrounding bushland as impacts and access will be restricted to the vegetation to be cleared.

Would the action interfere with the recovery of the species?

Impacts which are likely to substantially interfere with the recovery of the Koala may include one or more of the following:

- Increasing Koala fatalities in habitat critical to the survival of the Koala due to dog attacks to a level that is likely to result in multiple, ongoing mortalities.
- Increasing Koala fatalities in habitat critical to the survival of the Koala due to vehicle-strikes to a level that is likely to result in multiple, ongoing mortalities.
- Facilitating the introduction or spread of disease or pathogens for example Chlamydia or *Phytophthora cinnamomi*, to habitat critical to the survival of the Koala, that are likely to significantly reduce the reproductive output of Koalas or reduce the carrying capacity of the habitat.
- Creating a barrier to movement to, between or within habitat critical to the survival of the Koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the Koala.
- Changing hydrology which degrades habitat critical to the survival of the Koala to the extent that the carrying capacity of the habitat is reduced in the long-term.

The proposal is unlikely to lead to any of these impacts therefore it is unlikely to substantially interfere with the recovery of the species. No specific mitigation measures are therefore proposed.

Conclusion

Based on the factors addressed above, the proposed removal of eight mature and semi mature native paddock trees which are preferred feed trees for Koala will not result in a significant impact on an important population of the species. Referral of the action (proposal) to the Department of the Environment is not required.

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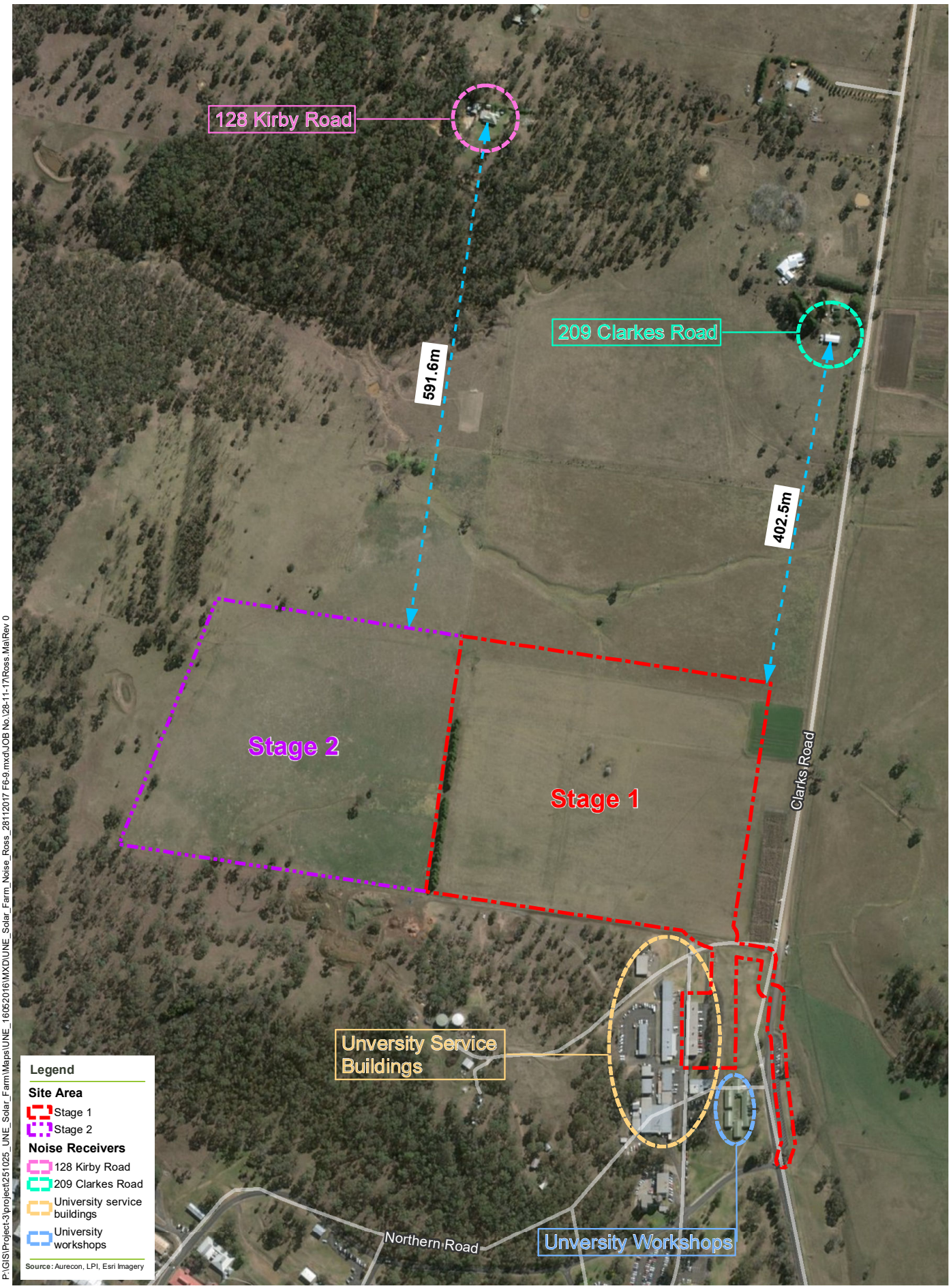
Responses to submissions to proposed construction of UNE solar farm – December 2017

Attachment 5 – Location and distance to nearest sensitive receivers



1:6,000

0 100 200 m

Projection: GDA 1994 MGA Zone 56

Figure 2: Distance to nearest sensitive receivers