

Memorandum

31 October 2019

To: Iwan Davies / Elle Donnelley
From: Claire Burnes
Subject: J17300 - New England Solar Farm - Additional information package

Dear Iwan & Elle,

1 Overview

UPC Renewables Australia Pty Ltd (UPC) proposes to develop the New England Solar Farm; a significant grid-connected solar farm and battery energy storage system (BESS) along with associated infrastructure, approximately 6 kilometres (km) east of the township of Uralla, which lies approximately 19 km south of Armidale in the Uralla Shire local government area (LGA) (the project).

The project is classed as State Significant Development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). A development application (DA) and environmental impact statement (EIS) was submitted under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The DA and EIS for the project were publicly exhibited from 20 February to 20 March 2019.

Following public exhibition of the DA and EIS, two additional reports have been submitted to the NSW Department of Planning, Industry and Environment (DPIE), namely:

- a response to submissions (RTS) report (June 2019), responding to the matters raised in the regulatory and public submissions provided during the public exhibition period of the EIS; and
- an amendment report (AR) (June 2019), providing a description of the additional project refinements and changes that have been made since the public exhibition of the EIS.

Since the submission of the RTS and AR, UPC has continued consultation with DPIE, NSW Roads and Maritime Services (RMS) and Uralla Shire Council in relation to a number of issues.

This memorandum provides a consolidated summary of the outcomes of the consultation with relevant agencies that has taken place since submission of the RTS and AR and updates the impact assessment and UPC's commitments for mitigation and management of those aspects that have changed from that documented in the RTS and AR. A summary of updates by key issue is outlined below, with supporting documentation provided in appendices as referenced. A set of updated project figures is provided in Appendix A.

2 Road upgrades

In the request for additional information (dated 2 August 2019), DPIE requested that UPC provide a schedule of the proposed road upgrade works, developed in consultation with Uralla Shire Council, and an assessment of the impacts of the upgrades.

Following lodgement of the AR, a number of significant pro-active changes were made by UPC to improve the proposed access route to site, including no utilisation of Munsies Road, and no utilisation of Barleyfields Road (south) for site access during construction. These changes help to further reduce safety risks associated with the project's construction phase and are reflected in the updated figures in Appendix A.

UPC engaged SCT Consulting PTY LTD (SCT) to identify suitable designs for the proposed road upgrades and intersection improvements for the following roads and intersections:

- intersection of New England Highway and Barleyfields Road;
- intersection of Big Ridge Road and Barleyfields Road;
- Barleyfields Road (north of the intersection with Big Ridge Road); and
- Big Ridge Road.

The proposed designs were identified as likely to result in additional surface disturbance activities that were not assessed as part of the EIS and supporting assessments. Subsequently, EMM prepared a memorandum to consider potential impacts to biodiversity, Aboriginal cultural heritage and traffic as a result of the proposed additional works and identify appropriate mitigation and management measures, where required. This memorandum was provided to DPIE on 19 September 2019, a copy of which is attached as Appendix B.

The schedule of road upgrades proposed in Table 2.1 of Appendix A was subject of further consultation with DPIE, RMS and Uralla Shire Council subsequent to the release of the memorandum to DPIE on 19 September 2019. Further discussions with Uralla Shire Council held on 9 October 2019 indicated Council's acceptance of UPC's proposed road upgrades of Barleyfields Road and segments 1-3 of Big Ridge Road, subsequently confirmed in a letter dated 10 October 2019 (refer Appendix B). Acceptance of UPC's proposed intersection arrangement at the Barleyfields Road / Big Ridge Road intersection was also confirmed by Council via email on 16 October 2019 (refer Appendix B).

UPC has carefully considered the appropriate upgrade requirements for segments 4 and 5 of Big Ridge Road, including the potential safety risks raised by Council in its letter of 10 October 2019. As articulated in detail in Appendix B, segments 4 and 5 of Big Ridge Road are currently an unformed farm track used by a very small number of project-related landholders to access their properties (included in the development footprint). There is no through traffic. During construction, the use of segments 4 and 5 will be heavily reduced for these few landholders and subject to a Traffic Management Plan implemented by the lead contractor to be engaged by UPC for the construction phase. Following construction, the use of segments 4 and 5 will be negligible, outside of the (reduced) need of these landholders to access their properties and the relevant solar farm related contractors, UPC staff and TransGrid employees accessing the site for operations and maintenance purposes.

Accordingly, UPC is proposing a gravel road suitable for construction purposes. To help reduce the financial burden on Council for maintenance of the road, UPC is willing to take on the ongoing maintenance obligations for segments 4 and 5 for the life of the project, provided that the following pre-requisites are met:

- Segments 4 and 5 are to consist of 8.7 m unsealed (gravel) carriageway for the construction and operational phases;
- If Council were to elect to improve or upgrade the road segment(s) at any time, Council will become responsible from that point in time onwards (noting that Big Ridge Road is a Council-owned road);
- The New England Solar Farm shall not be subject to any further Council related charged or obligations relating to segment 4 or 5 of Big Ridge Road, so long as the owners of the solar farm or its contractors are responsible for maintenance of the road; and
- No further upgrade requirements or other obligations shall be placed on the owners of the solar farm or its contractors at the time of handover of the road to Council at the end of the solar farm's life.

The final schedule of proposed road upgrades is illustrated in the updated traffic related figure in Appendix A and described in Table 2.1.

Table 2.1 **Schedule of road upgrades**

Upgrade location	Proposed upgrade(s)
Intersection of New England Highway and Barleyfields Road (north)	The following geometric modifications are proposed at the intersection of New England Highway/Barleyfields Road (north), to operate as a seagull priority intersection with BAL treatment: reduction in overtaking lane length for New England Highway (northbound) from 3.3 km to 2.3 km; • provision of a dedicated 100 m right turn bay for vehicles turning right from the New England Highway to Barleyfields Road (north); • provision of a dedicated 480 m acceleration lane for vehicles turning right from Barleyfields Road (north) to New England Highway; and • shoulder widening on the New England Highway (southbound) for 25 m on approach to Barleyfields Road (north). UPC is continuing consultation with RMS in relation to the design presented above. An alternative intersection design was recently proposed by RMS and this will be the subject of further discussions between RMS, UPC and SCT to determine any further design modifications. Subject to any alterations to the design being agreed with RMS, the proposed upgrades as described above will be implemented prior to commencement of construction. All works will be carried out to the satisfaction of RMS. As part of RMS's works program, intersection improvement works are scheduled for this intersection for November 2019, which may incorporate the modifications required to accommodate the project. Potential impacts of the proposed intersection upgrade works have been assessed in consideration of the full extent of the disturbance boundary defined in the memorandum in Appendix B.
Barleyfields Road (north)	The following modifications are proposed along Barleyfields Road between the intersection with Big Ridge Road and New England Highway: • construct a sealed road width of 7.2 m (ie 3.1 m sealed lanes with a 0.5 m sealed shoulder for both northbound and southbound traffic); and • construct an unsealed shoulder of 1 m on either side of Barleyfields Road (north). The total carriageway width will be 9.2 m and will be consistent with Austroads requirements during both construction and operations.
Intersection of Barleyfields Road and Big Ridge Road	The primary geometric modification proposed at the intersection of Barleyfields Road/Big Ridge Road is widening in the adjacent road shoulder north-east of the intersection, to operate as a normal priority intersection.
Big Ridge Road (Segment 1) 0-1,150 m	The following modifications are proposed along Big Ridge Road (Segment 1) between the intersection with Barleyfields Road and Munsies Road: • construct a sealed road width of 7.2 m (ie 3.1 m sealed lanes with a 0.5 m sealed shoulder for both eastbound and westbound traffic); and • construct an unsealed shoulder of 1 m on either side of Big Ridge Road (Segment 1). The total carriageway width will be 9.2 m and will be consistent with Austroads requirements during both construction and operations.
Big Ridge Road (Segment 2) 1,150 m-3,850 m	No upgrades are proposed as the existing carriageway is generally consistent with Austroads requirements during both construction and operations.
Big Ridge Road (Segment 3) 3,850 m-6,610 m	The following modifications are proposed along Big Ridge Road (Segment 3) between the end of the existing sealed carriageway and Mount Lydia: • construct a sealed road width of 7.2 m (ie 3.1 m sealed lanes with a 0.5 m sealed shoulder for both eastbound and westbound traffic); and • construct an unsealed shoulder of 1 m on either side of Big Ridge Road (Segment 3). The total carriageway width will be 9.2 m and will be consistent with Austroads requirements during both construction and operations.

Table 2.1 **Schedule of road upgrades**

Upgrade location	Proposed upgrade(s)
Big Ridge Road (Segment 4) 6,610 m-8,800 m	Big Ridge Road (Segment 4) between Mount Lydia and the development footprint will be upgraded to a formalised 8.7 m unsealed (gravel) carriageway. During construction, it is not anticipated that local traffic will use this segment of Big Ridge Road as it does not service any properties other than those that form part of the development footprint. Appropriate measures to manage traffic through Segment 4 during construction will be detailed in the traffic management plan (TMP).
Big Ridge Road (Segment 5)	Big Ridge Road (Segment 5) within the development footprint (along the cadastral road corridor that extends to the proposed location of the grid substation) will be upgraded to a formalised 8.7 m unsealed (gravel) carriageway. During construction, it is not anticipated that local traffic will use this segment of Big Ridge Road as it does not service any properties other than those that form part of the development footprint. Appropriate measures to manage traffic through Segment 4 during construction will be detailed in the TMP.

3 Subdivision

DPIE requested that the size and location of the proposed new Subdivision and residual lots be confirmed and provide a Subdivision Plan showing the location of the subdivision(s).

A copy of the indicative substation plan is provided in Appendix A. This plan is indicative only and will be subject to further consultation between TransGrid and UPC. The plan represents an upper area limit for the proposed subdivision and any future subdivision will be restricted to the lots identified.

4 Main Northern Railway

DPIE requested confirmation if the proposed works within the adjacent Main Northern Railway corridor form part of the current application and if so, an assessment of the impacts of these works.

The AR outlined that UPC had been considering the potential use of the Main Northern Railway line for delivery of construction materials and project infrastructure. Since lodgement of the AR, the use of the Main Northern Railway line for deliveries to the northern array area has been subject of further consultation with John Holland Country Regional Network (JHR), Transport for NSW (TfNSW) and DPIE.

To facilitate unloading activities, a temporary hardstand may be constructed on part of Lot 2 of DP 982376 to facilitate safe and efficient use of a mobile forklift, reach stacker or similar during unloading activities. A larger footprint than what will likely be required has been provided on the project layout figure (refer Appendix A) to allow for flexibility for placement of the temporary hardstand during the detailed design stage of the project. The exact dimensions for the temporary hardstand will be refined during the detailed design stage of the project and in consultation with JHR and TfNSW.

The existing level of the rail corridor, Main Northern Railway line and development footprint for the northern array is quite flat through the proposed area shown on the project layout figure and it is anticipated that minimal ground disturbance will be required (refer Photograph 2.1 and Photograph 2.2 of the AR). Nonetheless, potential impacts to Aboriginal cultural heritage and biodiversity as a result of the construction of the temporary hardstand have been considered.

Within Lot 2 of DP 982376, an EMM archaeologist and registered Aboriginal party (RAP) representatives surveyed the proposed hardstand footprint, covering a larger area to allow for changes in design if necessary. No Aboriginal sites or areas of archaeological sensitivity were identified during the survey effort. This is primarily due to the high level of ground disturbance as a result of the development of the railway system and historical farming practices in the surrounding area.

Vegetation on the subject land within Lot 2 of DP 982376 is consistent with the descriptions provided within the BDAR for the adjacent section of the northern array area. The subject land is in an area of the rail corridor that has already been disturbed and consists of exotic grassland of low biodiversity value. There are no trees within the proposed disturbance area.

The mitigation measures outlined in the EIS and AR will be implemented during the construction of the temporary hardstand, where relevant.

UPC will continue discussions with TfNSW in relation to the secondary approvals which must be in place prior to construction of the hardstand commencing, and also with respect to delivery of material by rail. RailCorp, as owner of the subject land within Lot 2 of DP 982376, has granted its consent, pursuant to Section 49(1) of the NSW Environmental Planning and Assessment Regulation 2000, to the lodgement by UPC of the DA for the project. A copy of landowners consent is included in Appendix C.

5 Construction Accommodation Village

Following feedback from a number of local residents, UPC has removed the construction accommodation village (CAV) from the development application for the project. Since the submission of the EIS, RTS and AR, UPC has continued to investigate potential alternatives to housing the project's non-local employees during construction. This has included consultation with potential construction contractors and accommodation service providers, including University of New England (UNE).

As a result of these ongoing investigations, UPC is confident that a large component of the project's construction and operations workforce will be generated from local workers within the neighbouring Armidale and Tamworth local government areas. A number of construction contractors have affirmed this based on experiences working on other large-scale solar developments in regional NSW. In addition, it is anticipated that local landlords will also play a more significant role in providing short-term accommodation services for the project's non-local employees than what had originally been assumed.

UPC is also liaising with representatives from UNE's Residential System in regard to the potential for provision of construction worker accommodation services, should these be required. UNE's Armidale campus is approximately 25 km north of the project's development footprint and has capacity to house a significant number of the project's non-local employees. The letter included in Appendix D acknowledges that both UPC and UNE continue to consider this venture, with a positive solution to be put in place in time for construction, should it be required.

The removal of the CAV from the development application for the project was communicated with Uralla Shire Council on 5 September 2019. Confirmation of Council's support of removal of the CAV from the project was received 26 September 2019, a copy of which is included in Appendix E.

The wider community including the nearest neighbouring landholders have been advised of this amendment and UPC has received positive feedback noting that the removal of the CAV will alleviate concerns around impacts to the safety and security of local residents.

Prior to the commencement of construction, UPC's appointed lead contractor for the construction phase will prepare an accommodation and employment strategy for the project to the satisfaction of the Secretary. This document will propose a strategy to ensure there is sufficient accommodation for the non-local construction workforce, as well as investigating options for prioritising the employment of local workers, where feasible.

6 Perimeter fencing

DPIE requested confirmation of the location of perimeter fencing within the project boundary i.e. is the fencing proposed to be located around/adjacent to the disturbance footprint?

The development footprint for the New England Solar Farm identifies the area in which development may occur. This footprint has avoided constraint areas which mainly relate to biodiversity, cultural heritage, historic heritage,

and surface water flows. Whilst the installation of solar infrastructure across some of these avoidance areas may not be appropriate, fencing may be.

As a general rule, the fencing will be contained entirely within the development footprint, however, UPC is seeking consent to adjust the fence alignment slightly outside of the development footprint in specific locations, where there are construction and practical reasons for doing so and no resulting impact associated with this. Although there has not yet been a detailed design of the project which would indicate exact alignment of fencing, UPC expects that the fence will fall outside of the development footprint in the following locations, which are illustrated in Figure 6.1 below:

- Location 1: continuation of boundary fencing parallel to the railway. The Aboriginal heritage buffer area will still be fenced off from the balance of the development.
- Location 2: continue north-south fence alignment, crossing over the Strahler order 3 stream. Fencing across this watercourse would allow UPC to easily maintain the ground vegetation west of this proposed boundary. Appropriate fencing will be used in this instance, to allow the flow of water through its natural course. UPC will discuss the fencing design in more detail with the construction contractor, but it is considering the use of drop-down fencing similar to the design outlined in the Gunnedah Solar Farm's conditions of consent, endorsed by the Independent Planning Commission.
- Location 3: fencing across the Strahler order 3 stream at the north and south boundaries. Appropriate fencing will be used in this instance, to allow the flow of water through its natural course. UPC will discuss the fencing design in more detail with the construction contractor, but it is considering the use of drop-down fencing similar to the design outlined in the Gunnedah Solar Farm's conditions of consent, endorsed by the Independent Planning Commission.

Any further modifications to the fencing alignment will adhere to the following principles:

- no material impact to biodiversity, which would increase the number of offset credits required for the project;
- no encroachment on identified Aboriginal or historical heritage buffer zones;
- no impact to Strahler order 3 or higher streams; and
- no encroachment to the 10-meter Inner Protection Area.

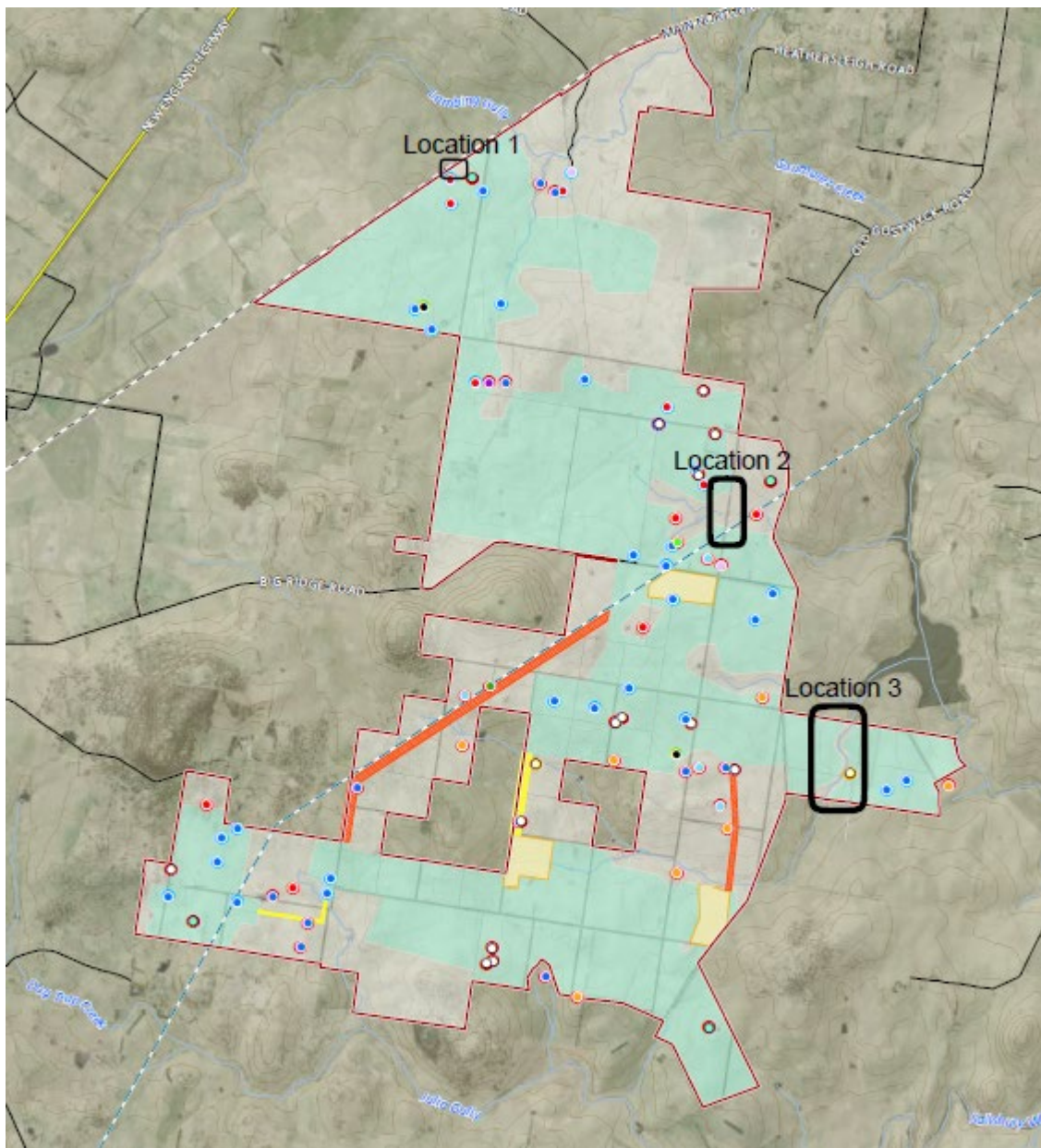


Figure 6.1 Indicative perimeter fence locations outside of the development footprint

DPIE requested that UPC consider the potential impact of security fencing on flooding for the 1% AEP event.

It is understood that this was an issue considered in the IPC's assessment of the Gunnedah solar farm, with drop down fencing subsequently conditioned for a number of locations around the perimeter of this development to coincide with crossings of irrigation canals and the main flood flow pathways during significant flood events.

In consideration of the Gunnedah example, this development is located within the floodplain and subject to broad regional flooding of the Namoi River catchment. In large flood events, the entire site on which the Gunnedah solar farm is proposed is inundated. Within the floodplain during significant flood events, potential for mobilisation of large amounts of debris that is then entrained within these flood waters presents high potential for debris to be caught on barriers (e.g. fencing) and to obstruct flow pathways thereby increasing the potential to redirect flows and/or increase flow velocities in other areas/properties in the floodplain. Provision of drop-down fencing at this site is likely to reduce the potential for obstruction of flood flows and associated impacts to other areas of the floodplain.

The NESF site presents a considerably different environment. This site is high in the catchment and does not form part of the floodplain. Modelling indicates that floodwater is largely contained within defined watercourses and

overbanks. In addition, the catchments of the 1st and 2nd order watercourses that contribute to flood flows within the development footprint and immediately downstream, originate from within the project boundary, within areas that generally consist of grassland with limited other vegetation. Further, at the completion of construction, the majority of these contributing catchment areas will be occupied by solar arrays and associated infrastructure within the development footprint that will be maintained by UPC during operation. There is therefore little potential for these areas to generate large amounts of debris that has potential to obstruct flow within the watercourses during significant flood events.

On this basis, it is not considered that installation of drop-down fencing is necessary for perimeter fence crossings of 1st and 2nd order watercourses at this site. As outlined above, UPC will consider appropriate options for installation of drop-down fencing similar to that designed for the Gunnedah solar farm for the proposed crossings of the 3rd order watercourses at referenced locations 2 and 3, however, this is considered a conservative approach in consideration of the catchment areas for these watercourses for which the same conditions apply as outlined for the higher order streams above.

7 Transport for NSW advice

DPIE requested a response to TfNSW's advice on the amended project, including commitments responding to each of TfNSW's recommendations in Appendix B.

A copy of TfNSW's letter to DPIE dated 20 June 2019 is included in Appendix F.

It is noted that TfNSW's additional input outlined in their letter to DPIE dated 20 June 2019 largely relates to issues that were raised by TfNSW previously, and which were addressed in the RTS. Included in Appendix F is a table of relevant responses that were contained in the RTS, which relate to TfNSW's additional input in their letter to DPIE. To this, we have added two further columns, which include TfNSW's additional comments/recommended conditions and UPC's further responses as required.

As the project progresses, UPC will continue consultation with JHR and TfNSW in relation to the potential use of the railway for construction deliveries.

8 Historic heritage impacts

DPIE requested clarification of impacts to HNE20, noting that Figure 5.3 and Table F1 of the Amendment Report are inconsistent as to this site being impacted or not.

Section 5.4.3 and Figure 5.3 of the AR identifies that the project will result in partial impacts to HNE20, the alignment of Old Gostwyck Road.

It is noted that Table F.1 of the AR identifies the impact type as 'none' for this item, which is in error and is inconsistent with the text within Section 5.4.3 and Figure 5.3. Impacts to this item are as described in Section 7.6.3 of Appendix E of the EIS, with proposed mitigation measures outlined in Table 5.6 of the AR.

DPIE requested clarification of impacts to HNE14, noting that Figure 5.3 of the Amendment Report shows HNE14 within the development footprint; Table F1 of Appendix F and the legend of Figure 5.3 indicates it will be impacted.

Impacts to HNE14 (granite tors) will be avoided as outlined in Table F.1 of Appendix F of the AR. Figure 5.3 has been amended to identify the avoidance buffer around this item and is attached in Appendix A.

9 Shuttle buses

DPIE requested confirmation of the number of shuttle buses within the 200-light vehicle estimate during peak construction.

Estimated peak construction traffic vehicle movements, on which the EIS and subsequent traffic-related assessments for the project have been based, assumes 20 light vehicle shuttle buses and 10 heavy-vehicle coaches (with an assumed carrying capacity of 6 and 50 people respectively) to transport the bulk of the construction workforce during the peak construction period.

The combination and number of coaches and shuttle bus services will be determined by the construction contractor prior to commencement of construction. The use of shuttle buses during construction of the project will be compliant with the maximum number of heavy and light vehicle movements as assessed as part of the EIS.

10 Use of rail

DPIE requested confirmation if rail is to be used, to what extent would roads be used (i.e. quantify the associated reduction in road traffic).

EMM has assessed the maximum potential impact associated with the rail and road haulage scenarios for the project to provide the construction contractor with flexibility in selection of a primary haulage method.

Given that the peak construction traffic vehicle movements along the haulage route have been assessed as part of the EIS, any use of rail would reduce the project's impact on the local and regional road network and therefore only be of benefit to the wider community. This potential reduction in road traffic movements is difficult to estimate at this stage but is not considered necessary given the conservative approach that has been taken in predicting potential impacts associated with worst case scenarios.

11 Visual

DPIE requested confirmation of location of vegetation screening if proposed.

No vegetation screening is proposed.

DPIE requested justification if no screening is proposed for N1 and N40.

N1:

N1 is the closest non-project related dwelling to the development footprint. As a result of ongoing discussions with N1, UPC has committed to two further refinements to the extent of the development footprint for the northern array area.

The distance from the dwelling at N1 to the closest part of the development footprint for the northern array area has increased to approximately 450 m as a result of the removal of approximately 7.5 ha directly to the south of the dwelling. This provides a 130 m exclusion zone from N1's property boundary and was determined after considering both the topography of the surrounding landscape and the outcomes of a supporting viewshed analysis. This additional refinement relates to the extent of project infrastructure on Lot 23 of DP 1171290 and is reflected on the revised project layout figure included in Appendix A.

In addition, an area of approximately 0.7 ha has also been excluded from the development footprint for the northern array area to further reduce potential visibility of project infrastructure when looking north-west from the dwelling. The results of the viewshed analysis presented in Appendix H of the AR indicate that as a result of this additional refinement, project infrastructure will not be visible from the dwelling at N1 when looking north-west towards the northern array area.

N40:

N40 is located approximately 380 m from the closest array area, for which moderate visual impact is predicted. N40 is a rural dwelling owned by one of the project landholders that is currently leased to a member of the local community. Being project-related, no vegetation screening is proposed at this residence. UPC is in discussions with

the owner of the rental property about its potential future use as accommodation during construction and/or operations.

DPIE requested a summary of the distances between the dwelling and the site boundary, plus the dwelling to the development footprint for N1; N5; N13; N20 and N21

Receptor	Distance to development footprint (m)	Distance to project boundary (m)
N1	450	340
N5	1,180	120
N13	1,225	62
N20	1,500	153
N21	1,670	125

12 Construction hours and timeframe

DPIE requested further detail regarding works that are proposed to be undertaken outside of standard construction hours, including a description of activities and evidence that these activities would be inaudible at receivers

Site preparation works and pile driving and foundations (as described in Table 6.2 of Appendix J of the EIS) have the most potential for noise impacts given the number of plants to be used, their emission levels and duration, and will be excluded from outside of standard construction hours.

As articulated below, the benefit of being able to conduct some non-excessive noise generating construction activities outside of standard construction hours is to minimise the duration of the construction schedule. Subject to a number of safeguards, UPC proposes to be able to undertake the remaining activities identified in Table 6.2 of Appendix J of the EIS outside of standard construction hours.

The noise modelling presented in Appendix J of the EIS is considered conservative as it is assumed equipment is operating simultaneously and at the nearest locations in the development footprint to the relevant residential dwellings. Additional refinements to the development footprint have also increased the distance to the closest non-project related residential dwelling (i.e. N1).

UPC is confident that the impacts to the noise amenity at each receiver location will be negligible and therefore propose noise monitoring during any relevant construction activities taking place outside of standard construction hours. Further to the noise monitoring program, UPC will also commit to the following:

- mechanical works will not occur within 500 m of any identified sensitive receptors;
- consultation will continue with neighbouring residents with the potential to be affected by the extended work hours; and
- UPC or its nominated construction contractor will respond to and resolve all complaints received from neighbouring residents within a timely manner.

If the construction contractor engaged by UPC elects to construct outside of standard construction hours, UPC proposes noise monitoring at the closest sensitive receptors during these periods for the duration of construction to ensure that LAeq15min noise levels from construction activities do not exceed the background noise level by more than 5 dB(A) or an LMax level of 45dB(A), which is consistent with the Noise Policy for Industry (EPA 2017). Noise monitoring will also account for the local environmental conditions such as prevailing winds and topography of the landscape.

This approach will allow construction of the project to continue outside of standard construction hours periods, while ensuring that noise generated by the project does not impact neighbouring residents.

Provide a construction timeframe based on construction during standard working hours only.

The reduced working hours would have an impact on the duration of the project's construction period. The extent of this impact will be dependent on the outcome of DPIE's consideration of the proposed approach to limited out of hours construction works (as described above).

Should construction only occur during standard working hours, it is anticipated that the duration of the project's construction period will increase to 40 months from the commencement of site establishment works to commissioning of the two array areas. This represents an increase in duration of 4 months.

Construction is still expected to occur in two stages, with Stage 2 commencing approximately 14 months after the commencement of Stage 1.

Stage 1 will include construction of the northern array area (including the grid substation) and is anticipated to take approximately 29 months to complete.

Stage 2, which will overlap with Stage 1, will include construction of the central array area and is anticipated to take approximately 24 months to complete. Stage 2 also includes the construction of the BESS, which is also anticipated to take approximately 24 months to complete.

13 Water source

DPIE requested further information regarding access to a viable water source(s).

The EIS noted in Section 5.9.3 that, during construction, it is estimated that approximately 150 kilolitres (kL) of water per month will be required, equating to 1.8 megalitres (ML) per year over the three - year construction period. Since the submission of the EIS, RTS and AR, UPC has discussed the project's water requirements further with potential construction contractors and is now revising the requirements as a result. UPC advises that the water requirements during construction will likely be in the order of 200 kL per day, which would amount to approximately 220 ML for the duration of construction. As noted previously, most of this water will be required for dust suppression, and would hence be non-potable water, with other minor uses including site amenities, fire protection and washing of equipment and plant.

It should be noted that the estimated 137 ML of water described in the EIS as necessary to service the CAV will no longer be required as this infrastructure has been removed from the development application (refer Section 5).

In response to DPIE's request for further information, UPC has progressed its investigations into viable water sources during construction. This has included consultation with AEE Services and Uralla Shire Council.

AEE Services has confirmed that it would be able to satisfy the project's water requirements and UPC intends to continue discussions with AEE Services following project determination.

UPC has also entered into discussions with Uralla Shire Council with regards to the potential use of treated water from Uralla's sewerage treatment plant. It is understood that the sewerage treatment plant currently produces in the order of 600 kL per day of treated water. The use of this water will be subject to further consultation with Uralla Shire Council and will be dependent on a review of water quality information to confirm the suitability of the treated water for use during construction. Additional infrastructure may also be required at the sewerage treatment plant to allow for the reuse of this water during construction.

The potential use of Uralla's potable town water supply has also been discussed with Uralla Shire Council. Should potable water be provided by Uralla Shire Council, standard rates would apply.

A number of viable water sources for the construction and operational stages of the project have been identified and UPC and its lead contractor will continue discussions with AEE Services, Uralla Shire Council and other providers prior to the commencement of construction.

14 Biophysical strategic agricultural land

DPIE requested confirmation of the total area (ha) of BSAL within the project boundary (site) i.e. the total amount of BSAL to be avoided.

Total BSAL within the development footprint is 99.8 ha.

Total BSAL within the project boundary is 921.5 ha.

Total BSAL within the project boundary of Lot 1 of DP 227322 is clipped is 272.4 ha.

15 Native vegetation

DPIE requested confirmation of the total area (ha) of native vegetation within the project boundary (site) i.e. the total amount of native vegetation to be avoided.

The areas of native vegetation mapped within the project boundary, along with the site boundary as presented in the PEA, are illustrated in the updated biodiversity figure included in Appendix A. The total area of native vegetation (PCT 510 woodland) for which impacts have been avoided through project refinements is approximately 21.7 ha.

16 Height of infrastructure

DPIE requested confirmation of the maximum height of the grid substation; internal substation; accommodation village infrastructure; and O&M buildings.

Grid substation	The maximum height of infrastructure within the grid substation will be approximately 35 m for the gantry. The gantry is typically a metal lattice structure, which collects the incoming transmission lines and provides sufficient clearance from the substation's perimeter security fencing. In addition, lightning protection with a height in the order of up to 30 m, in the form of narrow-profile poles, will be required to reduce the risk of lightning strike to equipment at the grid substation. A lightning risk assessment will be performed to determine the appropriate height and location of these poles.
Internal substation	Lightning protection with a height in the order of up to 30 m in the form of narrow-profile poles may also be required to reduce the risk of lightning strike to equipment at the internal substation, if constructed as part of the project. This will only be known once the detailed design has been completed. As noted above, a lightning risk assessment will be performed to determine the appropriate height and location of these poles if required.
Accommodation village	As noted previously, UPC has removed the CAV from the development footprint and is no longer seeking approval for this infrastructure as part of the development application.
O&M buildings	The maximum height of the O&M infrastructure (including control rooms, storage facilities, workshops and associated infrastructure) will be approximately 8 m.

17 Revised land areas

DPIE requested revised land area calculations for the revised project boundary and development footprint

Revised area calculations for the current project design are as follows:

- project boundary - 3,362.35 ha
- development footprint:
 - total – 2,060.80 ha

- northern array - 1,394.04 ha
- central array - 623.5 ha
- site access corridors/collector easements – 43.26 ha

18 Revised schedule of lands

DPIE requested a revised schedule of lands subject to the current project design.

The project boundary intersects land legally described and identified in Table 18.1. Based on the current design and lease agreements between UPC and the project landholders, no subdivision is proposed on the lots identified within Table 18.1, with the exception of land required for the grid substation (refer to grey highlighted lots).

Table 18.1 Involved lots within the project boundary

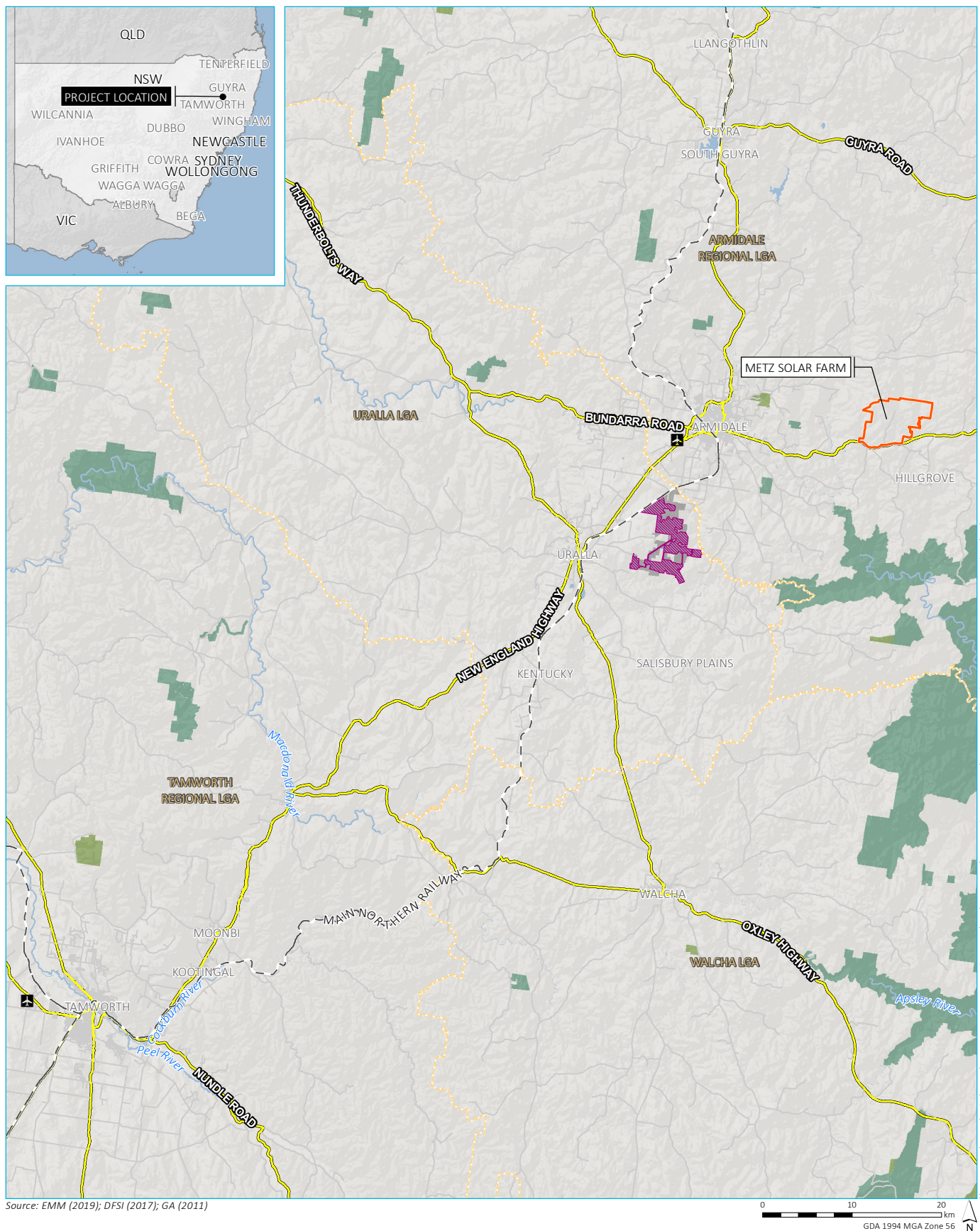
Project infrastructure component	Lot	Deposited plan (DP)	Label (refer cadastral details figure, Appendix A)
Northern – PV module array	2	DP567937	1
Potential electrical cabling	82	DP755814	2
Central – PV module array	183	DP755827	3
Potential site access/electrical cabling			
Central – PV module array	154	DP755827	4
Northern – PV module array	79	DP755814	5
Potential electrical cabling	202	DP755814	6
Potential electrical cabling	109	DP755827	7
Potential site access/electrical cabling	108	DP755827	8
Northern – PV module array	89	DP755827	9
Northern – PV module array	103	DP755827	10
Northern – PV module array	101	DP755827	11
Northern – PV module array	102	DP755827	12
Northern – PV module array	90	DP755827	13
Potential site access/electrical cabling	113	DP755827	14
Northern – PV module array	91	DP755827	15
Potential electrical cabling	111	DP755827	16
Potential electrical cabling	110	DP755827	17
Potential electrical cabling	93	DP755827	18
Northern – PV module array	92	DP755827	19
Potential electrical cabling			
Potential electrical cabling	98	DP755827	20
Central – PV module array	122	DP755827	21
Potential electrical cabling			
Central – PV module array	123	DP755827	22
Central – PV module array	125	DP755827	23
Central – PV module array	124	DP755827	24
Central – PV module array	126	DP755827	25

Project infrastructure component	Lot	Deposited plan (DP)	Label (refer cadastral details figure, Appendix A)
Northern – PV module array	2	DP567937	1
Northern – PV module array	4	DP172594	26
Northern – PV module array	B	DP172594	27
Northern – PV module array	78	DP755814	28
Northern – PV module array	84	DP755814	29
Northern – PV module array	83	DP755814	30
Potential electrical cabling	80	DP755814	31
Central – PV module array	181	DP755827	32
Potential site access/electrical cabling			
Central – PV module array	182	DP755827	33
Potential electrical cabling	97	DP755827	34
Northern – PV module array	2	DP127777	35
Northern – PV module array	1	DP127777	36
Northern – PV module array	39	DP755827	37
Northern – PV module array	38	DP755827	38
Northern – PV module array	5	DP127777	39
Northern – PV module array	1	DP405515	40
Northern – PV module array	37	DP755827	41
Central – PV module array	296	DP755827	42
Northern – PV module array	221	DP755814	43
Northern – PV module array	2	DP174053	44
Central – PV module array	1 (part) *	DP227322	45
Central – PV module array	8	DP173619	46
Potential electrical cabling			
Northern – PV module array	6	DP172594	47
Potential electrical cabling			
Northern – PV module array	21	DP1167870	48
Northern – PV module array	23	DP1171290	49
Northern – PV module array	24	DP1171290	50

Notes: *The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.

Appendix A

Updated figures

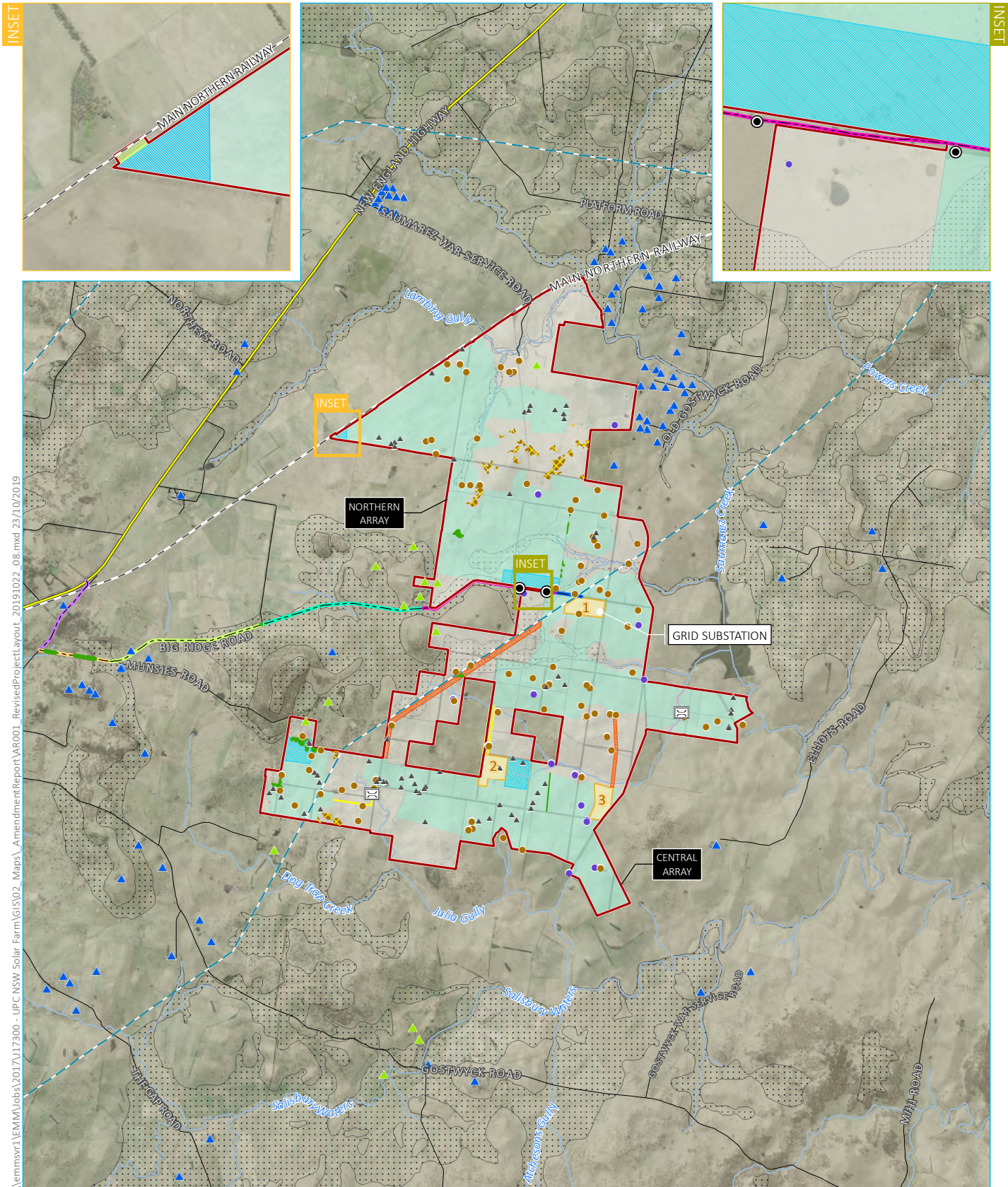


KEY

- | | | |
|-----------------------------|------------|---------------------------|
| Development footprint | Airport | Watercourse/drainage line |
| Project boundary | Rail line | Waterbody |
| Other SSD solar development | Main road | Local government area |
| | Local road | NPWS reserve |
| | | State forest |

Regional context

New England Solar Farm



Source: EMM (2019); DFSI (2017); UPC (2019)

*The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.
** The grid substation (location 1) and only one of potential substation location numbers 2 or 3 to be constructed

KEY

- 330 kV transmission line
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Project boundary *
- Biophysical Strategic Agricultural Land
- Sensitive receptors
 - ▲ Project-related
 - ▲ Non-project related

- Development footprint
 - Solar array
 - Potential electrical cabling
 - Potential site access/electrical cabling
 - Potential laydown area/site compound
 - Potential substation/BESS footprint (location number) **
 - Hardstand in rail corridor
 - Potential creek crossing
 - Proposed primary site access point
 - Paddock trees requiring offsets

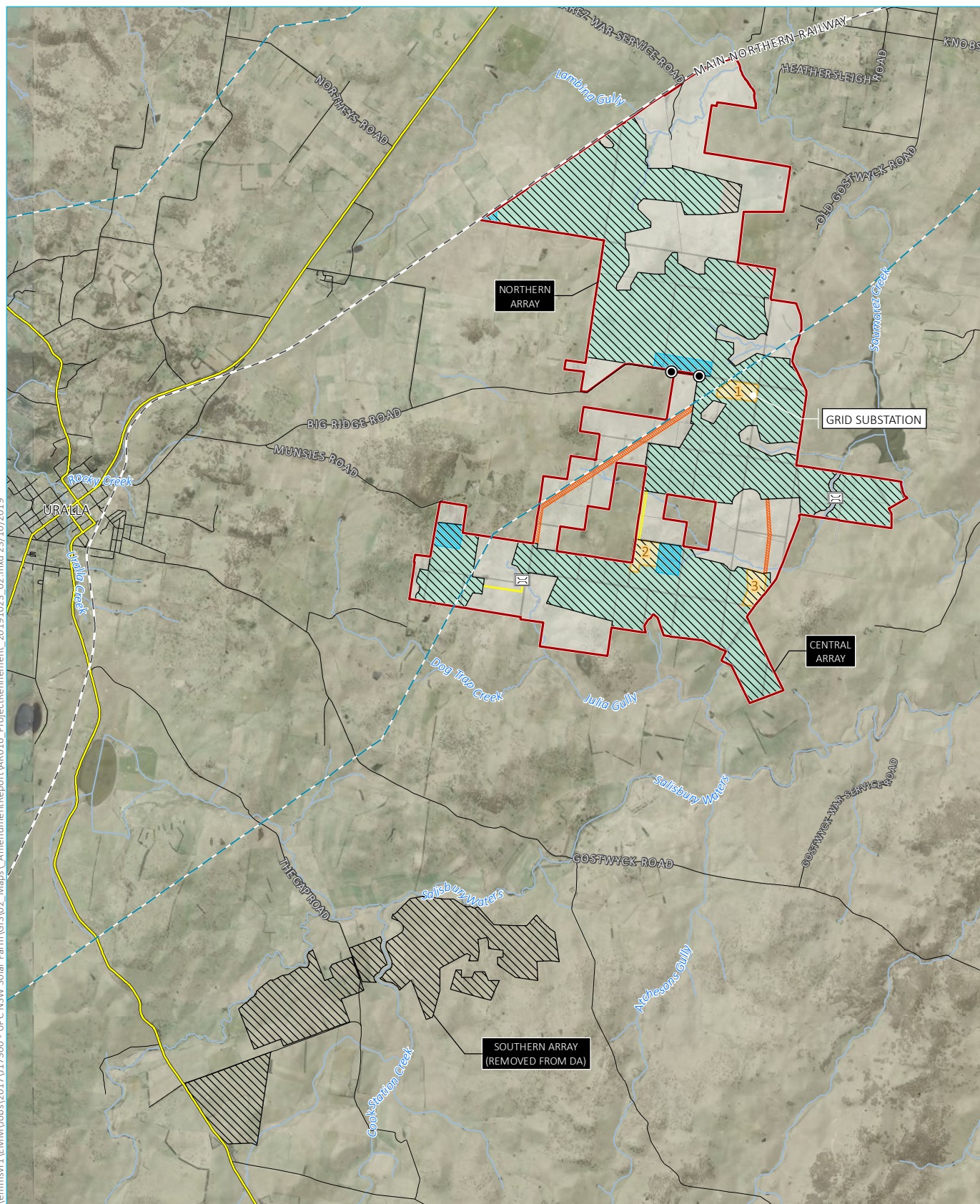
- Identified Aboriginal sites
- Historic heritage sites
- Plant community requiring offset
- Plant community type avoidance areas
- PCT 510 woodland
- Primary vehicle access route
 - Barleyfields Road
 - Big Ridge Road - segment 1
 - Big Ridge Road - segment 2
 - Big Ridge Road - segment 3
 - Big Ridge Road - segment 4
 - Big Ridge Road - segment 5

0 1 2 km
GDA 1994 MGA Zone 56
N

Project layout

New England Solar Farm

\\lemmsvr1\EMM\Jobs\2017\U17300 - UPC NSW Solar Farm\GIS\02_Maps\AmendmentReport\AR016 - ProjectRefinement_20191023_02.mxd 23/10/2019



Source: EMM (2019); DFSI (2017); UPC (2019)

*The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.
 ** The grid substation (location 1) and only one of potential substation location numbers 2 or 3 to be constructed

KEY

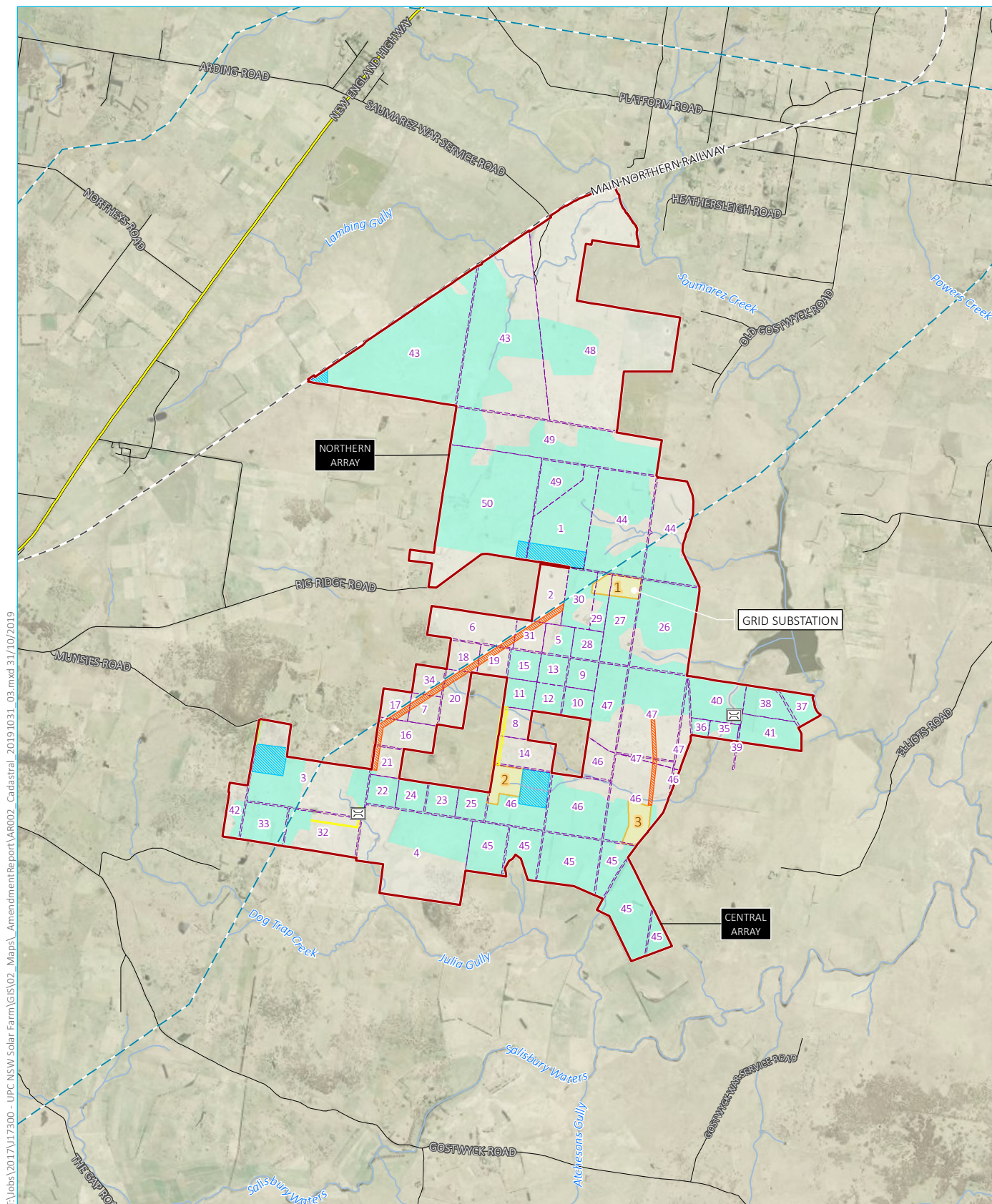
- 330 kV transmission line
- - Rail line
- Main road
- Local road
- Watercourse/drainage line
- ▨ EIS development footprint
- ▭ Project boundary *

- Development footprint
- ▭ Solar array
- ▭ Potential electrical cabling
- ▭ Potential site access/electrical cabling
- ▭ Potential laydown area/site compound
- ▭ Potential substation/BESS footprint (location number) **
- ▭ Potential creek crossing
- Proposed primary site access point

0 1 2 km
GDA 1994 MGA Zone 56

Project refinement

New England Solar Farm



Source: EMM (2019); DFSI (2017); UPC (2019)

*The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.
 ** The grid substation (location 1) and only one of potential substation location numbers 2 or 3 to be constructed

KEY

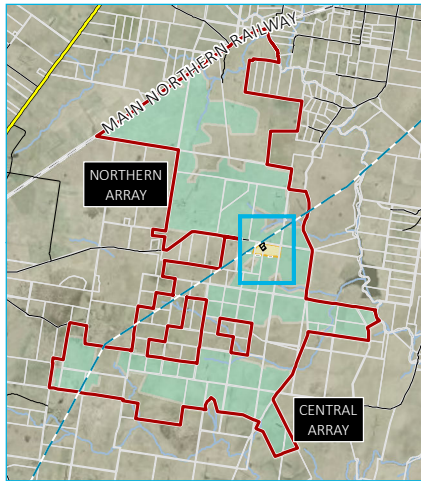
- Project boundary *
- Cadastral lots
- 330 kV transmission line
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Potential creek crossing

Development footprint

- Solar array
- Potential electrical cabling
- Potential site access corridor
- Potential site access/electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint (location number)

Cadastral details

New England Solar Farm
 Amendment report
 Figure 2.2



Source: EMM (2019); DFSI (2017); UPC (2019)

KEY

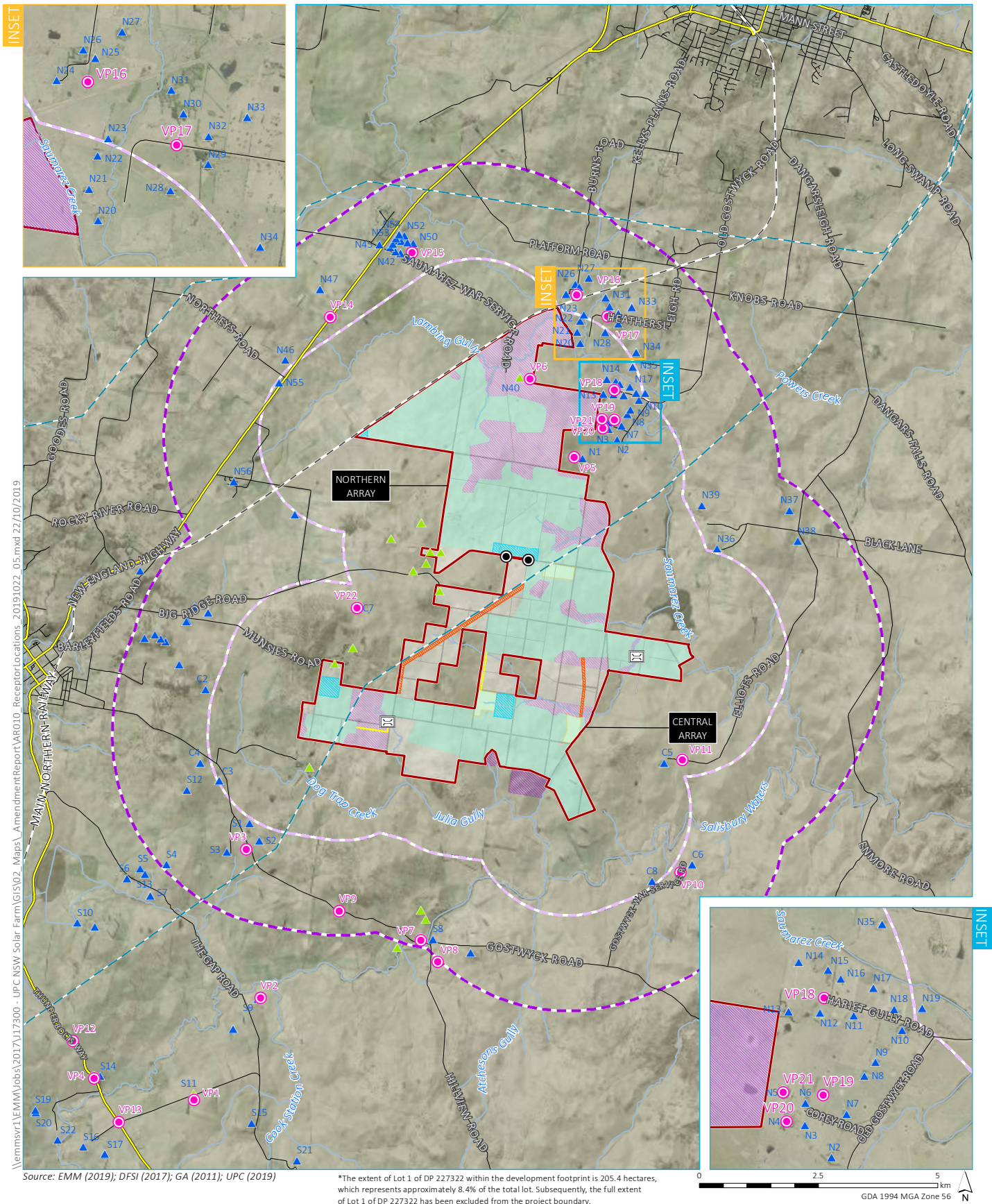
- Project boundary *
- Development footprint
- Solar array
- Potential substation/BESS footprint
- Indicative subdivision location

- 330 kV transmission line
- Rail line (refer to inset)
- Main road (refer to inset)
- Local road
- Watercourse/drainage line
- Cadastral boundary

Subdivision plan

New England Solar Farm

*The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.



KEY

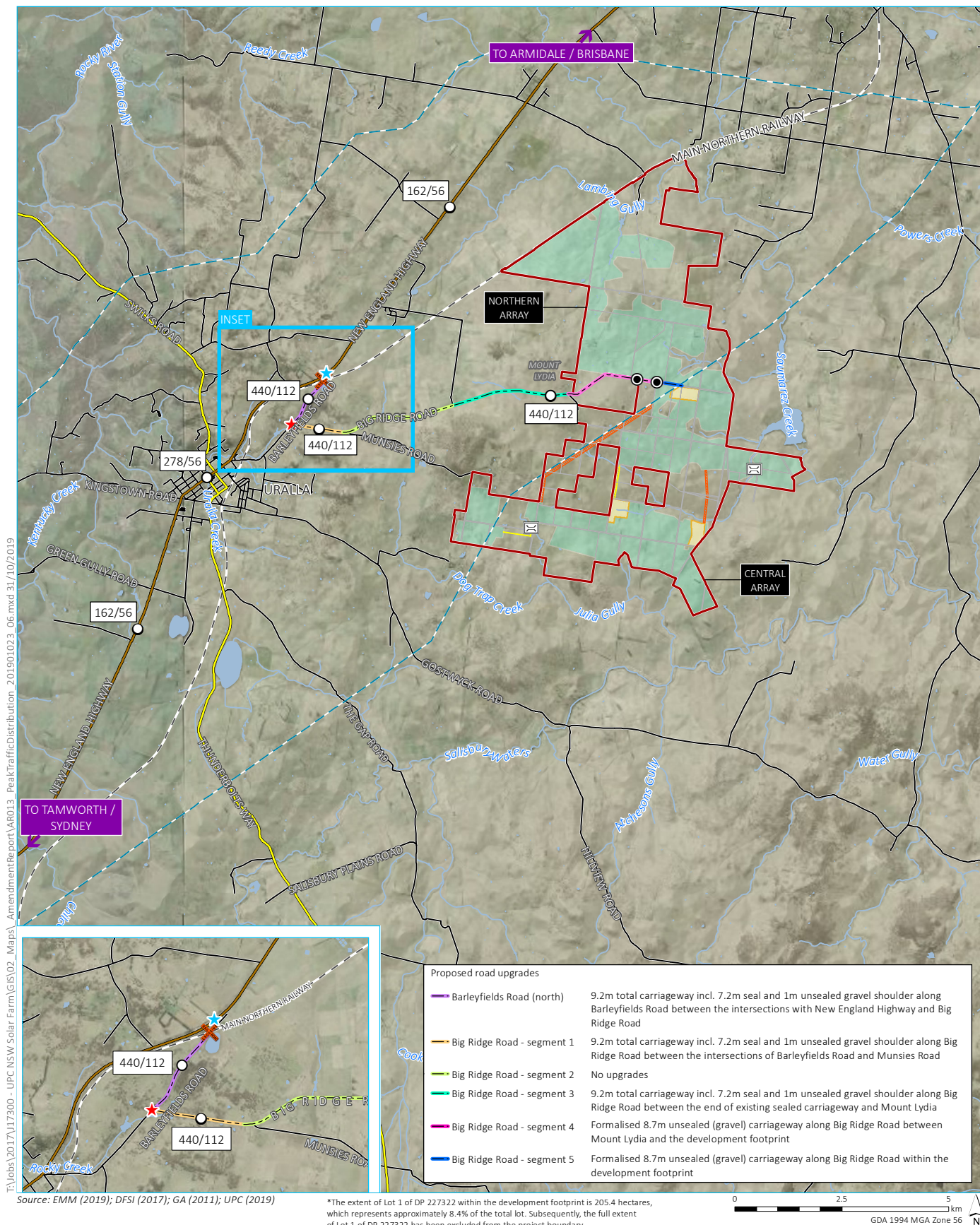
- 330 kV transmission line
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Distance from development footprint
 - Two kilometres
 - Four kilometres

- Project boundary *
- Development footprint
 - Solar array
 - Potential electrical cabling
 - Potential site access/electrical cabling
 - Potential laydown area/site compound
 - Potential substation/BESS footprint

- Potential creek crossing
- Proposed primary site access point
- Areas to exclude project infrastructure
- Viewpoint location
- Sensitive receptors
 - Project-related
 - Non-project related

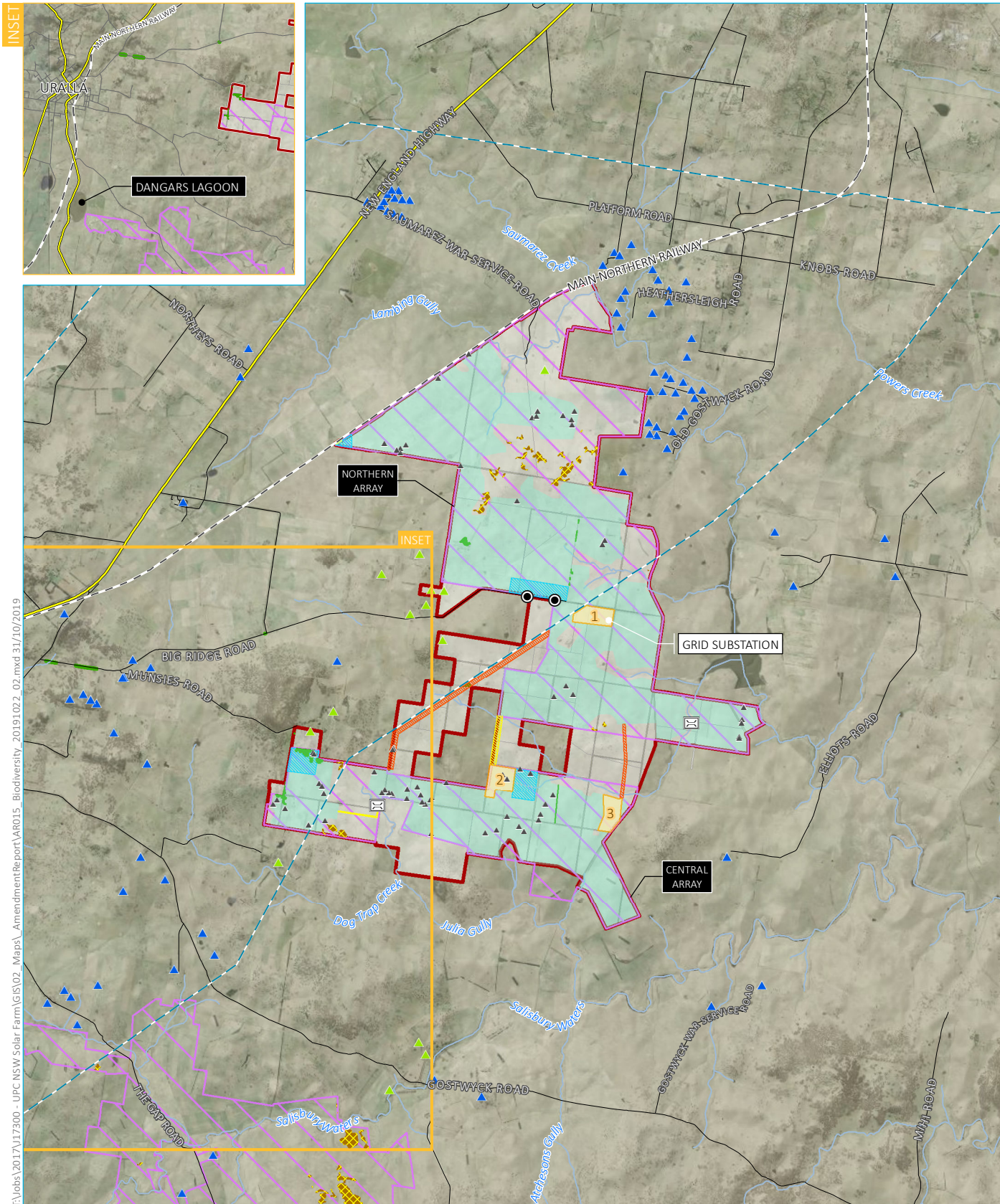
Assessed viewpoints, sensitive receptors and project refinements

New England Solar Farm
Amendment report
Figure 5.6



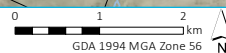
Peak daily traffic distribution for Stage 1 and Stage 2 combined

New England Solar Farm
Figure 3.2



Source: EMM (2019); DFSI (2017); UPC (2019)

*The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.



KEY

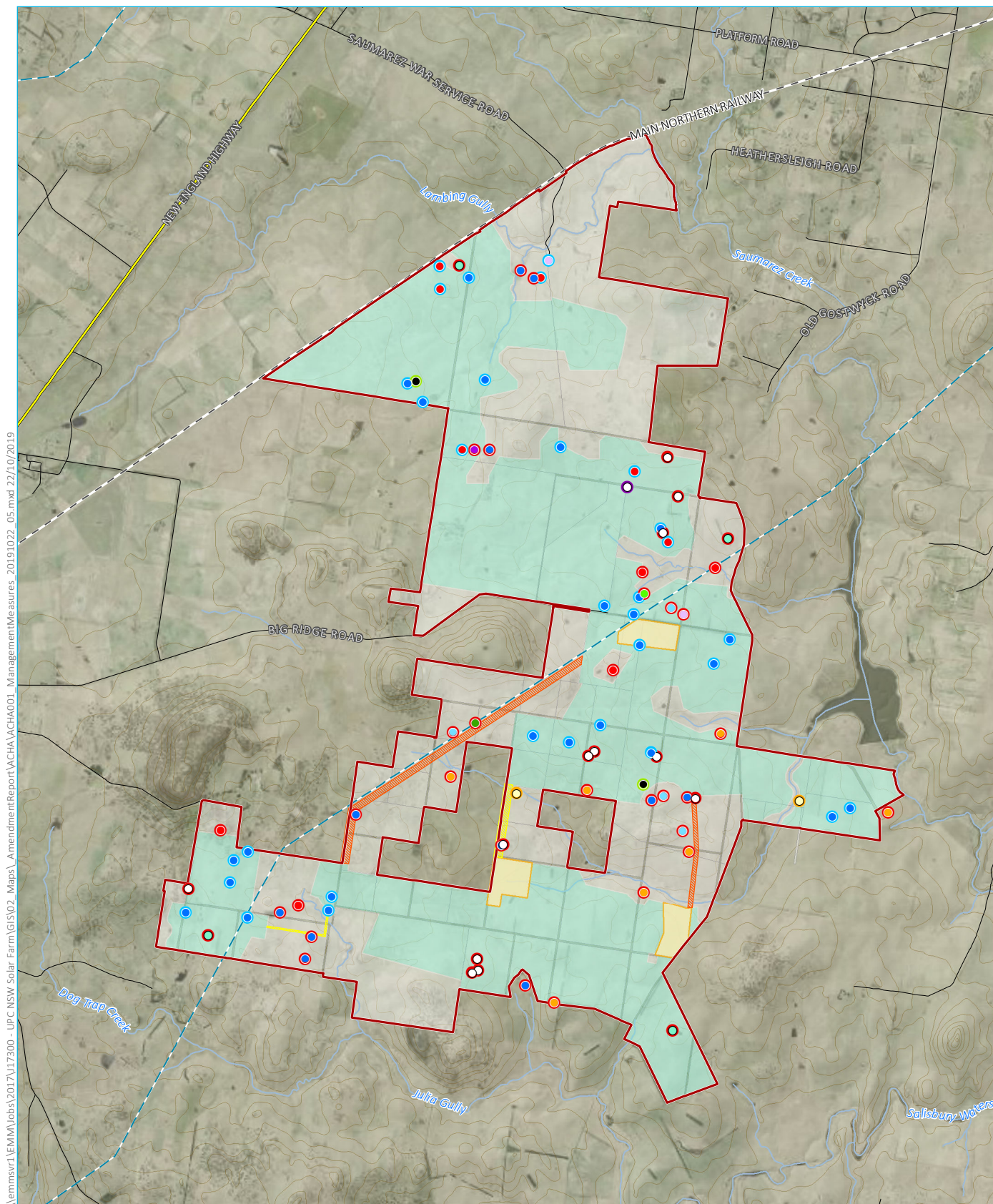
- Project boundary *
- Site boundary presented in PEA
- 330 kV transmission line
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Sensitive receptors**
- ▲ Project-related
- ▲ Non-project related

- Development footprint**
- Solar array
- Potential electrical cabling
- Potential site access/electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint (location number)
- Potential creek crossing
- Proposed primary site access point
- ▲ Paddock trees requiring offsets

- Plant community requiring offset
- Plant community type avoidance areas
- PCT 510 woodland

Biodiversity

New England Solar Farm



Source: EMM (2019); DFSI (2017); GA (2011); UPC (2019)

*The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.

KEY

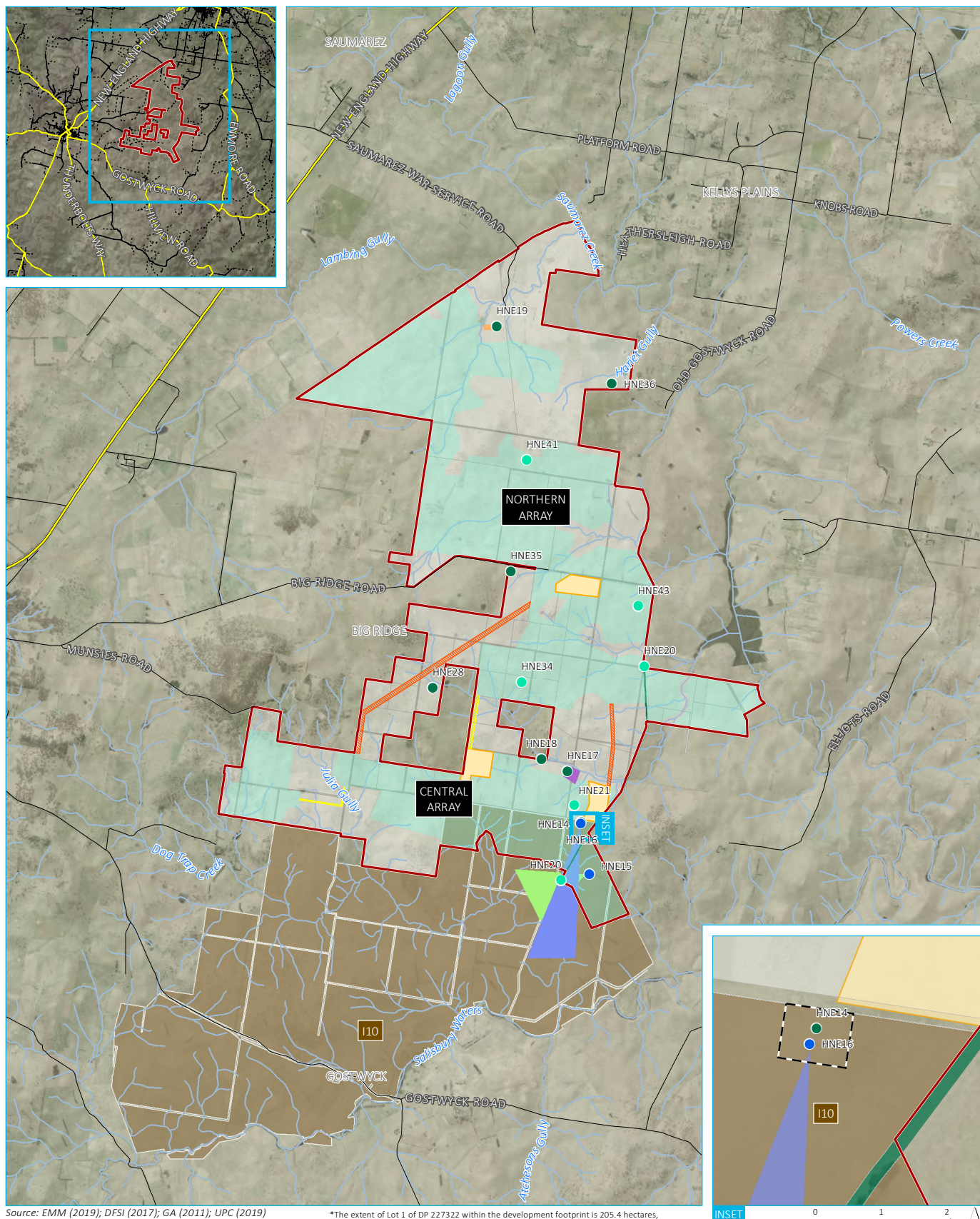
- 330 kV transmission line
- Main road
- Local road
- Rail line
- Contour (10 m)
- Project boundary *
- Development footprint
- Solar array
- Potential ETL easement
- Potential site access/ETL easement
- Potential substation/BESS footprint

- Management measure
- Avoidance
- Avoid significant area
- Surface collection
- Salvage: remove and relocate
- No management required
- Site type
- Artefact scatter
- Artefact scatter, PAD
- Artefact scatter, confirmed deposit, PAD

- Grinding groove
- Grinding groove, PAD
- Grinding groove, artefact scatter, PAD
- Isolated find
- Isolated find, PAD
- Isolated find, confirmed deposit, PAD
- Quarry, artefact scatter, PAD
- Scarred tree
- Not an Aboriginal scar tree

Revised management and mitigation measures – overview

New England Solar Farm
Aboriginal cultural heritage
assessment addendum report
Figure 7.1



KEY

- Project boundary *
- Main road
- Local road
- Watercourse/drainage line
- Development footprint
 - Solar array
 - Potential electrical cabling
 - Potential site access/electrical cabling
 - Potential substation/BESS footprint

- Uralla LEP listing - item
- Indicative site boundaries
 - HNE15
 - HNE16
 - HNE17
 - HNE19
 - HNE20

- Impact type
 - None
 - Physical
 - Visual
- Avoidance buffer (HNE14)

Note: HNE37 is not shown as a point as it is representative of the cultural landscape

Project impacts to identified heritage values

New England Solar Farm
Amendment report
Figure 5.3

Appendix B

Road Upgrades

Memorandum



Level 3, 175 Scott Street
Newcastle NSW 2300

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12 September 2019

To: Iwan Davies
From: David Richards
Subject: J17300 - New England Solar Farm - Revised traffic impact assessment and proposed road upgrades

Dear Iwan,

1 Overview

UPC Renewables Australia Pty Ltd (UPC) proposes to develop the New England Solar Farm; a significant grid-connected solar farm and battery energy storage system (BESS) along with associated infrastructure, approximately 6 kilometres (km) east of the township of Uralla, which lies approximately 19 km south of Armidale in the Uralla Shire local government area (LGA) (the project).

The project is classed as State Significant Development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). A development application (DA) and environmental impact statement (EIS) was submitted under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The DA and EIS for the project were publicly exhibited from 20 February to 20 March 2019.

Following public exhibition of the DA and EIS, two additional reports have been submitted to the NSW Department of Planning, Industry and Environment (DPIE), namely:

- a response to submissions (RTS) report, responding to the matters raised in the regulatory and public submissions provided during the public exhibition period of the EIS; and
- an amendment report (AR), providing a description of the additional project refinements and changes that have been made since the public exhibition of the EIS.

Since the submission of the RTS and AR, UPC has continued discussions with DPIE, NSW Roads and Maritime Services (RMS) and Uralla Shire Council in relation to potential road upgrades and intersection improvements that may be required to facilitate the safe movement of vehicles between the New England Highway and the development footprint for the project. As part of these discussions, the following roads and intersections have been identified as requiring additional works:

- intersection of New England Highway and Barleyfields Road;
- Barleyfields Road (north of the intersection with Big Ridge Road);
- intersection of Big Ridge Road and Barleyfields Road; and
- Big Ridge Road.

In their request for additional information (dated 2 August 2019), DPIE requested that UPC provide a schedule of the proposed road upgrade works, developed in consultation with Uralla Shire Council, and an assessment of the impacts of the upgrades.

UPC has engaged SCT Consulting PTY LTD (SCT) to identify suitable designs for the proposed road upgrades and intersection improvements. The proposed designs are likely to result in additional surface disturbance activities that were not assessed as part of the EIS and supporting assessments. Subsequently, this memorandum has been prepared to consider potential impacts to biodiversity, Aboriginal cultural heritage and traffic as a result of the proposed additional works and identify appropriate mitigation and management measures, where required. The proposed road upgrades and intersection improvements are referred to hereafter collectively as the road upgrades.

2 Schedule of the road upgrades

Since the submission of the EIS and AR, SCT has finalised the traffic and transport assessment for the project (Appendix A). This assessment has focused on two key aspects, namely:

- network and intersection performance – including an assessment of the impact of construction traffic on the existing railway crossing near the intersection of New England Highway/Barleyfields Road (north); and
- an assessment of the need to modify the sealed width on Barleyfields Road and Big Ridge Road based on the end-state traffic generation of the project, as well as consideration of the safety of road users during the construction period, road classifications and the operating environment.

The results of this assessment have been discussed with RMS and Uralla Shire Council and used to inform the schedule of proposed road upgrades described in Table 2.1 below. The proposed road upgrades described in Table 2.1 have been put forward in consideration of a combination of the end state traffic generated during operations, project-related vehicle movements during the construction of the project, and baseline or background traffic movements along the primary vehicle access route.

Table 2.1 Schedule of road upgrades

Upgrade location	Proposed upgrade(s)
Intersection of New England Highway and Barleyfields Road (north)	The following geometric modifications are proposed at the intersection of New England Highway/Barleyfields Road (north): • reduction in overtaking lane length for New England Highway (northbound) from 3.3 km to 2.3 km; • provision of a dedicated 100 m right turn bay for vehicles turning right from the New England Highway to Barleyfields Road (north); • provision of a dedicated 480 m acceleration lane for vehicles turning right from Barleyfields Road (north) to New England Highway; and • shoulder widening on the New England Highway (southbound) for 25 m on approach to Barleyfields Road (north). UPC is continuing consultation with RMS in relation to the design presented above and shown in Appendix B of Appendix A. An alternative intersection design was recently proposed by RMS and this will be the subject of further discussions between RMS, UPC and SCT to determine any further design modifications. The proposed upgrades as described above will be implemented prior to commencement of construction, unless a preferred alternate design is agreed with RMS, and all works will be carried out to the satisfaction of the relevant roads authority (ie RMS). As part of RMS's works program, intersection improvement works are scheduled for this intersection for November 2019, which may incorporate the modifications required to accommodate the project. Potential impacts of the proposed intersection upgrade works have been assessed in consideration of the full extent of the disturbance boundary defined in Appendix B and Appendix C of this memorandum.
Barleyfields Road (north)	The following modifications are proposed along Barleyfields Road between the intersection with Big Ridge Road and New England Highway: • construct a sealed road width of 7.2 m (ie 3.1 m sealed lanes with a 0.5 m sealed shoulder for both northbound and southbound traffic); and • construct an unsealed shoulder of 1 m on either side of Barleyfields Road (north). The total carriageway width will be 9.2 m and will be consistent with Austroads requirements during both construction and operations.

Table 2.1 **Schedule of road upgrades**

Upgrade location	Proposed upgrade(s)
Intersection of Barleyfields Road and Big Ridge Road	The primary geometric modification proposed at the intersection of Barleyfields Road/Big Ridge Road is widening in the adjacent road shoulder north-east of the intersection.
Big Ridge Road (Segment 1) 0-1,150 m	The following modifications are proposed along Big Ridge Road (Segment 1) between the intersection with Barleyfields Road and Munsies Road: • construct a sealed road width of 7.2 m (ie 3.1 m sealed lanes with a 0.5 m sealed shoulder for both eastbound and westbound traffic); and • construct an unsealed shoulder of 1 m on either side of Big Ridge Road (Segment 1). The total carriageway width will be 9.2 m and will be consistent with Austroads requirements during both construction and operations.
Big Ridge Road (Segment 2) 1,150 m-3,850 m	No upgrades are proposed as the existing carriageway is consistent with Austroads requirements during both construction and operations.
Big Ridge Road (Segment 3) 3,850 m-6,610 m	The following modifications are proposed along Big Ridge Road (Segment 3) between the end of the existing sealed carriageway and Mount Lydia: • construct a sealed road width of 7.2 m (ie 3.1 m sealed lanes with a 0.5 m sealed shoulder for both eastbound and westbound traffic); and • construct an unsealed shoulder of 1 m on either side of Big Ridge Road (Segment 3). The total carriageway width will be 9.2 m and will be consistent with Austroads requirements during both construction and operations.
Big Ridge Road (Segment 4) 6,610 m-8,800 m	The following modifications are proposed along Big Ridge Road (Segment 4) between Mount Lydia and the development footprint: • construct a sealed road width of 3.7 m; and • construct an unsealed shoulder of 2.5 m on either side of Big Ridge Road (Segment 4). The total carriageway width will be 8.7 m and will be consistent with Austroads requirements during operations. During construction, it is not anticipated that local traffic will use this segment of Big Ridge Road as it does not service any properties other than those that form part of the development footprint. Appropriate measures to manage traffic through Segment 4 during construction will be detailed in the traffic management plan (TMP).
Big Ridge Road (Segment 5)	The following modifications are proposed along Big Ridge Road (Segment 5) within the development footprint (along the cadastral road corridor that extends to the proposed location of the grid substation): • construct a sealed road width of 3.7 m; and • construct an unsealed shoulder of 2.5 m on either side of Big Ridge Road (Segment 5). The total carriageway width will be 8.7 m and will be consistent with Austroads requirements during operations. During construction, it is not anticipated that local traffic will use this segment of Big Ridge Road as it does not service any properties other than those that form part of the development footprint. Appropriate measures to manage traffic through Segment 4 during construction will be detailed in the TMP.

Source: SCT Consulting 2019, *New England Solar Farm Traffic and Transport Assessment*.

The schedule of road upgrades presented in Table 2.1 have been designed to meet and/or exceed the end-state requirements of the project and have been developed in consultation with RMS and Uralla Shire Council.

3 Impact assessment

3.1 Biodiversity

3.1.1 Overview

As part of the EIS, EMM prepared a biodiversity development assessment report (BDAR) for the project (Appendix C of the EIS), which assessed the project's potential impacts on biodiversity.

The road upgrades described in Table 2.1 are likely to result in additional surface disturbance activities that were not assessed as part of the EIS and supporting BDAR. Subsequently, an addendum to the BDAR has been prepared to consider potential impacts to biodiversity as a result of the proposed works and identify appropriate mitigation and management measures, where required (Appendix B of this memorandum).

For the purposes of this assessment, a conservative approach has been taken to facilitate the progression of the project through the approval process. This includes an assumption that, where present within the road upgrade disturbance boundary, native vegetation is at benchmark condition. Detailed biometric plots to ascertain the condition of the vegetation could not be undertaken due to inappropriate seasonal timing. Several threatened species have also been assumed present for this reason.

UPC may wish to conduct further assessments including biometric plots and targeted species surveys during the appropriate seasons and in accordance with the *Biodiversity Assessment Method* (BAM) (OEH 2017). It is likely that these further assessments will reduce the number of ecosystem credits and species credits required to offset impacts within the road upgrade disturbance boundary. UPC will continue to liaise with DPIE during the assessment process should further assessments be undertaken and credit requirements change.

3.1.2 Assessment of impacts

i Potential direct and indirect impacts

Unmitigated, the road upgrades have the potential to result in minor indirect or minor prescribed impacts. Prescribed impacts include:

- vehicle collision with fauna; and
- fragmentation of habitats and associated impacts to connectivity and fauna movement.

Unmitigated indirect impacts that could occur as a result of the road upgrades include:

- increased noise, vibration and dust levels; and
- increase in weeds and pathogens.

The removal of native vegetation has the potential to result in fragmentation of fauna habitat, with resultant effects on fauna species movement, reproduction and gene flow. The impact of vegetation clearance on habitat fragmentation is anticipated to be negligible, given that the majority of the vegetation removal is associated with grassland, which offers little connectivity benefit. The removal of woodland vegetation will be limited to a narrow strip either side of the existing carriageways. This is unlikely to significantly reduce the ability of fauna to move across the landscape.

Construction activities may result in increased levels of noise and vibration. These impacts will be limited to relatively small sections (ie active work areas) during road upgrades and impacts will be temporary in nature. Given the temporary nature of the disturbance and the ability for most species to move to other areas of adjacent habitat (that will not be impacted), significant impacts to fauna are not anticipated.

ii Serious and irreversible impacts

White Box Yellow Box Blakely's Red Gum Woodland is considered a potential entity to meet the serious and irreversible impacts (SAILs) principle (refer Appendix 3 of the BAM (OEH 2017)).

All five vegetation zones recorded as part of the BDAR addendum meet the criteria for the NSW *Biodiversity Conservation Act 2016* (BC Act) listing of White Box Yellow Box Blakely's Red Gum Woodland. Potential for SAILs to this ecological community have been considered in Section 5.3 of Appendix B.

Impacts to White Box Yellow Box Blakely's Red Gum Woodland as a result of the proposed road upgrades are considered of low magnitude.

iii Impacts requiring offsets

Impacts to native vegetation requiring offsets include:

- direct impacts on 0.02 ha of PCT 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion woodland_moderate (1 credit);
- direct impacts on 0.25 ha of PCT 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion_derived native grassland (5 credits); and
- direct impacts on 0.19 ha of PCT 567 - Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion woodland_moderate (10 credits).

The total number of ecosystem credits required to offset the proposed road upgrades is 16 credits.

Impacts to species credit species requiring offsets include:

- Bluegrass (15 species credits);
- Hawkweed (16 species credits);
- Silky Swainson-pea (16 species credits);
- Austral Toadflax (12 species credits);
- Pale-headed Snake (11 species credits);
- Bush Stone-curlew (11 species credits);
- Glossy Black-Cockatoo (breeding) (11 species credits);
- Eastern Pygmy Possum (11 species credits);
- Squirrel Glider (11 species credits); and
- Koala (breeding) (11 species credits).

The total number of species credits required to offset the proposed road upgrades is 125 credits.

iv Matters of national environmental significance

An assessment of the impacts of the project on matters of national environmental significance (MNES), considering cumulative impacts associated with the project (ie within the development footprint) and the proposed road upgrades, was prepared (refer Section 6.1 of Appendix B). This determines whether referral of the project to the Commonwealth Minister for the Environment is required.

A likelihood of occurrence assessment considering each entity individually is provided in Appendix C of Appendix B. Assessments of significance have been completed for entities which were either recorded or considered as having potential to occur (refer Appendix D of Appendix B) and included:

- one critically endangered ecological community - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and derived native grassland;
- two vulnerable plant species - Bluegrass and Austral Toadflax;
- two critically endangered fauna species - Regent Honeyeater and Swift Parrot;
- two vulnerable fauna species - Painted Honeyeater and Koala; and
- two migratory species - Fork-tailed Swift and White-throated Needletail.

All assessments concluded that no significant impacts on threatened entities are predicted to result from the project. Referral of the project to the Commonwealth Minister for the Environment for assessment is not required.

3.1.3 Mitigation measures

A biodiversity management plan (BMP) will be prepared which will contain advice regarding the effective implementation of each of the biodiversity management and mitigation measures listed in Table 6.1 of the BDAR.

Measures to mitigate impacts specific to the road upgrades will include reduced speed limits for project-related vehicle movements, which will be detailed in the TMP. Given that the access route utilises public roads, reduced speed limits for public vehicles may not be enforced (except during road upgrade works).

3.1.4 Conclusion

UPC has selected an access route which utilises existing roads and tracks in order to minimise the amount of vegetation clearing required to provide adequate clearance for vehicle access. This has largely limited additional impacts to narrow strips of vegetation on either side of the existing carriageways.

The road upgrades will have direct impacts on biodiversity primarily due to the clearing of native vegetation and loss of species habitat. Indirect impacts on biodiversity may also occur during construction as a result of increased vehicle movements and noise and vibration.

Residual impacts on biodiversity will be managed through the implementation of the BMP, which will include measures such as pre-clearance surveys and standard erosion and sediment control and biosecurity management procedures.

A total of 16 ecosystem credits and 125 species credits are required to offset the residual impacts of the road upgrades. Offsets will be provided in accordance with the biodiversity offset framework. A credit report is provided in Appendix B.

3.2 Aboriginal cultural heritage

As part of the EIS, EMM prepared an Aboriginal cultural heritage assessment report (ACHAR) for the project, which included Aboriginal community consultation and an archaeological survey program (refer Appendix D of the EIS).

The road upgrades described in Table 2.1 are likely to result in additional surface disturbance activities that were not assessed as part of the EIS and supporting ACHAR. Subsequently, an addendum to the ACHAR has been prepared to consider potential impacts to Aboriginal cultural heritage as a result of the proposed works and identify appropriate mitigation and management measures, where required (Appendix C of this memorandum).

The addendum to the ACHAR presents the outcomes of additional consultation and survey and provides an updated impact assessment and management measures in response to the findings of the additional archaeological investigations.

No Aboriginal objects were identified as a result of the survey effort and it is unlikely subsurface archaeological deposits occur within the area of the proposed works.

Should any Aboriginal objects be identified during the proposed works, they should be managed in accordance with the proposed Aboriginal heritage management plan (AHMP) that will be developed subsequent to project approval. The AHMP will provide the details of the management measures outlined in Section 7.2 of Appendix E of the AR and Section 9.2 of Appendix D of the EIS.

3.3 Traffic

3.3.1 Overview

A traffic impact assessment (TIA) was undertaken in accordance with the relevant governmental assessment requirements, guidelines and policies, and in consultation with relevant government agencies. The assessment was based on the general scope for matters to consider in a TIA as defined by the Guide to Traffic Generating Developments (RTA 2002) and included consideration of the Austroads Guide to Road Design (Austroads 2015) and the Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development (Austroads 2016).

Since the submission of the EIS and AR, and in consultation with DPIE and Uralla Shire Council, UPC has made two further amendments to the project, which will impact project-related traffic volumes on the local and regional road network. These include:

- removal of the construction accommodation village from the development application; and
- consolidation of the proposed route to connect the New England Highway to the development footprint.

As a result of these additional project amendments, Section 5.8.1 of the AR has been updated to provide an accurate summary of the traffic impacts associated with the amended project.

3.3.2 Traffic demands for the project

i Primary access routes

The proposed vehicle route for the project will be via Barleyfields Road (north), then onto Big Ridge Road. Vehicles will travel from the Big Ridge Road site access points for the northern array area to the central array via an internal site access road between the northern and central array areas. All light and heavy vehicles travelling from the north and south that require access to the development footprint will use this route.

ii Construction traffic

Construction of the project will take approximately 32–36 months from the commencement of site establishment works to commissioning of the two array areas. As noted in Section 2.4.5 of the AR, Stage 1 will include complete construction of the northern array area and Stage 2 will include complete construction of the central array area.

The forecast daily light and heavy vehicle movements accessing the development footprint across the two stages are shown in Table 3.1.

Table 3.1 Forecast daily light and heavy vehicle movements

Stage	Average daily light vehicle movements	Peak daily light vehicle movements	Average daily heavy vehicle movements	Peak daily heavy vehicle movements
1	150	230	46	60
2	130	210	38	52

In summary, it is anticipated that the maximum number of daily vehicle movements generated by the project during the peak construction periods will be in the order of 440 light vehicle movements (ie 220 light vehicles), 112 heavy vehicle movements (ie 66 heavy vehicles) and approximately 6 over-dimensional vehicles.

iii Traffic distribution

a Construction

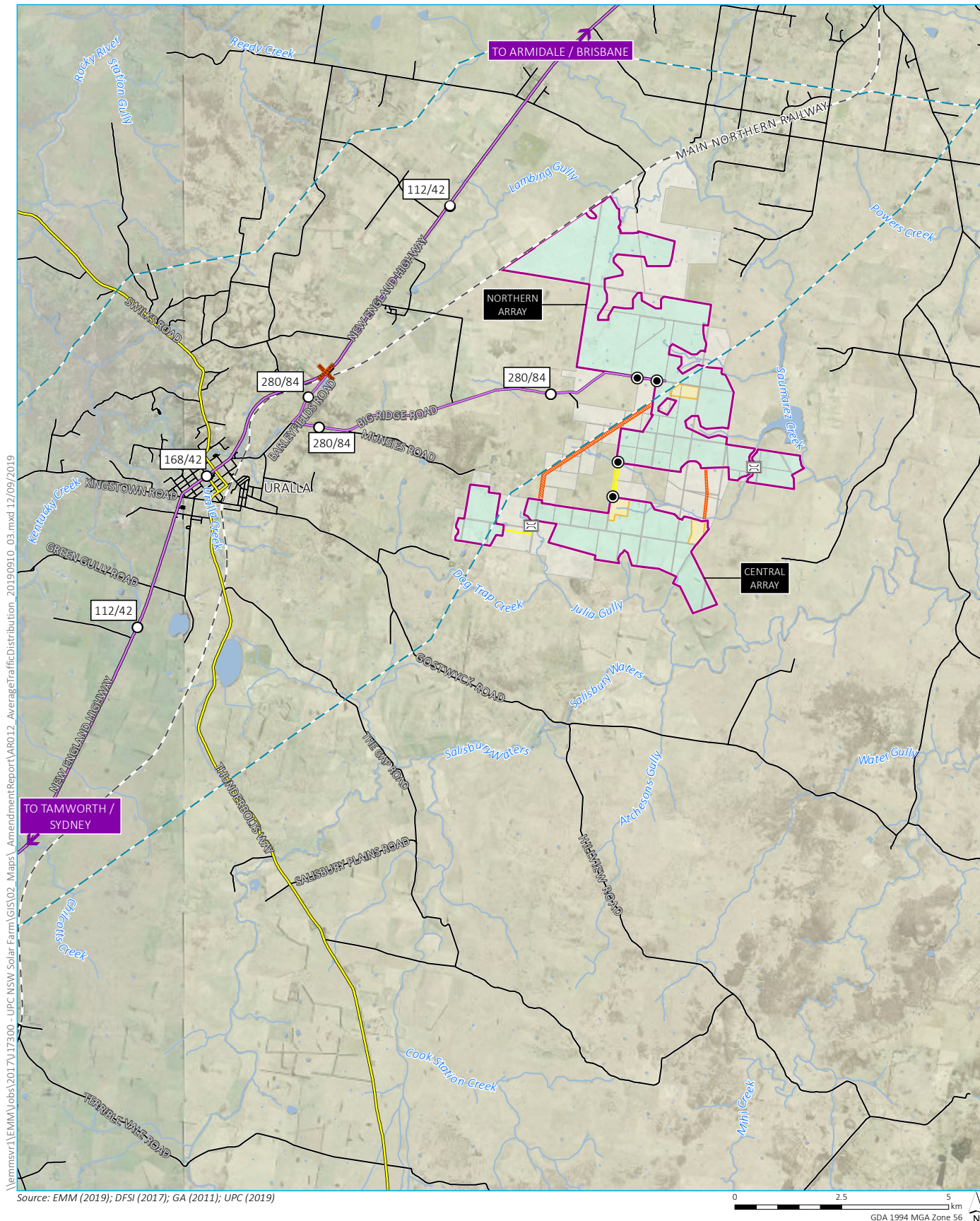
The origins of traffic during construction will be the same as previously stated in the TIA presented as part of the EIS (refer Section 3.4.1 of Appendix K of the EIS).

The proposed traffic distribution for the project's light vehicle traffic (mainly workforce cars and shuttle buses) and heavy vehicle traffic (mainly delivery trucks) for Stage 1 and Stage 2 combined are illustrated in Figure 3.1 (average daily traffic distribution) and Figure 3.2 (peak daily traffic distribution).

b Operations

As noted in Section 2.6 of the AR, it is anticipated that a workforce of up to 15 FTEs will still be required for the project. The origins of traffic during operations will be the same as previously stated in the TIA presented as part of the EIS (refer Section 3.4.2 of Appendix K of the EIS). During operations, there will be much lower daily traffic movements.

The maximum number of heavy vehicles anticipated to require access to the development footprint during operations is 10 daily heavy vehicle movements (ie 5 heavy vehicles).



KEY

- Project boundary*
- Development footprint
- Solar array
- Potential ETL easement
- Potential site access/ETL easement
- Potential substation/BESS footprint
- Potential creek crossing
- Primary site access point

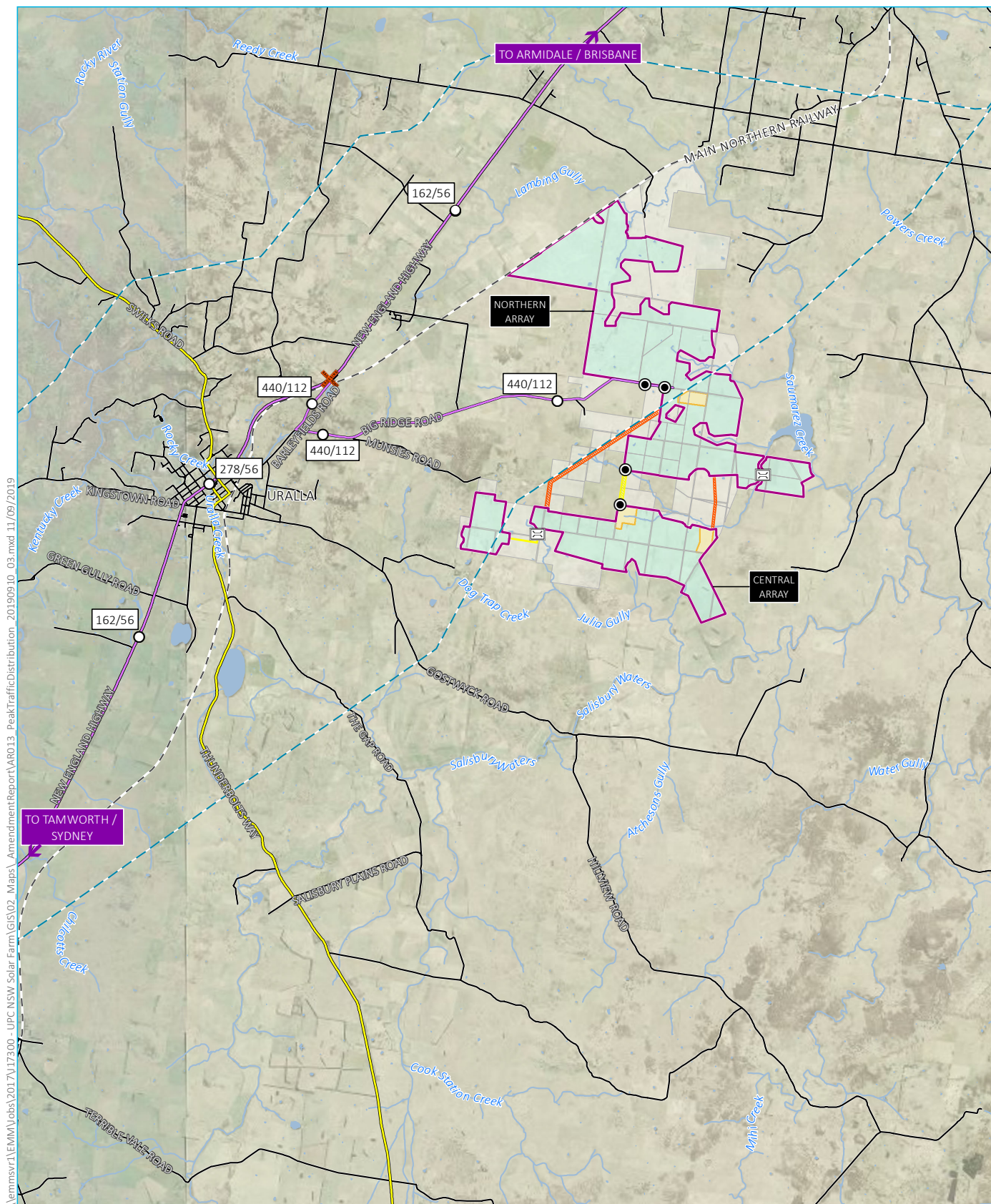
- 330 kV transmission line
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Waterbody

- X Level crossing
- Light / heavy vehicle traffic route
- Traffic distribution count
- 0/0 Light/heavy vehicle count

*The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.

Average daily traffic distribution for Stage 1 and Stage 2 combined

New England Solar Farm
Figure 3.1



KEY

- Project boundary*
- Development footprint
- Solar array
- Potential ETL easement
- Potential site access/ETL easement
- Potential substation/BESS footprint
- Potential creek crossing
- Primary site access point

- 330 kV transmission line
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Waterbody

- Level crossing
- Light / heavy vehicle traffic route
- Traffic distribution count
- 0/0 Light/heavy vehicle count

*The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.

Peak daily traffic distribution for Stage 1 and Stage 2 combined

New England Solar Farm
Figure 3.2

3.3.3 Assessment of impacts

i Traffic volumes on the road network

a Average construction traffic

A summary of the current baseline traffic conditions within the local road network is provided in Table 3.2, which also includes the predicted future average daily traffic during the Stage 1 and Stage 2 construction overlap period. Where the predicted future average daily traffic volume results in a change in the applicable Austroads standard, this is in **bold**.

Table 3.2 Future daily traffic assessment for project average construction traffic

Project related traffic route	Projected baseline daily traffic volume (year 2018)	Baseline Austroads rural daily traffic volume standard	Meets design standard (baseline only)	Average construction traffic			Future Austroads rural daily traffic volume standard
				Average daily traffic from the project	Future total daily traffic	Percentage of traffic increase	
New England Highway (north of Uralla)	6,557	> 3,000 daily vehicles	Yes	154	6,711	+2.35%	> 3,000 daily vehicles
Bridge Street (Uralla)	8,659	> 3,000 daily vehicles	Yes	210	8,869	+2.43%	> 3,000 daily vehicles
New England Highway (south of Uralla)	3,985	> 3,000 daily vehicles	Yes	154	4,139	+3.86%	> 3,000 daily vehicles
Barleyfields Road (north of Big Ridge Road)	419*	150 – 500 daily vehicles	No	364	783	+86.87%	500 – 1,000 daily vehicles
Big Ridge Road (east of Barleyfields Road)	119*	1 – 150 daily vehicles	No	364	483	+305.88%	150 – 500 daily vehicles
Big Ridge Road (east of Munsies Road)	54*	1 – 150 daily vehicles	No	364	418	+674.07%	150 – 500 daily vehicles

Note: *Daily traffic volumes updated based on data presented in SCT Consulting 2019, *New England Solar Farm Traffic and Transport Assessment*.

The highest proportional daily traffic increases from the project will be on Big Ridge Road, east of Munsies Road (+674%), followed by Big Ridge Road, east of Barleyfields Road (+306%) and Barleyfields Road, north of Big Ridge Road (+87%).

While these increases are proportionally quite significant, they will only apply temporarily during construction and traffic volumes will subsequently decrease significantly following the completion of construction.

Big Ridge Road and Barleyfields Road (north of Big Ridge Road) will move into a higher band in the Austroads rural daily traffic volume capacity standards during the average construction period.

b Peak construction traffic

A summary of the current baseline traffic conditions within the local road network is provided in Table 3.3, which also includes the predicted future peak daily traffic during the Stage 1 and Stage 2 construction overlap period.

Since the submission of the AR, the construction accommodation village has been removed from the development application for the project. As noted within Section 3.4.1 of the TIA (Appendix K of the EIS), UPC has consulted

with Armidale Regional Council, Tamworth Regional Council and Uralla Shire Council with regards to potential pick up/muster points for shuttle bus services operating to and from Armidale, Tamworth and Uralla, respectively. Without the construction accommodation village, it is anticipated that shuttle bus services will be utilised by a greater proportion of the project's construction workforce. The number of light vehicle movements during peak construction have been revised to reflect this. The exact locations of the muster points will be determined in consultation with the relevant council as part of the TMP.

Where the predicted future total daily traffic volume results in a change in the applicable Austroads standard, this is in bold.

Table 3.3 Future daily traffic assessment for project peak construction traffic

Project related traffic route	Projected baseline daily traffic volume (year 2018)	Baseline Austroads rural daily traffic volume standard	Meets design standard (baseline only)	Peak construction traffic			Future Austroads rural daily traffic volume standard
				Peak daily traffic from the project	Future total daily traffic	Percent traffic increase	
New England Highway (north of Uralla)	6,557	> 3,000 daily vehicles	Yes	218	6,775	+3.32%	> 3,000 daily vehicles
Bridge Street (Uralla)	8,659	> 3,000 daily vehicles	Yes	334	8,993	+3.86%	> 3,000 daily vehicles
New England Highway (south of Uralla)	3,985	> 3,000 daily vehicles	Yes	218	4,203	+5.47%	> 3,000 daily vehicles
Barleyfields Road (north of Big Ridge Road)	419*	150 – 500 daily vehicles	No	552	971	+131.74%	500 – 1,000 daily vehicles
Big Ridge Road (east of Barleyfields Road)	119*	1 – 150 daily vehicles	No	552	671	+463.87%	500 – 1,000 daily vehicles
Big Ridge Road (east of Munsies Road)	54*	1 – 150 daily vehicles	No	552	606	+1,022.22%	500 – 1,000 daily vehicles

Note: *Daily traffic volumes updated based on data presented in SCT Consulting 2019, *New England Solar Farm Traffic and Transport Assessment*.

The highest proportional daily traffic increases from the project will be on Big Ridge Road, east of Munsies Road (+1,022%), followed by Big Ridge Road, east of Barleyfields Road (+464%) and Barleyfields Road, north of Big Ridge Road (+132%).

While these increases are proportionally quite significant, they will only apply temporarily during the project's peak construction periods. The traffic volumes will subsequently decrease after the peak construction periods.

Big Ridge Road and Barleyfields Road (north of Big Ridge Road) will move into a higher band in the Austroads rural daily traffic volume capacity standards during the average construction period.

c Operational traffic

During operations, it is anticipated that a workforce of up to 15 FTEs will still be required for the project. The origins of traffic during operations will be the same as previously stated in the TIA presented as part of the EIS (refer Section 3.4.2 of Appendix K of the EIS).

As described in Section 4.1.3 of the TIA, the majority of daily traffic movements are anticipated to be to and from the operations and control room that will likely be within the development footprint for the northern array area with access via Big Ridge Road.

For the purpose of assessing the worst-case scenario, it is assumed that 15 light vehicles per day (ie 30 light vehicle movements) and 5 heavy vehicles per day (ie 10 heavy vehicle movements) will use local roads during operations, as presented in Table 3.4. Where the predicted future average daily traffic volume results in a change in the applicable Austroads standard, this is in **bold**. It should be noted that during normal operations, no heavy vehicle movements are likely to be required on a regular basis.

Table 3.4 Future daily traffic assessment for project operations traffic

Project related traffic route	Projected baseline daily traffic volume (year 2018)	Baseline Austroads rural daily traffic volume standard	Meets design standard (baseline only)	Operations traffic			Future Austroads rural daily traffic volume standard
				Average daily traffic from operation	Future total daily traffic	Percent traffic increase	
New England Highway (north of Uralla)	6,557	> 3,000 daily vehicles	Yes	15	6,572	+0.23%	> 3,000 daily vehicles
Bridge Street (Uralla)	8,659	> 3,000 daily vehicles	Yes	25	8,684	+0.29%	> 3,000 daily vehicles
New England Highway (south of Uralla)	3,985	> 3,000 daily vehicles	Yes	15	4,000	+0.38%	> 3,000 daily vehicles
Barleyfields Road (north of Big Ridge Road)	419*	150 – 500 daily vehicles	No	40	459	+9.54%	150 – 500 daily vehicles
Big Ridge Road (east of Barleyfields Road)	119*	1 – 150 daily vehicles	No	40	159	+40%	150 – 500 daily vehicles
Big Ridge Road (east of Munsies Road)	54*	1 – 150 daily vehicles	No	40	94	+74%	1 – 150 daily vehicles

Note: *Daily traffic volumes updated based on data presented in SCT Consulting 2019, *New England Solar Farm Traffic and Transport Assessment*.

Big Ridge Road (east of Barleyfields Road) will move into a higher band in the Austroads rural daily traffic volume capacity standards during operations.

3.3.4 Mitigation measures

The schedule of road upgrades presented in Table 2.1 have been designed to meet and/or exceed the end-state requirements of the project and have been developed in consultation with RMS and Uralla Shire Council. As described in Section 6.1 of the TIA (Appendix K of the EIS), a TMP and Driver's Code of Conduct will also be prepared prior to commencement of construction. The TMP and Driver's Code of Conduct will include a map of the consolidated heavy vehicle route for access to the two array areas. The TMP will also include consideration of the additional recommendations provided by SCT in Section 4.1.5 of Appendix A.

3.3.5 Conclusion

The amendments to the project have reduced the number of local roads that will be used by project-related light and heavy vehicle movements. Access to the two array areas will be from Barleyfields Road and Big Ridge Road.

The peak daily project-related vehicle movements should be considered as a limited duration construction traffic impact as they are anticipated to occur across two four-month periods within the overall 36-month construction period.

Project-related peak and average construction vehicle movements will have a short-term impact on traffic conditions and usability, nonetheless, UPC propose to implement the schedule of road upgrades presented in Section 2 to mitigate the project's impacts on the local road network. Importantly, the upgrades proposed along the road segments used by the general public to access their properties will be consistent with Austroads requirements during both construction and operations .

3.4 Other environmental aspects

The EIS and AR contain assessments of the potential impacts of the project on a number of different environmental aspects. Due to the minor extent of additional clearance and disturbance requirements (ie narrow strips either side of existing carriageways) and the temporary nature of the proposed road upgrade works, no updates to the outcomes of these assessments are considered necessary.

4 Mitigation measures

As noted in Section 2.8 of the AR, an environmental management strategy will be implemented to provide the strategic framework for environmental management of the project. The strategy will:

- incorporate all required plans, protocols, management and mitigation measures proposed in the EIS and AR;
- identify all relevant statutory approvals;
- establish roles, responsibility, authority and accountability of all key personnel involved in the environmental management of the project (including the proposed road upgrades);
- establish procedures for consulting with neighbouring landholders, the local community and relevant agencies, including Uralla Shire Council and RMS, about the operation and environmental performance of the project; and
- establish procedures for handling of complaints, disputes, non-compliances and emergency response.

The mitigation measures outlined in the EIS and AR will be incorporated into the detailed design and construction of the project and into the required management plans as relevant. Where relevant, the mitigation measures provided in Appendix B of the AR will be implemented during the proposed road upgrades.

5 Conclusion

This memorandum provides a schedule of the proposed road upgrade works, which has been developed in consultation with Uralla Shire Council, and an assessment of the impacts of these upgrades.

The proposed designs are likely to result in additional surface disturbance activities that were not assessed as part of the EIS and supporting assessments. Subsequently, this memorandum has been prepared to consider potential impacts to biodiversity, Aboriginal cultural heritage and traffic as a result of the proposed additional works and identify appropriate mitigation and management measures, where required.

The proposed road upgrades have been designed to avoid and minimise adverse impacts where possible. The residual impacts to biodiversity and Aboriginal cultural heritage have been identified and assessed. While there are some unavoidable impacts (namely as a result of additional clearance and disturbance requirements), mitigation and management measures have been proposed to address these.

If you require any additional information or have any queries please do not hesitate to contact the undersigned.

Yours sincerely

A handwritten signature in dark ink, reading "D Richards". The signature is fluid and cursive, with the first letter 'D' being large and prominent.

David Richards

Senior Environmental Scientist

drichards@emmconsulting.com.au

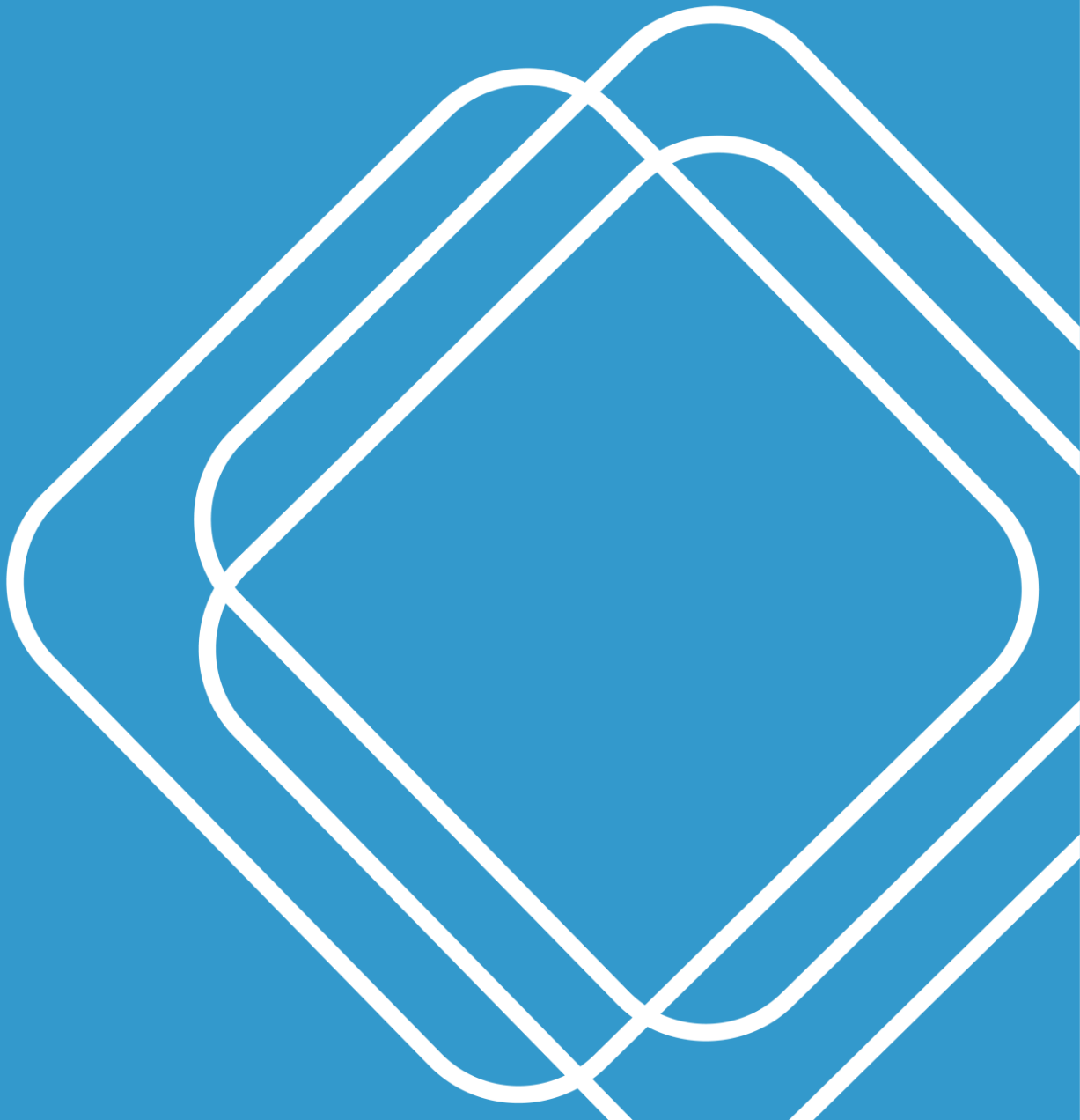
Appendix A

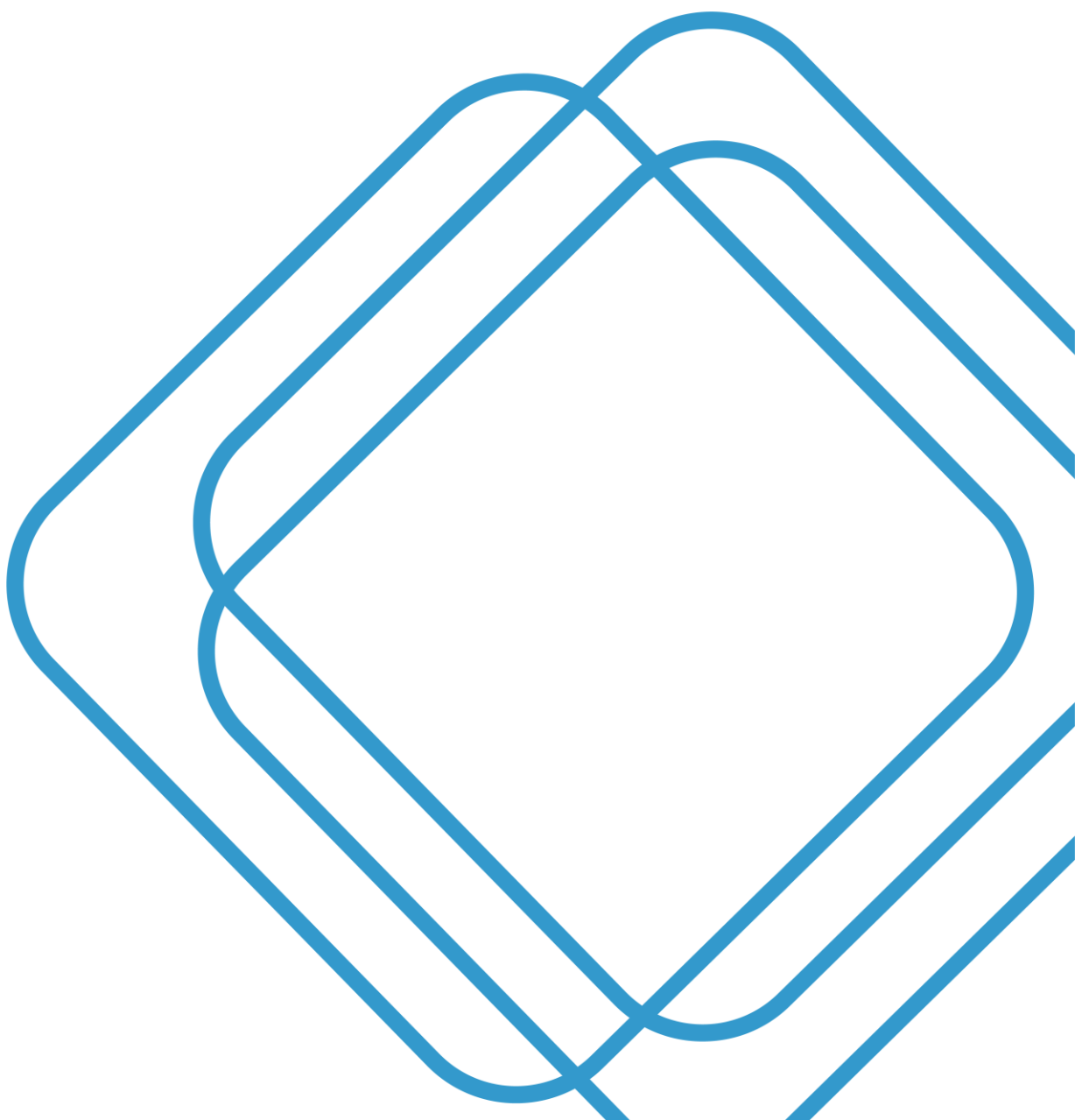
Traffic and transport assessment

NEW ENGLAND SOLAR FARM

Traffic and Transport Assessment

10 SEPTEMBER 2019





Quality Assurance

Project:	New England Solar Farm		
Project Number:	SCT_00107		
Client:	UPC Renewables Australia Pty Ltd	ABN:	27 616 856 672
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1.1	7 August 2019	Final document for issue (incorporating client feedback)
1.2	12 August 2019	Final document for issue (incorporating client feedback)
1.3	14 August 2019	Final document for issue (incorporating client feedback)
1.4	28 August 2019	Final document for issue (revised construction traffic volumes)
1.5	3 September 2019	Final document for issue (modification to carriageway width)
1.6	10 September 2019	Final document for issue (inclusion of design drawings)

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Executive Summary

Overview

UPC Renewables Australia Pty Ltd are finalising approvals and investigatory works to develop the New England Solar Farm, a significant grid connected solar farm and battery energy storage system east of Uralla. Following receipt of feedback from various stakeholders the project team have requested further assessment of the following:

- Intersection concept design and swept path analyses for the intersection of New England Highway / Barleyfields Road (north) and Barleyfields Road / Big Ridge Road (Note: Not contained within this document);
- Network and intersection performance including an assessment of the impact of construction traffic on the existing at grade railway crossing near the intersection of New England Highway / Barleyfields Road (north); and
- An assessment of the need to modify the sealed width on Barleyfields Road and Big Ridge Road based on the end-state traffic generation of the NESF. This assessment would also consider the safety of road users during the construction period, road classification and operating environment.

Network and intersection performance

To support the relevant intersection and mid-block performance assessment detailed traffic surveys were undertaken on the New England Highway, Barleyfields Road and Big Ridge Road. Analysis was undertaken in accordance with technical documentation prepared by Roads and Maritime Services and Austroads.

Intersection performance, at the New England Highway / Barleyfields Road (north) site was modelled as Level of Service A during both the existing and peak construction AM and PM peak periods. This is the highest level of performance achievable and indicates no operational concerns at these sites, based on projected construction traffic volumes, should be anticipated at any stage of the project. The longest 95th percentile back of queue recorded on Barleyfields Road during construction was less than one vehicle. This is a result of the proposed intersection upgrade to the New England Highway / Barleyfields Road (north) which removes the priority conflict between right turning vehicles from Barleyfields Road (north) to New England Highway.

The mid-block capacity assessment further supports the above findings with no capacity concerns noted during the AM and PM peak hour under both existing and peak construction operations. A Level of Service of A was recorded for all assessed segments on New England Highway, Barleyfields Road and Big Ridge Road.

Based on the high standard of performance modelling results indicate it is possible to route all light and heavy construction vehicles to site via the intersection of New England Highway / Barleyfields Road (north).

Mitigation measures

The focal point of this document, regarding mitigation measures, centres on the provision of required road upgrades and acceptable road widths.

From an end state perspective, the operation of the New England Solar Farm would require no upgrades to the road network in relation to the anticipated increase in traffic demand (30 movements per day). However, this comment should be considered with the knowledge that, under current conditions, impacted roadways which meet Austroads (2017) *'Guide to Road Design Part 3: Geometric Design'* sealed width criteria are limited to the New England Highway and Big Ridge Road (Segment 2). Available measurements of current road widths, overlaid against surveyed traffic volume data, are provided in **Table ES1**.

Safety and providing a long-lasting benefit to the community are important social factors behind the New England Solar Farm project. To this end it is proposed to upgrade Barleyfields Road and Big Ridge Road in line with Austroads sealed width requirements. This will also minimise the future maintenance responsibility of Uralla Shire Council.

Table ES2 outlines a proposed methodology from which upgrades to Barleyfields Road and Big Ridge Road can be delivered to balance the competing needs of:

- End state traffic generation;
- Constructing the New England Solar Farm; and
- Sufficient road infrastructure to support background traffic movements on construction access routes.

Table ES1 Existing design conformance

Road	AADT	Design AADT Segment	Surveyed sealed width (traffic lanes only)	Nominated design width (traffic lanes only)	Nominated design width currently achieved
New England Highway	6,338	> 3,000	11m [^]	11m [^]	✓
Barleyfields Road	419	150 – 500	5.8m	6.2m	✗
Big Ridge Road (Segment 1)	119	1 – 150	5m – 5.6m	3.7m – 6.2m	✗
Big Ridge Road (Segment 2)	54	1 – 150	6.9m – 7.1m	3.7m – 6.2m	✓
Big Ridge Road (Segment 3)	54*	1 – 150	3.8 – 6.9m (unsealed)	3.7m (if sealed) 8.7 carriageway width	✗ [#]
Big Ridge Road (Segment 4)	54*	1 – 150	Not available (unsealed)	3.7m (if sealed) 8.7 carriageway width	✗ [#]

[#] = Austroads does not reference unsealed road widths, assessment based on carriageway width.

* = AADT is overestimated given position of property access locations relative to survey location within Segment 2.

[^] = total sealed width

Source: SCT Consulting 2019, modified from EMM Consulting; 2018, Matrix 2019 and Austroads; 2017

Table ES2 Proposed road upgrade

Road	Proposed lane width modification
New England Highway	No modification required
Barleyfields Road	Upgrade sealed width of two traffic lanes from 5.8m to 7.2m (including shoulder sealing). Total carriageway width 9.2m <i>Note: Cost apportionment methodology for road upgrade to be established between UPC Renewables Australia Pty Ltd and Uralla Shire Council.</i>
Big Ridge Road (Segment 1)	<u>Option 1:</u> Operate under temporary traffic signal control to remove width conflict for heavy vehicles. <u>Option 2:</u> Upgrade to a sealed two traffic lane width of 7.2m (including shoulder sealing) to reduce likelihood of head-on accidents. Total carriageway width 9.2m <i>Note: Cost apportionment methodology for road upgrade to be established between UPC Renewables Australia Pty Ltd and Uralla Shire Council.</i>
Big Ridge Road (Segment 2)	No modification recommended
Big Ridge Road (Segment 3)	<u>Option 1:</u> Upgrade unsealed, unformed track to a sealed traffic lane width of 3.7m with two 2.5m unsealed shoulders, equating to total width of 8.7m. This would include management plans for construction vehicles. <u>Option 2:</u> Upgrade unsealed roadway to a sealed two traffic lane width of 7.2m (including shoulder sealing). Total carriageway width 9.2m

Road	Proposed lane width modification
Big Ridge Road (Segment 4)	<u>Option 1:</u> Upgrade unsealed, unformed track to a sealed traffic lane width of 3.7m with two 2.5m unsealed shoulders, equating to total width of 8.7m. This would include management plans for construction vehicles. <u>Option 2:</u> Upgrade unsealed roadway to a sealed two traffic lane width of 7.2m (including shoulder sealing). Total carriageway width 9.2m. <u>Option 3:</u> Upgrade unsealed roadway to a width of 8.7m (including shoulder sealing).

Source: SCT Consulting 2019, modified from EMM Consulting; 2018, Matrix 2019 and Austroads; 2017

In addition to the above it is recommended to mark the centreline of all roads impacted by construction traffic associated with the NESF. Whilst not utilised by construction vehicles formalisation of the Munsies Road approach to the intersection of Munsies Road / Big Ridge Road, through installation of signage and line marking, is recommended.

1.0 Introduction

1.1 Background

UPC Renewables Australia Pty Ltd (UPC) proposes to develop the New England Solar Farm (NESF); a significant grid connected solar farm and battery energy storage system (BESS) along with associated infrastructure, approximately six kilometres (km) east of the township of Uralla, which lies approximately 19 km south of Armidale in the Uralla Shire local government area (LGA) (the project).

To date the Environmental Impact Statement (EIS) for the project was completed in November 2018 with a project amendment report lodged in June 2019.

Subsequent commentary from key stakeholders such as Roads and Maritime Services (Roads and Maritime) and Uralla Shire Council (USC) has been provided regarding the need for further detail surrounding:

- Intersection concept design and swept path analyses for the intersection of New England Highway / Barleyfields Road (north) and Barleyfields Road / Big Ridge Road; and
- Potential impact of construction traffic on the existing at grade railway crossing near the intersection of New England Highway / Barleyfields Road (north).

UPC would like to investigate if any required changes are necessary to sealed road widths on Barleyfields Road and Big Ridge Road caused by the end-state operation of the NESF. This should be considered in the context of the existing design standard of these roads, road classification and operating environment of the access road(s), and the construction traffic generation for the site.

Barleyfields Road remains generally consistent in its alignment between Big Ridge Road and the New England Highway. However, Big Ridge Road varies in its width and formation and has been segmented as follows for the purposes of this assessment:

- Segment 1: Barleyfields Road to west of Munsies Road (Chainage 0m – 1,150m)
 - Sealed carriageway with a trafficable lane width range of 5.5m – 5.6m
- Segment 2: West of Munsies Road to end of sealed carriageway (Chainage 1,150m – 3,850m)
 - Sealed carriageway with a trafficable lane width range of 6.9m – 7.1m
- Segment 3: End of sealed carriageway to Mount Lydia (Chainage 3,850m – 6,610m)
 - Unsealed carriageway with a trafficable lane width range of 3.8m – 6.9m
- Segment 4: Mount Lydia to end of Big Ride Road (Chainage 6,610m – 8,800m)
 - Unsealed carriageway consisting of unformed roadway with limited delineation of desired vehicle path

An overview of the key roads considered in this document, including a visualisation of the segmentation of Big Ridge Road, is provided in **Figure 1–1**.

Figure 1–1 Key road corridors



Source: SCT Consulting; 2019

1.2 Report structure

This proposal has been structured into the following sections:

- **Section 2** details the existing traffic conditions relating to the core study area roads of New England Highway, Barleyfields Road and Big Ridge Road;
- **Section 3** outlines the findings of the construction impact assessment regarding intersection and mid-block capacities;
- **Section 4** outlines a potential methodology with respect to road widening which ensures the end state requirements are balanced against peak period construction traffic volumes; and
- **Section 5** documents the next steps to ensure project delivery.

2.0 Existing conditions

2.1 Traffic volumes

To ensure an accurate assessment was undertaken traffic conditions at key intersections and roadways were collected to inform decision making. A detailed overview of intersection survey results are provided in **Appendix A** with a summary of traffic volumes at key mid-block locations, categorised according to key construction traffic movement periods and daily volumes, provided in **Table 2-1**. Survey locations are provided in **Figure 2-1**.

Table 2-1 Surveyed traffic volumes (2019)

Time period	Traffic Volume											
	New England Highway (Site 1) ¹			Barleyfields Road (Site 2) ²			Big Ridge Road – west of Munsies Road (Site 3) ³			Big Ridge Road – east of Munsies Road (Site 4) ⁴		
	NB	SB	Total	NB	SB	Total	EB	WB	Total	EB	WB	Total
6-7AM	123	81	204	10	3	13	2	-	2	-	-	-
7-8AM	260	133	393	30	9	39	5	4	9	1	3	4
3-4PM	251	266	517	14	18	32	4	5	9	3	2	5
4-5PM	230	322	552	14	31	45	5	6	11	2	2	4
Average Annual Daily traffic (AADT)	3,194	3,144	6,338	208	211	419	59	60	119	25	29	54

Source: SCT Consulting; 2019, modified from Matrix; 2019

Figure 2-1 Traffic survey locations



Source: SCT Consulting; 2019

¹ New England Highway vehicle composition (Combined AADT): 85% light vehicles, 10% medium vehicles and 5% heavy vehicle

² Barleyfields Road vehicle composition (Combined AADT): 94% light vehicles, 6% medium vehicles and 0% heavy vehicles

³ Big Ridge Road west of Munsies Road vehicle composition (Combined AADT): 87% light vehicles, 12% medium vehicles and 1% heavy vehicles

⁴ Big Ridge Road east of Munsies Road vehicle composition (Combined AADT): 83% light vehicles, 14% medium vehicles, and 1% heavy vehicles

2.2 Road widths

Austrroads (2017) 'Guide to Road Design Part 3: Geometric Design' provides guidance on appropriate lane widths for rural roads which are documented in **Table 2–2**. On page 46 the document states:

'Where traffic volumes are less than 150 vehicles per day and, particularly, where terrain is open, single lane carriageways may be used. The traffic lane width adopted on such roads should be at least 3.7 m. A width greater than 4.5 m but less than 6.0 m may lead to two vehicles trying to pass with each remaining on the seal. This potentially increases head-on accidents. On two lane sealed roads, the total width of seal should desirably be not less than 7.2 m to allow adequate width for passing.'

The document also states that 'A minimum 7.0m seal should be provided on designated heavy vehicle routes (or where the AADT contains more than 15 per cent heavy vehicles' (Austrroads Guide to Road Design Part 3: Geometric Design; 2017; p47).

Table 2–2 Single carriageway rural road widths

Element	Design AADT				
	1–150	150–500	500–1000	1000–3000	> 3000
Traffic lanes (m)	3.7 (1 x 3.7)	6.2 (2 x 3.1)	6.2–7.0 (2 x 3.1/3.5)	7.0 (2 x 3.5)	7.0 (2 x 3.5)
Total shoulder (m)	2.5	1.5	1.5	2.0	2.5
Minimum shoulder seal (m)	0	0.5	0.5	1.0	1.5
Total carriageway (m)	8.7	9.2	9.2–10.0	11.0	12.0

Source: Austrroads Guide to Road Design Part 3: Geometric Design; 2017; p47

Measurements of available road widths on key construction routes were taken during site inspections, or were presented in EMM Consulting's (2018) 'New England Solar Farm: Traffic Impact Assessment'. The findings of this analysis, overlaid against surveyed traffic volume data, are provided in **Table 2–3**. Under current operating conditions the only roadways which meet the Austrroads (2017) 'Guide to Road Design Part 3: Geometric Design' sealed width criteria are New England Highway and Big Ridge Road (Segment 2). The assessment for Segment 3 and Segment 4 is based on carriageway width due to a lack of sealed pavement.

Table 2–3 Existing design conformance

Road	AADT	Design AADT Segment	Surveyed sealed width (traffic lanes only)	Nominated design width (traffic lanes only)	Nominated design width currently achieved
New England Highway	6,338	> 3,000	11m^	11m^	✓
Barleyfields Road	419	150 – 500	5.8m	6.2m	✗
Big Ridge Road (Segment 1)	119	1 – 150	5m – 5.6m	3.7m – 6.2m	✗
Big Ridge Road (Segment 2)	54	1 – 150	6.9m – 7.1m	3.7m – 6.2m	✓
Big Ridge Road (Segment 3)	54*	1 – 150	3.8 – 6.9m (unsealed)	3.7m (if sealed) 8.7 carriageway width	✗#
Big Ridge Road (Segment 4)	54*	1 – 150	Not available (unsealed)	3.7m (if sealed) 8.7 carriageway width	✗#

= Austrroads does not reference unsealed road widths, assessment based on carriageway width.

* = AADT is overestimated given position of property access locations relative to survey location within Segment 2.

^ = total width

Source: SCT Consulting, modified from EMM Consulting; 2018, Matrix 2019 and Austrroads; 2017

2.3 Network performance

2.3.1 Intersection performance

Operational performance is typically measured through an assessment of the throughput of vehicles across a traffic network, with average delay per vehicle used to assess the performance of an individual intersection. The average delay per vehicle measure is linked to a Level of Service (LoS) index which characterises the intersection's specific performance. **Table 2–4** provides a summary of the LoS performance bands which will be used in the quantification of intersection performance.

The other measure assessed as part of an intersection's performance is Degree of Saturation (DoS). DoS is used to identify the capacity of the intersection. This is determined by the ratio of the volume of vehicles that can pass through the intersection against the capacity provided by the green time, if applicable, and number of available traffic lanes. i.e. $\text{vehicle} / \text{capacity} = \text{DoS}$. Capacity is reached when $\text{DoS} = 1.0$.

Modelling for the intersection of New England Highway / Barleyfields Road (north) was assessed within SIDRA 8.0. Results are documented within **Section 2.3**.

Table 2–4 Level of Service definition

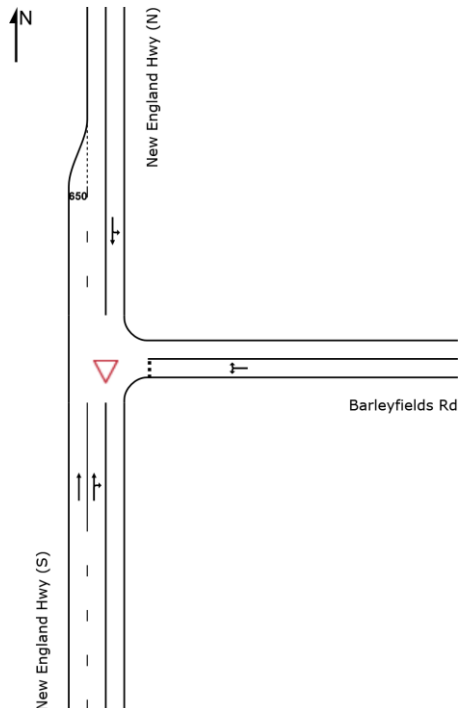
Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals / Roundabout	Give Way / Stop Signs
A	Less than 14.5	Good operation	Good operation
B	14.5 to 28.4	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	28.5 to 42.4	Satisfactory	Satisfactory, but accident study required
D	42.5 to 56.4	Operating near capacity	Near capacity and accident study required
E	56.5 to 70.4	At capacity, at signals incidents will cause excessive delays. Roundabouts require other control method.	At capacity, requires other control method
F	>70.5	At capacity, at signals incidents will cause excessive delays. Roundabouts require other control method.	At capacity, requires other control method

Source: Roads and Maritime Guide to Traffic Generating Developments (2002)

2.3.1.1 New England Highway / Barleyfields Road (north)

2.3.1.1.1 Geometry

An illustration of the geometric layout for the New England Highway / Barleyfields Road (north) intersection is provided in **Figure 2–2**. The site is identified as a standard T-intersection with no turn bays provided for left or right turning vehicles.

Figure 2–2 Geometric layout: New England Highway / Barleyfields Road (north)

Source: SCT Consulting; 2019

2.3.1.1.2 Intersection performance

Modelling results (**Table 2–5**) highlight that the intersection performance in both the AM and PM peak hour period is LoS A, the highest standard of operating performance. The highest average delay per vehicle, 8.6 seconds, was recorded in the PM peak on Barleyfields Road (north).

No capacity constraints are evident with the highest DoS, 0.208, being recorded on the New England Highway (N leg) approach in the PM peak hour period. This is a result of the number of vehicles travelling southbound on the New England Highway relative to the capacity of the single travel lane.

In both the AM and PM peak scenarios the longest 95th percentile queue length on Barleyfields Road (north) is 1.3m. i.e. Less than one car length. This demonstrates that there is currently no impact on the operation of the level crossing, located approximately 120m back from the Barleyfields Road (north) give way line intersection marking.

Table 2–5 Intersection performance: New England Highway / Barleyfields Road (north)

Intersection / Peak	Vehicles	DoS	Average Delay (sec)	LoS	95% back of queue (m)
AM Peak					
New England Highway (S leg)	288	0.079	7.9	A	<1
Barleyfields Road north (E leg)	56	0.056	8.1	A	1.3
New England Highway (N leg)	184	0.105	7.9	A	0.0
Total	528	0.105	8.1	A	1.3
PM Peak					
New England Highway (S leg)	215	0.058	8.5	A	<1
Barleyfields Road north (E leg)	17	0.019	8.6	A	<1
New England Highway (N leg)	369	0.208	7.9	A	<1
Total	601	0.208	8.6	A	<1

Source: SCT Consulting; 2019

2.3.2 Mid-block capacity

Austrroads (2013) 'Guide to Traffic Management' identifies that the mid-block capacity of a two-lane highway as 1,700 passenger cars per hour for each direction of travel. This figure 'is nearly independent of the directional distribution of traffic' (Austrroads; 2013; p43).

Passenger cars is a metric of unit commonly referred as Passenger Car Units (PCU) to account for the different performance and physical characteristics of vehicle types in a network. It does this by assigning a higher conversion factors for larger, slower vehicles to convert to an equivalent car unit. The Roads and Maritime 'Traffic Modelling Guidelines' (2013) suggest the following values as shown in **Table 2-6** for various vehicle types.

Table 2-6 PCU values for vehicle classifications

Vehicle Type	PCU Factor
Pedal Cycle	0.2
Motor Cycle	0.4
Car	1
Rigid Truck	1.9
Bus	2.0
Articulated Truck	2.9
Articulated Bus	3.2
B-Double	3.6

Source: Roads and Maritime Traffic Modelling Guidelines (2013; p156), modified by SCT Consulting; 2018

Based on the suggested PCU values, traffic volumes can be represented in PCUs to determine a volume to capacity ratio (V/C) of a segment of highway. V/C is a ratio of demand to capacity of a road, whereby a value of 1.0 would represent saturated conditions, or full capacity. To represent a worst case scenario average annual weekday traffic (AAWT) was used to undertake the mid-block assessment instead of AADT. This resulted in higher traffic volumes at each location.

As Austrroads does not provide definitive V/C ratios for two lane highway LoS criteria, the following V/C ratios for multi-lane highways are summarised in **Table 2-7** and have been used as a capacity reference point for the assessment of the New England Highway. These have also been applied to the Barleyfields Road and Big Ridge Road route components in the absence of any rural road capacity V/C ratios, albeit with a reduction in capacity to account for narrow lane widths and lateral clearances. This results in capacity values of 850 PCU/hr for both Site 2 and Site 3.

For Site 4, due to the current single lane nature of the alignment, low volumes and lack of guidance within Austrroads documentation, no mid-block capacity calculation was undertaken. During the construction assessment, detailed in **Section 3.3.2**, a mid-block capacity of 300 PCU/hr was assumed based on the provision of an interrupted metered flow lane with capacity for two vehicles to pass each other across a 7.2m width (3.7m sealed | 5m unsealed).

Table 2-7 LoS Criteria for V/C Ratio of multi-lane highways

Free-flow speed	Maximum volume to capacity ratio (V/C): Level of Service				
	A	B	C	D	E
100 km/hr	0.32	0.50	0.72	0.92	1.00
90 km/hr	0.32	0.47	0.68	0.89	1.00
80 km/hr	0.28	0.44	0.64	0.85	1.00
70 km/hr	0.26	0.41	0.59	0.81	1.00

Source: Austrroads Guide to Traffic Management Part 3 (Table 4.4, page 48), modified by SCT Consulting; 2018

A mid-block capacity assessment, based on existing survey data, is provided in **Table 2-8**. Results indicate that all roads, assessed in this document as being impacted by construction vehicles associated with the NESF, currently do not have any capacity constraints and operate at LoS A.

Table 2–8 Volume / Capacity ratio assessment (Existing conditions)

Time period	Volume / Capacity Ratio							
	New England Highway (Site 1)		Barleyfields Road (Site 2)		Big Ridge Road – west of Munsies Road (Site 3)		Big Ridge Road – east of Munsies Road (Site 4)	
	NB	SB	NB	SB	EB	WB	EB	WB
6-7AM	0.12	0.07	0.02	0.01	0.004	0.000	N/A	N/A
7-8AM	0.23	0.11	0.05	0.01	0.006	0.008	N/A	N/A
3-4PM	0.18	0.2	0.02	0.02	0.006	0.006	N/A	N/A
4-5PM	0.17	0.26	0.02	0.04	0.009	0.009	N/A	N/A

Source: SCT Consulting; 2019, modified from Matrix; 2019

3.0 Construction impact assessment

3.1 Construction overview

Construction of the NESF is anticipated to take approximately 36 months from the commencement of site establishment works to commissioning of the two array areas. Construction is planned in the following two stages:

- Stage 1 will include complete construction of the northern array area including the grid substation and is anticipated to take approximately 25 months to complete.
- Stage 2 will include complete construction of the central array area and is anticipated to take approximately 20 months to complete. Stage 2 will commence approximately 12 months after the commencement of site establishment works planned as part of Stage 1.

Construction activities are planned to be undertaken from 6am to 6pm Monday to Sunday. In order to provide a worst case traffic generation figure this assessment assumes that the use of rail to transport materials to site, currently being investigated by UPC, will not be undertaken.

3.2 Construction traffic volumes

There are two construction traffic generation scenarios contained within the NESF EIS. These provide for peak and average construction vehicle movements. To support the assessment of a worst case traffic generation scenario peak construction traffic volumes have been used. A summary of peak construction traffic volumes, broken down across the 6AM-6PM construction activity period is provided in **Table 3–1**.

Total peak construction volumes provide for a total of 440 light vehicle daily movements and 112 heavy vehicle movements (552 total movements). All vehicles will access the construction site via Big Ridge Road.

The peak construction hours of 6-7AM and 7-8AM (inbound) and 3-4PM and 4-5PM (outbound) are governed by the movement of the construction workforce who will primarily travel to site by private vehicle. This results in a uni-directional flow within these time periods and minimal traffic generation throughout the remainder of the day.

The below construction traffic volumes are used throughout this document as a basis for recommended outcomes as they provide for a worst case assessment. In reality they are only forecast to occur for eight months of the 36-month construction period.

Table 3–1 Construction traffic volumes

Time Period	Light vehicles		Heavy vehicles		Total	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
6-7AM	99	0	5	-	104	0
7-8AM	99	0	5	5	104	5
8-9AM	3	0	5	5	8	5
9-10AM	3	3	5	5	8	8
10-11AM	3	3	5	5	8	8
11AM-12PM	3	3	6	5	9	8
12-1PM	3	3	5	6	8	9
1-2PM	3	3	5	5	8	8
2-3PM	3	3	5	5	8	8
3-4PM	0	99	5	5	5	104
4-5PM	0	99	5	5	5	104
5-6PM	0	3	-	5	0	8
Total	220	220	56	56	276	276

Source: EMM Consulting; 2019

3.2.1 Construction traffic volume distribution

The distribution of light and heavy vehicles is provided below:

- For light vehicle traffic during the peak construction period:
 - 38% originating in Armidale and travelling south along the New England Highway (this will include shuttle buses from a muster point);
 - 38% originating in Tamworth and travelling north along the New England Highway (this will include shuttle buses from a muster point);
 - 19% originating in Uralla (this will include shuttle buses from a muster point);
 - 5% originating from the CAV (this traffic will primarily be shuttle buses).
- For heavy vehicle traffic during the average and peak construction periods:
 - 50% originating from the Port of Brisbane and travelling to site along the New England Highway north of Uralla; and
 - 50% originating from the Port of Sydney and travelling to site along the New England Highway south of Uralla.

3.2.2 Variation to Environmental Impact Statement construction access route

Within EMM Consulting's (2018) 'New England Solar Farm: Traffic Impact Assessment' light vehicles from Uralla and Tamworth were forecast to access Big Ridge Road via Barleyfields Road (south). Given the proposed upgrade to both Barleyfields Road, north of Big Ridge Road, and the intersection of New England Highway / Barleyfields Road (north) it is recommended to redirect light vehicles via this access route. **Figure 3–1** Error! Reference source not found. depicts the alternate access route visually.

Redirecting light vehicles to the site via the intersection of New England Highway / Barleyfields Road (north) removes the potential for any future discussion with USC concerning the potential upgrade of Barleyfields Road, between Big Ridge Road and Wood Street. As such it has not been considered in this assessment.

Figure 3–1 Light vehicle access route modification



Source: SCT Consulting; 2019

3.2.3 Construction traffic volume summary

Based on the redistribution of construction traffic **Table 3–2** provides an illustration of traffic volumes across key access routes, during the peak construction period, accounting for the redistribution in construction traffic volumes. The growth, relative to existing baseline traffic volumes, is provided within the provided brackets. The total increase in traffic movements per day is 552.

Table 3–2 Overall traffic volumes (During peak construction)

Time period	Traffic Volume											
	New England Highway (Site 1)			Barleyfields Road (Site 2)			Big Ridge Road – west of Munsies Road (Site 3)			Big Ridge Road – east of Munsies Road (Site 4)		
	NB	SB	Total	NB	SB	Total	EB	WB	Total	EB	WB	Total
6-7AM	182 (+59)	81 (+0)	263 (+59)	10 (+0)	107 (+104)	117 (+104)	106 (+104)	- (+0)	106 (+104)	104 (+104)	- (+0)	104 (+104)
7-8AM	319 (+59)	136 (+3)	455 (+62)	35 (+5)	113 (+104)	148 (+109)	109 (+104)	9 (+5)	118 (+109)	105 (+104)	8 (+5)	113 (+109)
3-4PM	254 (+3)	325 (+59)	579 (+62)	118 (+104)	23 (+5)	141 (+109)	9 (+5)	109 (+104)	118 (+109)	8 (+5)	106 (+104)	114 (+109)
4-5PM	233 (+3)	381 (+59)	614 (+62)	118 (+104)	36 (+5)	154 (+109)	10 (+5)	110 (+104)	120 (+109)	7 (+5)	106 (+104)	113 (+109)
AADT	3,347 (+153)	3,297 (+153)	6,645 (+307)	484 (+276)	487 (+276)	971 (+552)	335 (+276)	336 (+276)	671 (+572)	301 (+276)	305 (+276)	606 (+552)

Source: SCT Consulting; 2019, modified from Matrix; 2019 and EMM Consulting; 2019

3.3 Network assessment

3.3.1 Intersection performance

3.3.1.1 New England Highway / Barleyfields Road (north)

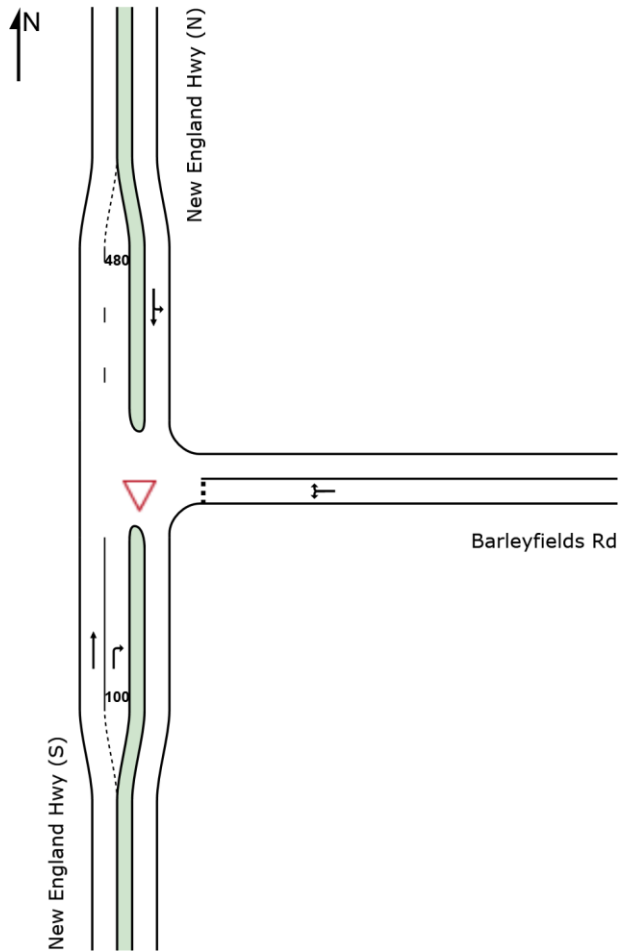
3.3.1.1.1 Geometrical modifications

To support the efficient operation of the intersection, and improve safety outcomes for all road users, the following geometric modifications, shown in **Figure 3–2**, are proposed at the intersection of New England Highway / Barleyfields Road (north):

- Reduction in overtaking lane length for New England Highway (northbound) from 3.3km to 2.3km;
- Provision of dedicated 100m right turn bay for vehicles turning right from the New England Highway to Barleyfields Road (north);
- Provision of 480m dedicated acceleration lane for vehicles turning right from Barleyfields Road (north) to New England Highway; and
- Shoulder widening on the New England Highway (southbound) for 25m on approach to Barleyfields Road (north).

These modifications reduce the risk of rear end and side impact crashes for vehicles using the intersection. They also reduce the conflict between right turning vehicles from Barleyfields Road (north) accessing the New England Highway. This, has the unintended outcome of shortening the potential for queue lengths to occur on Barleyfields Road (north), reducing the likelihood of vehicles queuing across the existing at grade railway crossing.

A copy of strategic design plans for the upgrade is provided in **Appendix B**.

Figure 3–2 Geometric Layout: New England Highway / Barleyfields Road (north)

Source: SCT Consulting; 2019

3.3.1.1.2 Intersection performance

Table 3–2 Error! Reference source not found. documents the AM and PM peak modelling results under the peak traffic generation construction scenario. As with the existing conditions intersection performance assessment LoS A is forecast to occur in both the AM and PM peak hour period. No capacity constraints are evident with the highest DoS increasing slightly from 0.208 to 0.211. This is recorded on the New England Highway (N leg) approach in the PM peak hour period.

During construction the longest 95th percentile queue length on Barleyfields Road (north) is forecast to be 3.5m. i.e. Less than one car length. Modelling there demonstrates that there is no forecast impact on the operation of the level crossing, located approximately 120m back from the Barleyfields Road (north) give way line intersection marking. The primary reason for the minimal increase in queue length is the proposed design of the New England Highway / Barleyfields Road (north) intersection. As noted in **Section 3.3.1.1.1** the design removes the conflict, and associated delay, between right turning vehicles accessing the New England Highway from Barleyfields Road (north).

Table 3–3 Intersection performance: New England Highway / Barleyfields Road (north)

Intersection / Peak*	Vehicles	DoS	Average Delay (sec)	LoS	95% back of queue (m)
AM Peak					
New England Highway (S leg)	371	0.157	8.1	A	1.7
Barleyfields Road north (E leg)	61	0.055	8.8	A	1.3
New England Highway (N leg)	240	0.136	8.0	A	0
Total	672	0.157	8.8	A	1.7

Intersection / Peak*	Vehicles	DoS	Average Delay (sec)	LoS	95% back of queue (m)
PM Peak					
New England Highway (S leg)	217	0.116	11.1	A	<1
Barleyfields Road north (E leg)	155	0.124	8.0	A	3.5
New England Highway (N leg)	373	0.211	8.1	A	0
Total	664	0.211	11.1	A	3.5

* Note: Modelling assessment based on construction traffic volumes outlined within New England Solar Farm Traffic and Transport Assessment (Dated 14 August 2019). This provides a worst case assessment of operating conditions.

Source: SCT Consulting; 2019

3.3.2 Mid-block capacity

A mid-block capacity assessment, based on a worst case construction, was undertaken with results provided in **Table 3–4**. Results indicate that all roads, assessed in this document as being impact by construction vehicles associated with the NESF, will not experience any mid-block capacity constraints and operate primarily at LoS A. Site 4, east of the transition from a sealed to an unsealed alignment, is calculated to operate at LoS C during the peak construction period, a satisfactory and acceptable result.

Table 3–4 Volume / Capacity Ratio Assessment (Construction Assessment)

Time period	Volume / Capacity Ratio*							
	New England Highway (Site 1)		Barleyfields Road (Site 2)		Big Ridge Road – west of Munsies Road (Site 3)		Big Ridge Road – east of Munsies Road (Site 4)	
	NB	SB	NB	SB	EB	WB	EB	WB
6-7AM	0.12	0.07	0.11	0.08	0.17	0.02	0.43	0.06
7-8AM	0.23	0.11	0.16	0.09	0.18	0.03	0.44	0.08
3-4PM	0.19	0.20	0.10	0.13	0.03	0.18	0.07	0.44
4-5PM	0.17	0.26	0.10	0.15	0.03	0.18	0.07	0.44

* Note: Assessment based on construction traffic volumes outlined within New England Solar Farm Traffic and Transport Assessment (Dated 14 August 2019). This provides a worst case assessment of operating conditions.

Source: SCT Consulting; 2019, modified from Matrix; 2019

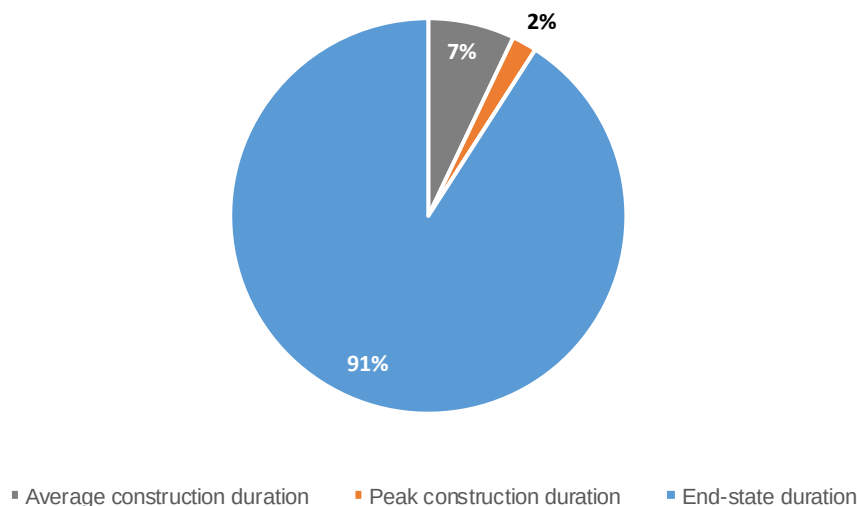
4.0 Mitigation measures (Road width)

The Traffic and Transport Assessment for the NESF EIS, released in November 2018, provided an evaluation of existing road widths against standards relating to the construction and upgrade of rural roads in their end state, or long term, operating capacity.

At present the end state traffic generation for the proposed NESF is only 15 light vehicles (i.e. 30 movements per day). These volumes are minimal in nature and would not necessitate road upgrades. **Figure 4–1** highlights the whole of project life phase duration in percentage terms. The figure demonstrates that, as is currently observed with the AADT profile of the impacted roads, traffic volumes Big Ridge Road and Barleyfields Road will continue to be low volume regional roads at the completion of NESF's construction phase. i.e. Traffic volumes will be approximately 15 light vehicles (30 movements) higher than current levels for 91 per cent of the project's life.

Despite the above UPC recognises the need to ensure safe passage of vehicles to and from the site, and the surrounding road network. Therefore UPC proposes to undertake various upgrades, discussed below, to increase the safety of Barleyfields Road and Big Ridge Road. The majority of these upgrades consider increasing the sealed width component of the carriageway in line with Austroads requirements.

Figure 4–1 NESF: Whole of life overview



Source: SCT Consulting; 2019

4.1 Big Ridge Road

4.1.1 Segment 1: Barleyfields Road to west of Munsies Road (Chainage 0m – 1,150m)

Segment 1 provides the greatest challenge in balancing the impact of construction vehicles on Big Ridge Road whilst providing for the end state use of the road. The segment currently does not conform to Austroads 'Guide to Road Design Part 3: Geometric Design' (2017) standards. Given the AADT of 119 vehicles the available width of between 5 – 5.7m, for the provided sealed two-way road segment, is less than the six metres. Austroads notes this has the potential to increase head-on accidents. This is particularly relevant given the crest which is present at chainage 400m (approx.). As a result the following two options are proposed for discussion with USC.

4.1.1.1 Option 1: Implement temporary traffic control signals

Given the identified width constraints on Segment 1, and general access semi-trailer and b-double widths of 2.5m (excluding mirrors), these vehicles may be unable to pass each other at the narrowest locations where the measured sealed carriageway width is 5m. Sight distance issues are also present due to the crest located at chainage 400m (approx.). The scope for widening the carriageway is also constrained due to the topography of the land surrounding the existing carriageway. This is potentially a contributing factor as to why Segment 1 and Segment 2, discussed below in **Section 4.1.2**, differ in their available sealed width.

Hence Option 1 proposes to introduce temporary traffic control signals during construction hours (6AM – 6PM). This would remove the possibility for two heavy vehicles to meet within the width constrained component of Segment 1.

Whilst signalisation would be present the two-way operation of the road would be maintained within the controlled section to ensure the operational ability of landowner's driveways would not be impacted.

The stopping sight distance for a heavy vehicle travelling at 80km/h is 160m. The installation of temporary traffic signals should ensure that this can be achieved. Temporary signals can be operated as either a:

- Shuttle based system based on pre-determined manual timing inputs. This approach could be used to assist with the traffic flow relating to the forecast uni-directional nature of construction traffic; or
- Vehicle actuated system which involves the detection of vehicles through microwave detection with associated changes in phase length timing.

An overview of the potential locations for the positioning of temporary traffic signals is provided in **Figure 4–2**.

Figure 4–2 Big Ridge Road: Segment 1 (Temporary traffic signal proposal)



Source: SCT Consulting; 2019

In order to further reduce the risk of vehicle conflict the following modifications are proposed:

- Installation of longitudinal markings, in the form of dividing separation lines or dividing barrier lines, in accordance with the Roads and Maritime (2015) Delineation Manual Section 4: Longitudinal Markings. The intent of these works is to provide formal designation of a vehicle's lane.

4.1.1.2 Option 2: Road widening

In the event that temporary traffic signals are not pursued the road width issue within Segment 1, with respect to heavy vehicles, could be addressed through localised widening. Noting the constraints identified above with respect to topography, and Austroads commentary concerning likelihood of road safety incidents with respect to corridor width, it is suggested a minimal sealed width of 7.2m, inclusive of two 0.5m shoulders, be provided. Total carriageway width is recommended as 9.2m.

USC is the roads authority for Big Ridge Road. Given the road does not confirm with relevant Austroads standards it is recommended that a cost apportionment methodology be agreed between USC and UPC to fund these works.

4.1.2 Segment 2: West of Munsies Road to end of sealed carriageway (Chainage 1,150m – 3,850m)

Segment 2 is not proposed to be widened or require immediate civil works to accommodate construction traffic as it meets the sealed width requirements specified in Austroads, noting a negligible difference 0.1-0.2m was observed in various survey locations.

The following minor modifications are proposed to improve safety:

- Installation of longitudinal markings, in the form of dividing separation lines or dividing barrier lines, in accordance with the Roads and Maritime (2015) Delineation Manual Section 4: Longitudinal Markings. The intent of these works is to provide formal designation of a vehicle's lane; and
- Formalisation of the Munsies Road / Big Ridge Road intersection through provision of give way signage and associated line marking on Munsies Road.

4.1.3 Segment 3: End of sealed carriageway to Mount Lydia (Chainage 3,850m – 6,610m)

Segment 3 currently consists of a formalised, unsealed road alignment with an existing AADT, based on surveys, of approximately 55 vehicles. This is extremely likely to be overestimated given the survey location is near the intersection of Big Ridge Road / Munsies Road and there are only seven property owners beyond the commenced of the unsealed section of Big Ridge Road.

4.1.3.1 Option 1: End-state requirement

Within Segment 3 one proposed option is to adopt an end state sealed traffic lane width of 3.7m with two 2.5m unsealed shoulders. This aligns with the end state traffic generation of 30 vehicles, equating to an AADT (based on likely overestimation of segment traffic volumes) of approximately 85 vehicles. Consistency with the 7.2m road width proposed in Segment 1 and Segment 2 is maintained.

The proposed road width is considered acceptable during the construction period due to:

- The uni-directional nature of construction traffic;
- Peak construction period being limited to eight months;
- Ability to control traffic movements through a detailed management plan pertaining to heavy vehicle access / egress; and
- Likely overestimation of existing traffic volumes.

Between the hours of 6-7AM and 7-8AM, during peak light vehicle construction worker access, a total of 104 and 109 vehicles, respectively, are forecast to travel eastbound on Big Ridge Road. Within the 6-7AM and 7-8AM time period this traffic is forecast to be opposed by zero and four westbound vehicles, respectively. The PM peak provides an inversed distribution of the AM peak. A breakdown of vehicle type and direction of travel is provided in **Table 4–1**.

Table 4–1 Segment 3 – Traffic distribution / opposing vehicle movements (Peak construction period)

Vehicle Category	Direction of travel							
	Eastbound (towards site)				Westbound (towards Uralla)			
	6-7AM	7-8AM	3-4PM	4-5PM	6-7AM	7-8AM	3-4PM	4-5PM
Existing traffic (light vehicles)	-	5	4	5	-	4	5	6
Construction traffic (light vehicles)	99	99	-	-	-	-	99	99
Construction traffic (heavy vehicles)	5	5	5	5	-	5	5	5
Total	104	109	9	9	-	9	109	110

Source: SCT Consulting; 2019, modified from EMM; 2019 and Matrix; 2019

Furthermore, sight distance on Segment 3 is excellent with vehicles having long sight lines to observe oncoming vehicles. Notwithstanding this it is recommended that to enhance the safety of Big Ridge Road within Segment 3:

- The width of sealed road surface is extended to 7.2m (two 3.1m traffic lanes and two 0.5m sealed shoulders) between chainage 4,800m and 5,600m. Total carriageway width is recommended as 9.2m. This will ensure that

potential sight distance issues pertaining to the proposed width and alignment of Big Ridge Road are removed. Based on this recommendation the total length of Segment 3 with a sealed carriageway width of 3.7m and unsealed shoulder width of 2.5m (5m total) is approximately 2km.

- Installation of longitudinal markings, in the form of dividing separation lines or dividing barrier lines, in accordance with the Roads and Maritime (2015) Delineation Manual Section 4: Longitudinal Markings be provided between chainage 4,800 and 5,600m. The intent of these works is to provide formal designation of a vehicle's lane on approach and departure to the identified sight distance constraints.

4.1.3.2 Option 2: Intermediate requirement

An alternate option is to place greater emphasis on the immediate function of Segment 3, that of supporting construction traffic during the three-year construction period. To achieve this objective the remaining 2km of unsealed road detailed in Option 1 is proposed to be widened to a sealed width of 7.2m (two 3.1m traffic lanes, two 0.5m sealed shoulders). Total carriageway width is recommended as 9.2m. The benefit of providing the increased sealed width would be:

- Heavy vehicles would not be required to traverse the edge of the sealed pavement to pass oncoming traffic. This would provide greater pavement life during the construction period, minimising possible road repairs which may impact on the construction delivery program. Prior to making a determination on the preferred option it is recommended that UPC undertake some strategic cost estimation to evaluate the cost of potentially requiring additional road repairs for Option 1, compared to Option 2, over a three year construction period.
- Speed for access vehicles would be increased, particularly during the peak hours of the peak construction period, as vehicles would not be required to straddle the sealed and unsealed sections of road when passing oncoming traffic.

4.1.4 Segment 4: Mount Lydia to end of Big Ride Road (Chainage 6,610m – 8,800m)

Segment 4 of Big Ridge Road is currently an unformed, unsealed track with no property accesses. It is not of sufficient form to support the proposed construction vehicle types and requires upgrading. As stated above traffic generation for Segment 4 is minimal with no property access provided on a dead-end road. Three options are provided for consideration by UPC:

4.1.4.1 Option 1: End-state requirement

It is proposed to adopt an end state traffic lane width of 3.7m with two 2.5m unsealed shoulders. This would support the end state traffic generation of 30 vehicles, likely to be AADT for this segment whilst also reducing the long-term maintenance requirements of the road segment. The rationale for this design solution being acceptable is outlined in **Section 4.1.3.1**.

4.1.4.2 Option 2: Intermediate requirement

An alternate option is to place greater emphasis on the immediate function of Segment 3, that of supporting construction traffic during the three-year construction period. To achieve this objective Segment 4 is proposed to be widened to a sealed width of 7.2m (two 3.1m traffic lanes and two 0.5m sealed shoulders). Total carriageway width is recommended as 9.2m. The benefit of providing the increased sealed width is outlined above in **Section 4.1.3.2**.

4.1.4.3 Option 3: Do minimum

Lastly, given the minimal end-state traffic volumes and short-term construction period, Option 3 proposes to provide a formalised 8.7m unsealed carriageway. Consideration of the impact of heavy vehicles on the unsealed carriageway is recommended during detail design to establish the short term maintenance impact.

4.1.5 Additional recommendations (General)

The following proposals are provided for UPC for consideration regarding increased safety outcomes on the Big Ridge Road alignment:

- Install guidance signage (**Figure 4–3**) along the Big Ridge Road alignment advising motorists to ‘Reduce Speed to Conditions’ (Sign: G9-318-1).

Figure 4–3 Reduce speed to conditions sign

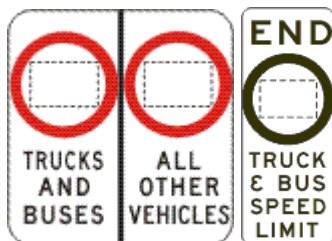


Source: Roads and Maritime; 2019

- Introduce a 50km/h restricted speed limit, for heavy vehicles due to the lower quality rural road environment on Big Ridge Road. Representation can be made to Roads and Maritime regarding a formal approval of a speed zone change and installation of truck and bus speed zone (R4-246) and end truck and bus speed limit (R4-220) signage. All speed zoning changes must be approved by Roads and Maritime.

In the event Roads and Maritime did not support the position of Roads and Maritime any traffic management plans, produced to support the construction of NESF, could nominate to drivers a speed limit for heavy vehicles to maintain

Figure 4–4 Truck and bus speed zone signage



Source: Roads and Maritime; 2019

4.2 Barleyfields Road

Barleyfields Road is a sealed two-lane two-way road which runs parallel to the New England Highway, providing access to various residential properties and local access roads. The carriageway, as identified within **Section 2.2**, currently does not conform to the sealed traffic lane width standards outlined within Austroads (2017) ‘*Guide to Road Design Part 3: Geometric Design*’ with a surveyed width of 5.8m. A minimum traffic lane width (two lanes) of 6.2m with two shoulders of 1.5m (0.5m sealed), is highlighted within Austroads documentation.

Barleyfields Road, to the north of Big Ridge Road, is forecast to cater for an additional daily 552 vehicle movements (440 light construction vehicles | 112 heavy construction vehicles) during the peak construction period.

Due to the lack of sealed road shoulder, and combination of existing sight distance constraints and introduction of heavy vehicles, the current observed width of 5.8m on Barleyfields Road north of Big Ridge Road is not considered satisfactory. To address this concern it is proposed to increase the sealed width of Barleyfields Road to a minimum of 7.2m (2 X 3.1m trafficable lanes + 2 X 0.5m sealed shoulder). Total carriageway width is recommended as 9.2m. The total length of this upgrade is approximately 1.4km.

In addition to the above proposal the following minor modifications are proposed to further improve safety:

- Installation of longitudinal markings, in the form of dividing separation lines or dividing barrier lines, in accordance with the Roads and Maritime (2015) Delineation Manual Section 4: Longitudinal Markings. The intent of these works is to provide formal designation of a vehicle’s lane.

- Install guidance signage (**Figure 4–3**) along the Big Ridge Road alignment advising motorists to ‘Reduce Speed to Conditions’ (Sign: G9-318-1).
- Widen the Barleyfields Road / Big Ridge Road intersection footprint to cater for the swept path of the largest design vehicle anticipated, a B-double. A copy of the strategic design is provided in **Appendix B**;

Given the current state of the road and non-conformance with existing design requirements it is recommended that a cost apportionment methodology for the works be determined between USC, as the roads authority, and UPC.

4.3 Summary

As noted above, the road widening proposals outlined in Section 4 have been designed to meet and / or exceed the end-state requirements of the NESF. These proposals have also been balanced against the construction traffic increase on Barleyfields Road and Big Ridge Road. **Table 4–2** provides a summary of the projected end state AADT for the abovementioned roads, overlaid against conformance of each proposed upgrade option against the sealed widths within Austroads (2017) document ‘*Guide to Road Design Part 3: Geometric Design*’.

Table 4–2 End-state requirements

Road	AADT (End-state)	AADT (Peak Construction)	Option	Proposed sealed width (inclusive of shoulders)	Austroads sealed width conformance (End-state)
Barleyfields Road	459	971	-	7.2m (Carriageway 9.2m)	✓
Big Ridge Road (Segment 1)	149	671	1	N/A – Retain existing and utilise management	×
			2	7.2m (Carriageway 9.2m)	✓
Big Ridge Road (Segment 2)	84	606	-	No works – retain current sealed width	✓ (Negligible discrepancy)
Big Ridge Road (Segment 3)	84*	606	1	Provide sealed width of 3.7m / unsealed 5m shoulder (Carriageway 9.2m)	×
			2	7.2m (Carriageway 9.2m)	✓
Big Ridge Road (Segment 4)	84*	606	1	Provide sealed width of 3.7m / unsealed 5m shoulder (Carriageway 8.7m)	×
			2	7.2m (Carriageway 9.2m)	✓
			3	N/A	-

Source: SCT Consulting; 2019

APPENDIX A

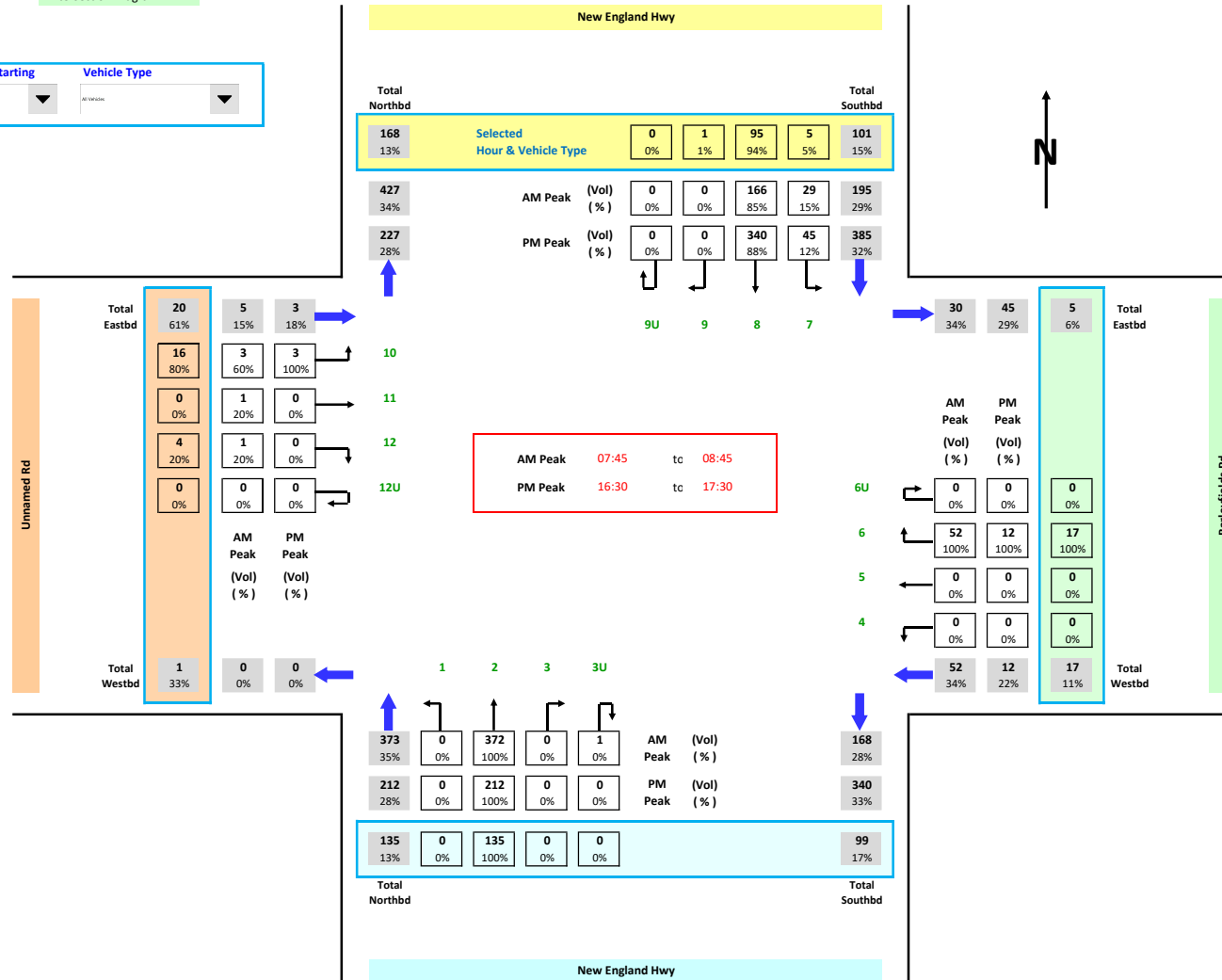
Traffic Survey

Job No. : N4993
Client : SCT
Suburb : Uralla
Location : 1. New England Hwy / Barleyfields Rd

Day/Date : Tue, 14th May 2019
Weather : Fine
Description : Classified Intersection Count
Intersection Diagram



Hour Starting Vehicle Type

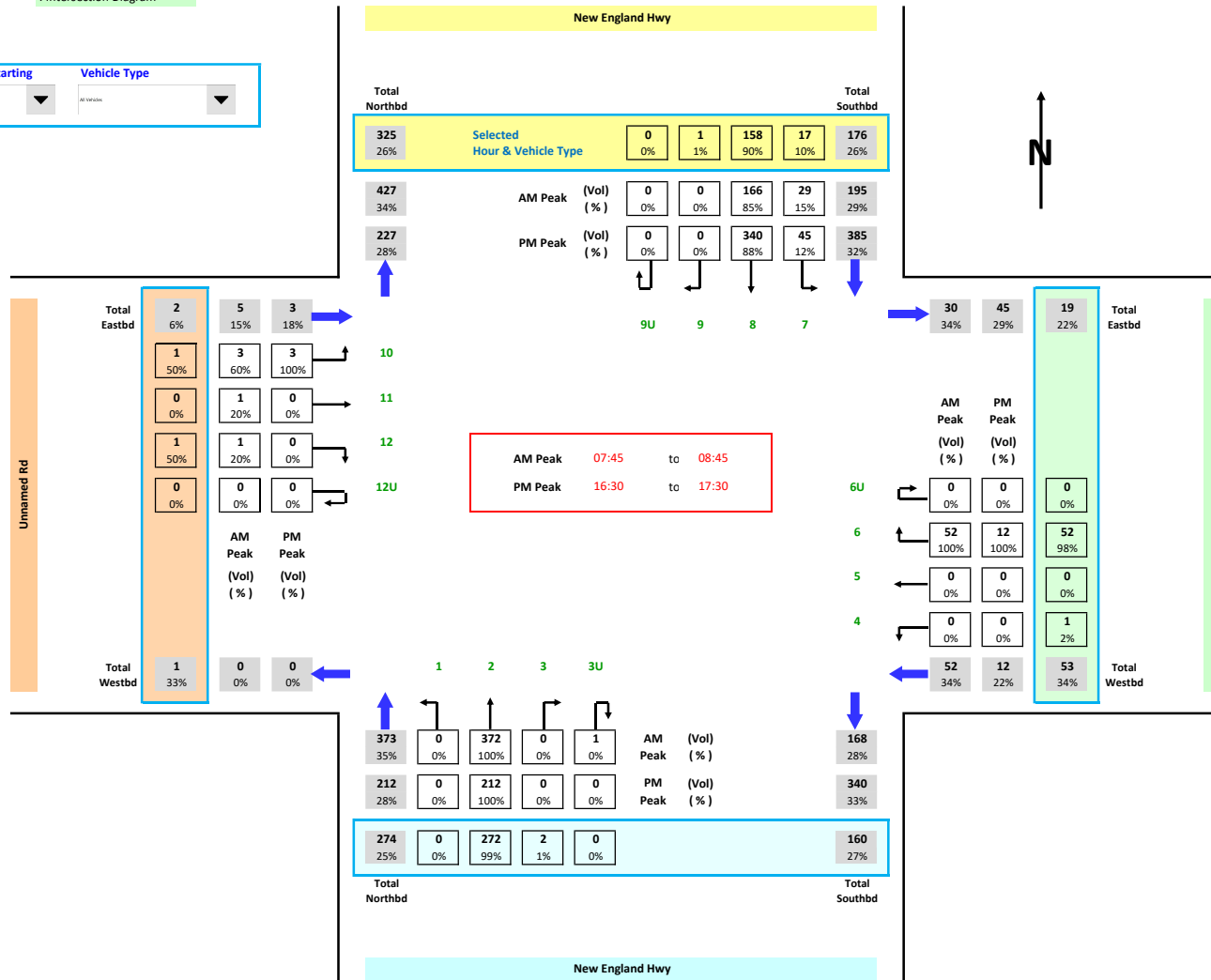


Job No. : N4993
Client : SCT
Suburb : Uralla
Location : 1. New England Hwy / Barleyfields Rd

Day/Date : Tue, 14th May 2019
Weather : Fine
Description : Classified Intersection Count
: Intersection Diagram



Hour Starting Vehicle Type

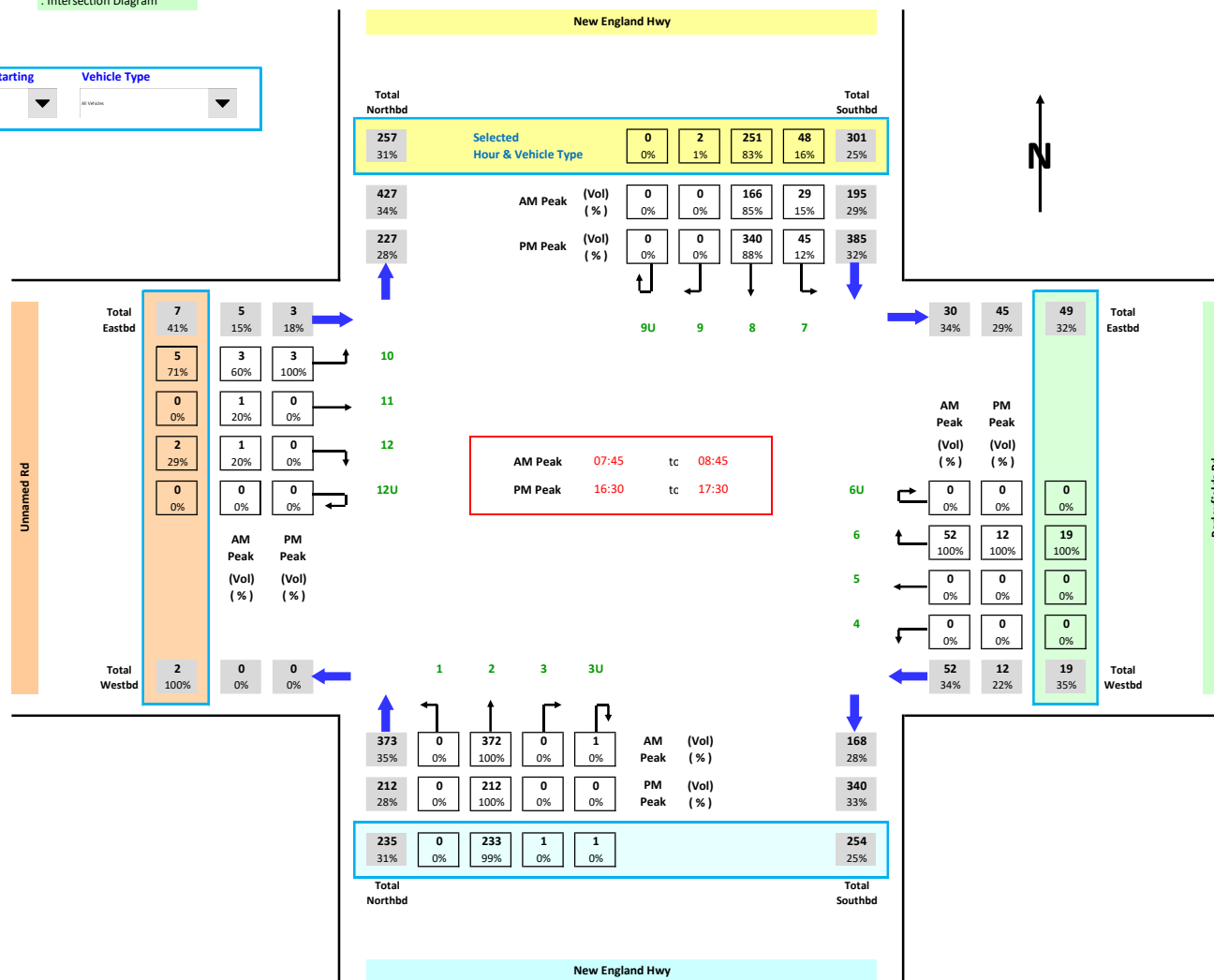


Job No. : N4993
Client : SCT
Suburb : Uralla
Location : 1. New England Hwy / Barleyfields Rd

Day/Date : Tue, 14th May 2019
Weather : Fine
Description : Classified Intersection Count
Intersection Diagram



Hour Starting Vehicle Type

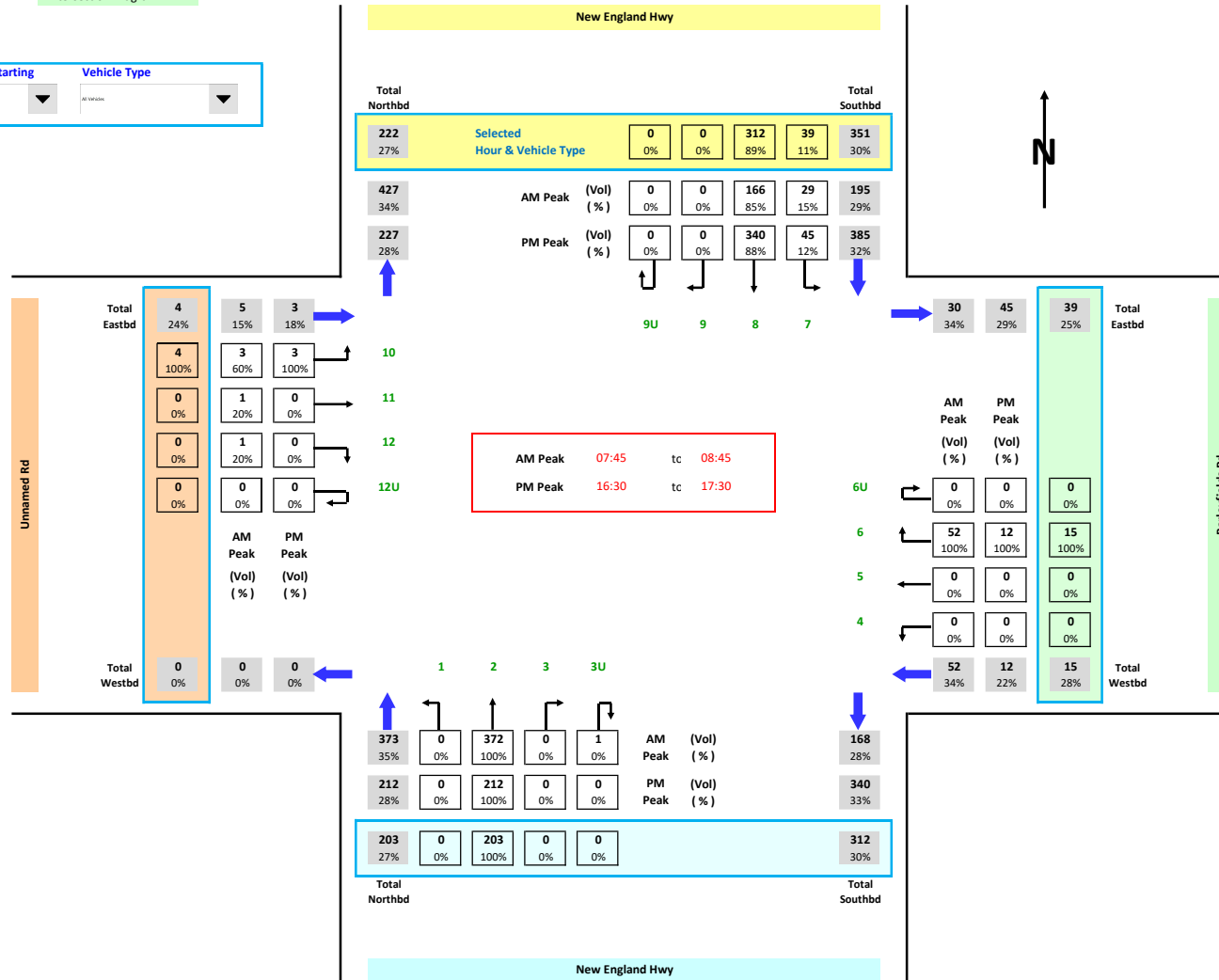


Job No. : N4993
Client : SCT
Suburb : Uralla
Location : 1. New England Hwy / Barleyfields Rd

Day/Date : Tue, 14th May 2019
Weather : Fine
Description : Classified Intersection Count
Intersection Diagram



Hour Starting Vehicle Type

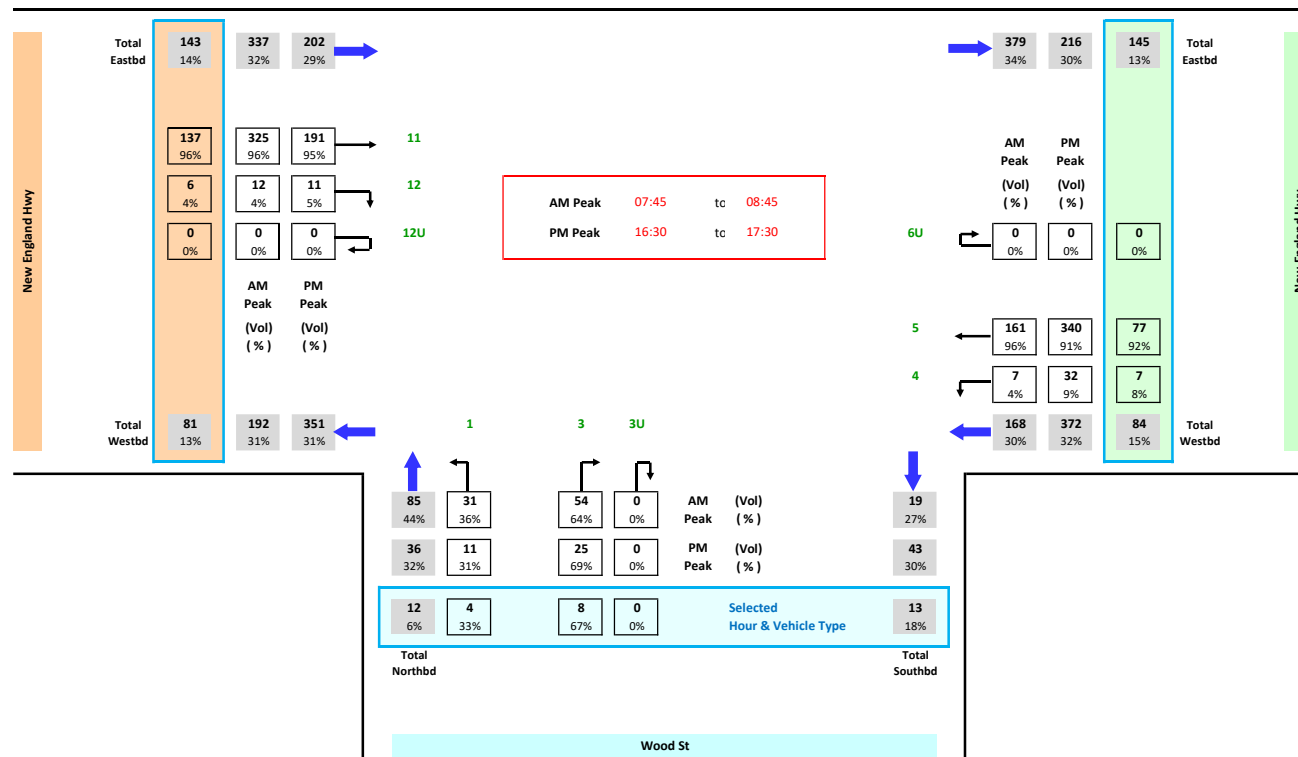


Job No. : N4993
Client : SCT
Suburb : Uralla
Location : 2A, New England Hwy / Wood St

Day/Date : Tue, 14th May 2019
Weather : Fine
Description : Classified Intersection Count
Intersection Diagram



Hour Starting: 06:00
Vehicle Type: All Vehicles

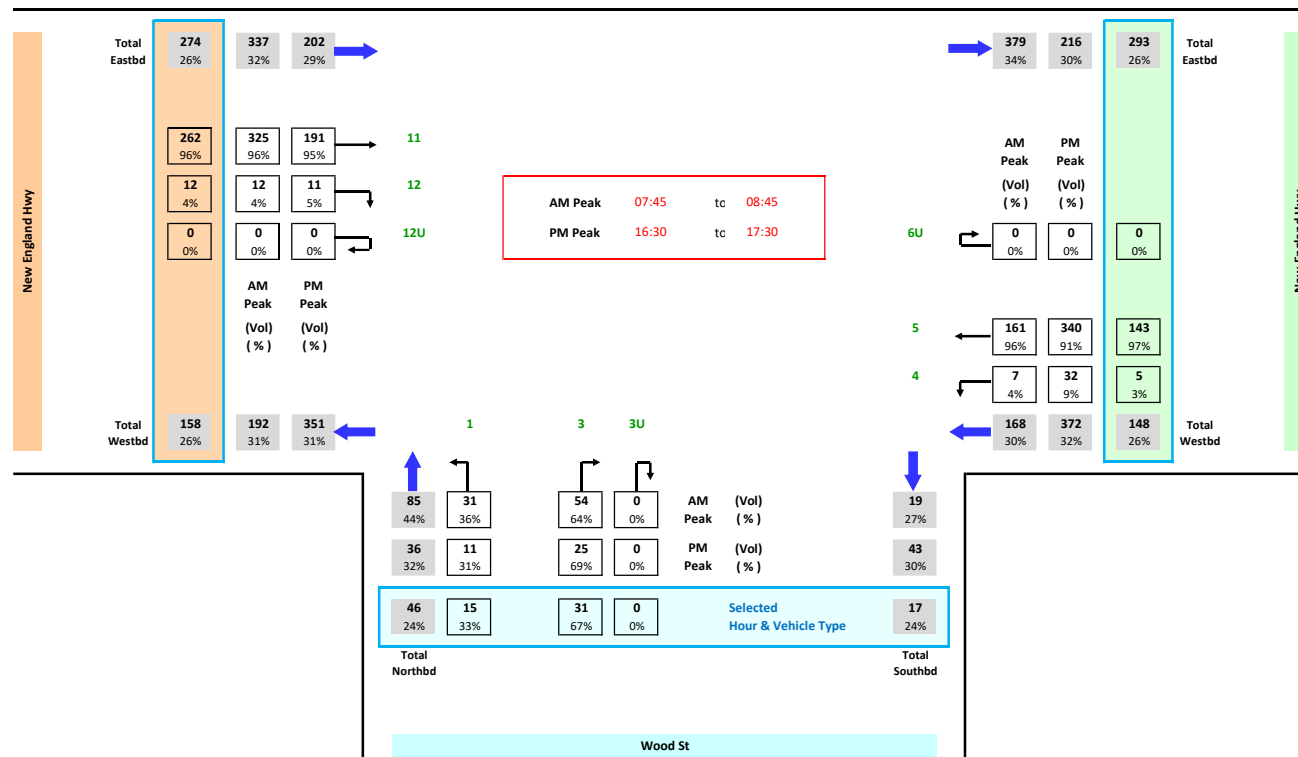


Job No. : N4993
Client : SCT
Suburb : Uralla
Location : 2A, New England Hwy / Wood St

Day/Date : Tue, 14th May 2019
Weather : Fine
Description : Classified Intersection Count
Intersection Diagram



Hour Starting: 07:00
Vehicle Type: All Vehicles

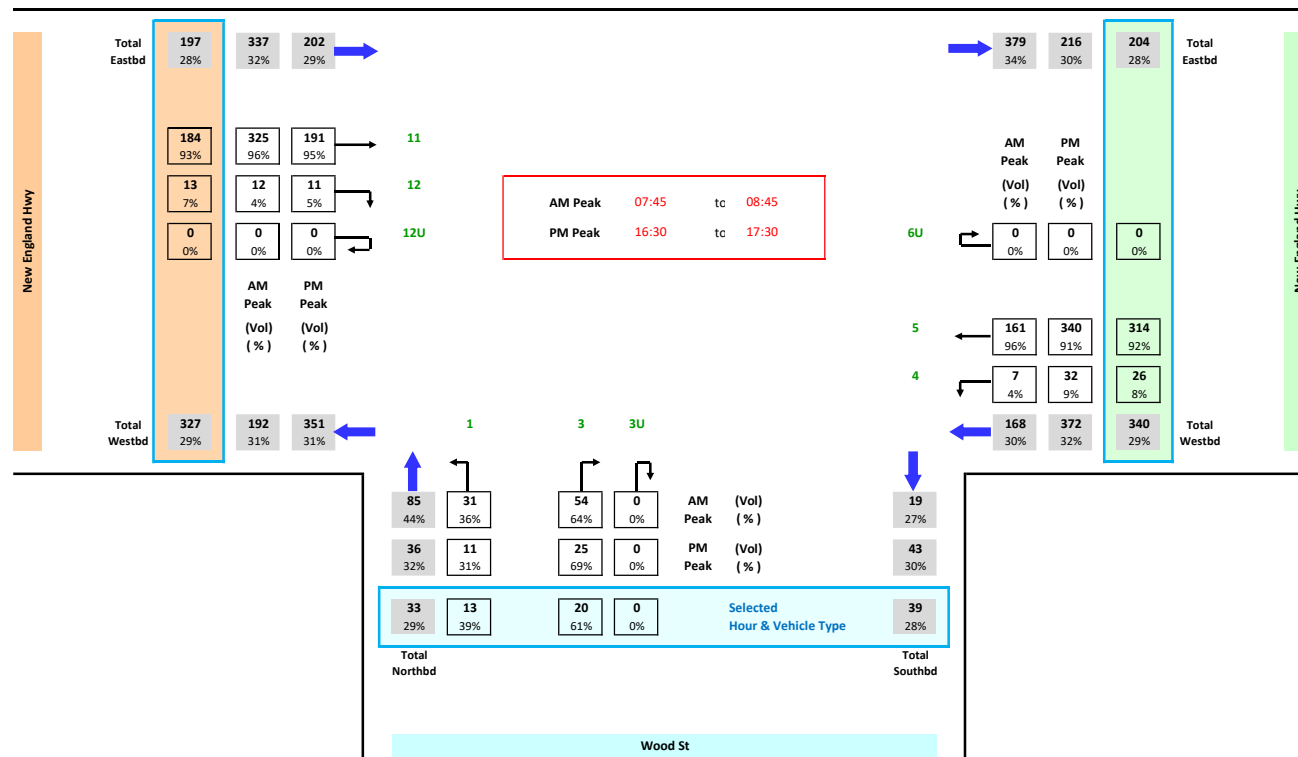


Job No. : N4993
Client : SCT
Suburb : Uralla
Location : 2A, New England Hwy / Wood St

Day/Date : Tue, 14th May 2019
Weather : Fine
Description : Classified Intersection Count
Intersection Diagram



Hour Starting: 15:00
Vehicle Type: All Vehicles

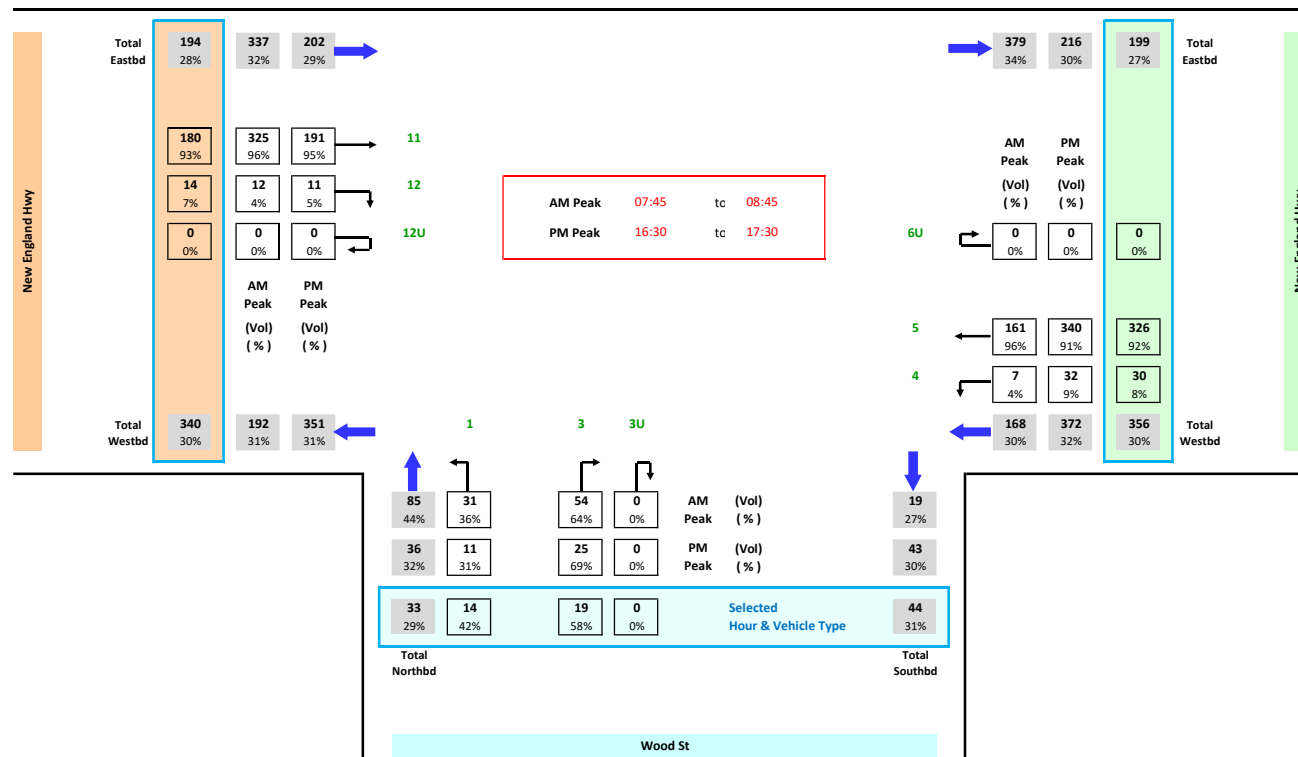


Job No. : N4993
Client : SCT
Suburb : Uralla
Location : 2A, New England Hwy / Wood St

Day/Date : Tue, 14th May 2019
Weather : Fine
Description : Classified Intersection Count
Intersection Diagram



Hour Starting: 16:00
Vehicle Type: All Vehicles



APPENDIX B

Strategic Design



Appendix B

Biodiversity development assessment report addendum

New England Solar Farm

Biodiversity development assessment report - Addendum

Prepared for UPC Renewables Australia Pty Ltd
September 2019



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New England Solar Farm

Biodiversity development assessment report - Addendum

Report Number

J17300 RP 1

Client

UPC Renewables Australia Pty Ltd

Date

12 September 2019

Version

v1 Final

Prepared by



Eugene Dodd

Senior Ecologist

12 September 2019

Approved by



Claire Burnes

Associate - Environmental Engineer

12 September 2019

This report has been prepared in accordance with the brief provided by the client and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of the client and no responsibility will be taken for its use by other parties. The client may, at its discretion, use the report to inform regulators and the public.

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1 Introduction

1.1 Project overview

UPC Renewables Australia Pty Ltd (UPC) proposes to develop the New England Solar Farm; a significant grid-connected solar farm and battery energy storage system (BESS) along with associated infrastructure, approximately 6 kilometres (km) east of the township of Uralla, which lies approximately 19 km south of Armidale in the Uralla Shire local government area (LGA) (the project).

The project is classed as State Significant Development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). A development application (DA) and environmental impact statement (EIS) was submitted under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The DA and EIS for the project were publicly exhibited from 20 February to 20 March 2019.

As part of the EIS, EMM Consulting Pty Limited (EMM) prepared a biodiversity development assessment report (BDAR) (Appendix C of the EIS) and a summary of the project's potential impacts on biodiversity was included in Section 5.2 of the EIS.

Following public exhibition of the DA and EIS, two additional reports have been submitted to the NSW Department of Planning, Industry and Environment (DPIE), namely:

- a response to submissions (RTS) report, responding to the matters raised in the regulatory and public submissions provided during the public exhibition period of the EIS; and
- an amendment report (AR), providing a description of the additional project refinements and changes that have been made since the public exhibition of the EIS.

Since the submission of the RTS and AR, UPC has continued discussions with DPIE, NSW Roads and Maritime Services (RMS) and Uralla Shire Council in relation to potential road upgrades and intersection improvements that may be required to facilitate the safe movement of vehicles between the New England Highway and the development footprint for the project. As part of these discussions, the following roads and intersections have been identified as requiring additional works:

- intersection of New England Highway and Barleyfields Road;
- Barleyfields Road (north of the intersection with Big Ridge Road);
- intersection of Big Ridge Road and Barleyfields Road; and
- Big Ridge Road.

In their request for additional information (dated 2 August 2019), DPIE requested that UPC provide a schedule of the proposed road upgrade works, developed in consultation with Uralla Shire Council, and an assessment of the impacts of the upgrades.

UPC has engaged SCT Consulting PTY LTD (SCT) to identify suitable designs for the proposed road upgrades and intersection improvements. The proposed designs are likely to result in additional surface disturbance activities that were not assessed as part of the EIS and supporting BDAR. Subsequently, this addendum to the BDAR has been prepared to consider potential impacts to biodiversity as a result of the proposed additional works and identify appropriate mitigation and management measures, where required. The proposed road upgrades and intersection improvements are referred to hereafter collectively as the road upgrades.

In addition; as acknowledged in Section 2.4.4 of the AR, UPC has been considering potential use of the Main Northern Railway line for delivery of construction materials and project infrastructure. To facilitate this, part of Lot 2 of DP 982376 (within the rail corridor) may be required for a temporary hardstand area (hardstand), which would facilitate safe and efficient use of a mobile forklift, reach stacker or similar during unloading activities.

This addendum also considers potential impacts to biodiversity as a result of the construction and use of the temporary hardstand area during construction.

For the purposes of this report, the potential disturbance areas associated with both the road upgrades and the hardstand are collectively referred to as the subject land. The subject land considered as part of this addendum does not include the development site that was considered as part of the BDAR.

1.2 Purpose of this report

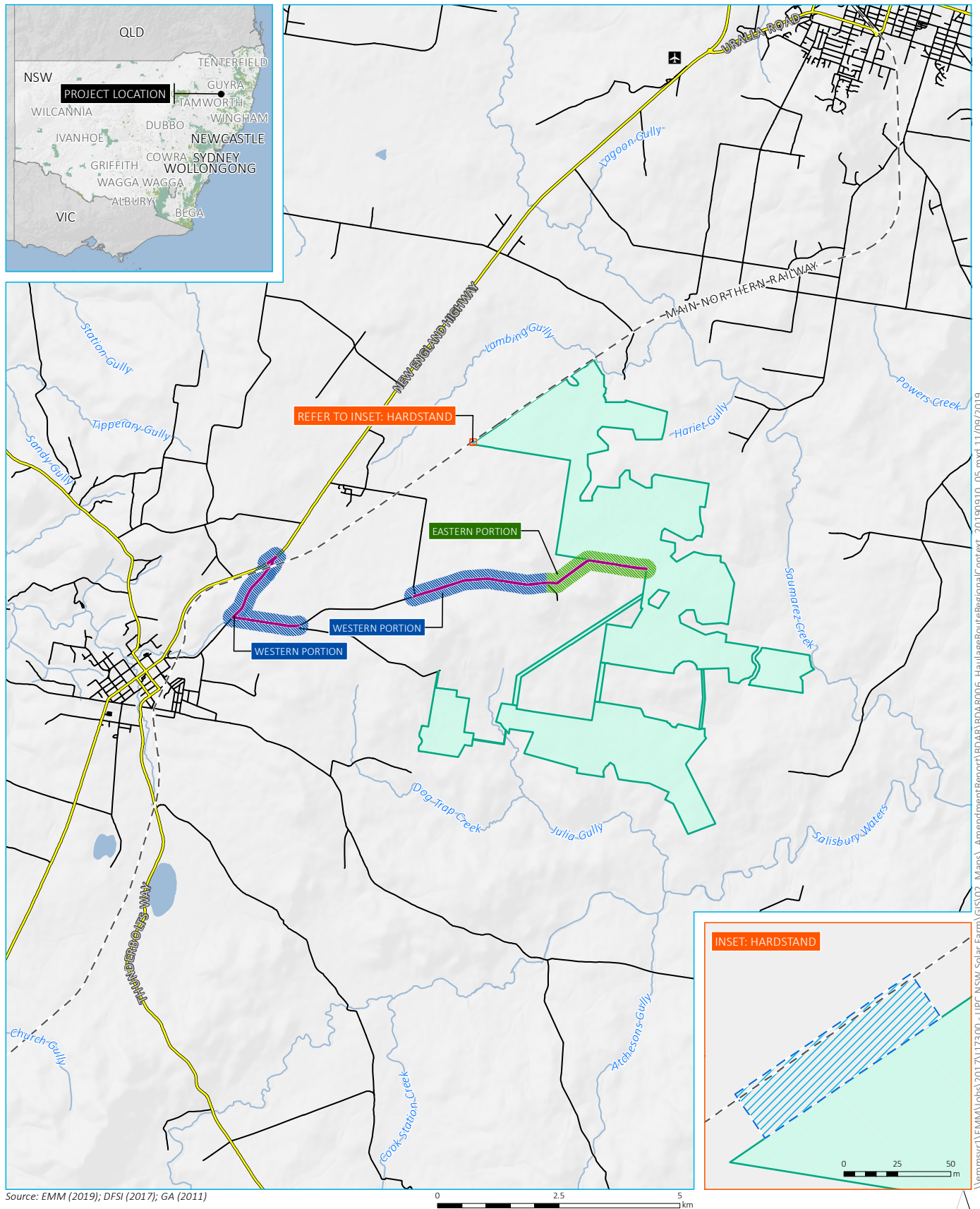
EMM has prepared this addendum to the BDAR to:

- satisfy the requirements of the Biodiversity Assessment Method (OEH 2017); and
- provide an updated impact assessment and management measures in response to the findings of the additional biodiversity investigations.

This addendum to the BDAR addresses DPIE's request for information (dated 2 August 2019), which requested an assessment of the impacts associated with the proposed road upgrades and activities within the rail corridor for the Main Northern Railway line.

For the purposes of this assessment, a conservative approach has been taken to facilitate the progression of the project through the approval process. This includes an assumption that, where present within the road upgrade disturbance boundary, native vegetation is at benchmark condition. Detailed biometric plots to ascertain the condition of the vegetation could not be undertaken due to inappropriate seasonal timing. Several threatened species have also been assumed present for this reason.

UPC may wish to conduct further assessments including biometric plots and targeted species surveys during the appropriate seasons and in accordance with the BAM (OEH 2017). It is likely that these further assessments will reduce the number of ecosystem credits and species credits required to offset impacts within the subject land. UPC will continue to liaise with DPIE during the assessment process should further assessments be undertaken and credit requirements change.



KEY

- | | |
|---|---|
| Road upgrade disturbance boundary | Waterbody |
| Development site | NPWS reserve (refer to inset) |
| Hardstand | State forest (refer to inset) |
| Airport | Disturbance boundary portion |
| Rail line | Western portion |
| Main road | Eastern portion |
| Local road | |
| Watercourse | |

Project locality

New England Solar Farm
Biodiversity development assessment
report addendum
Figure 1.1

Landscape assessment

The identification of landscape features within the subject land was determined using Section 4 of the BAM (OEH 2017), as summarised within this chapter. This section of the report provides an update to the description of landscape features provided in Chapter 3 of the BDAR (Appendix C of the EIS).

1.3 Subject land

The detailed design for the proposed road upgrades has not been finalised and therefore a conservative approach has been undertaken to define the road upgrade disturbance boundary. A 10 m disturbance area has been assumed for the length of the proposed road upgrades (refer Figure 1.1).

At two intersections (ie Barleyfields Road (north)/New England Highway and Barleyfields Road/Big Ridge Road), the width of disturbance has been increased to facilitate intersection improvement works.

The assessed road upgrade disturbance boundary is shown on the figures presented in Appendix A.

The existing roads/tracks and any maintained vegetation on either side of these have been excluded from the impact assessment presented in Chapter 5. The maintained (ie cleared vegetation) either side of the existing road was verified via measurement in the field and via interpretation of aerial imagery.

The hardstand area is a discrete area, with the entire area assumed to be impacted.

1.4 Bioregion and landscapes

The bioregion and subregion remain unchanged for the subject land and comprise the New England Tablelands IBRA Bioregion and the Armidale Plateau IBRA subregion. A total of three Mitchell landscapes intersect with the subject land, including:

- Moonbi - Walcha Granites;
- Niangala Plateau and Slopes; and
- Uralla Basalts and Sands.

For the purposes of consistency with the BDAR, the Moonbi - Walcha Granites Mitchell landscape was selected; however, the Uralla Basalts and Sands Mitchell landscape is most prevalent within the subject land (refer Figure 1.1).

1.5 Waterways and wetlands

The subject land is within part of the Macleay catchment as described in the BDAR. The road upgrade disturbance area intersects several mapped watercourses categorised in accordance with Strahler categorisation, including;

- one third order watercourse;
- three second order watercourses; and
- seven first order watercourses.

All of the mapped watercourses were inspected during the assessment. No aquatic habitat or watercourses were recorded within the subject land. The watercourses are likely to be historical and mapped prior to modification by surrounding agricultural practices. This is consistent with the development site with watercourses being highly modified and in many cases undiscernible owing to multiple dams and retention banks. Whilst no wetlands occur within the subject land, Barleyfields Lagoon is approximately 50 m south of Barleyfields Road, close to the existing level crossing on the Main Northern Railway Line (refer Figure 1.1). The lagoon is ephemeral, typically existing in a dry state.

1.6 Connectivity

The proposed hardstand is situated in an already cleared area. Therefore, development within this area will have no impacts on connectivity.

The proposed road upgrades have potential to remove up to 0.34 hectares (ha) of woodland. The assessed road upgrade disturbance boundary (refer Appendix A), is based on a 10 m disturbance width for the majority of the route, with the exception of intersections, where greater widths may be required. Taking into account the existing carriageways and any maintained vegetation on either side, the actual vegetation removal is limited to narrow strips either side of the existing carriageways.

Given that a very narrow strip of vegetation will be removed, impacts to connectivity are considered negligible, especially when considering the presence of the existing roads. The increased road width is unlikely to significantly change the ability of species to move between either side of the road or in the wider landscape.

1.7 Areas of geological significance and soil hazard features

The subject land does not contain karst, caves, crevices, cliffs or other areas of geological significance. Similarly, there are no soil hazard features that occur within the subject land or buffer area.

1.8 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value, as declared by the Minister, within the subject land.

1.9 Assessment of site context

Site context has been assessed in accordance with Section 4.3 of BAM (OEH 2017) for site-based developments.

1.10 Native vegetation extent

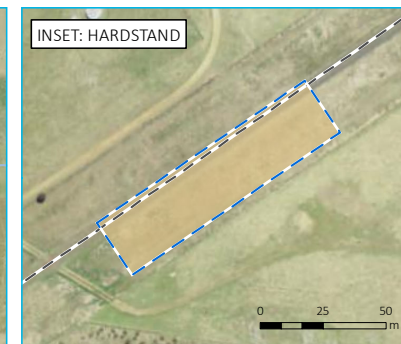
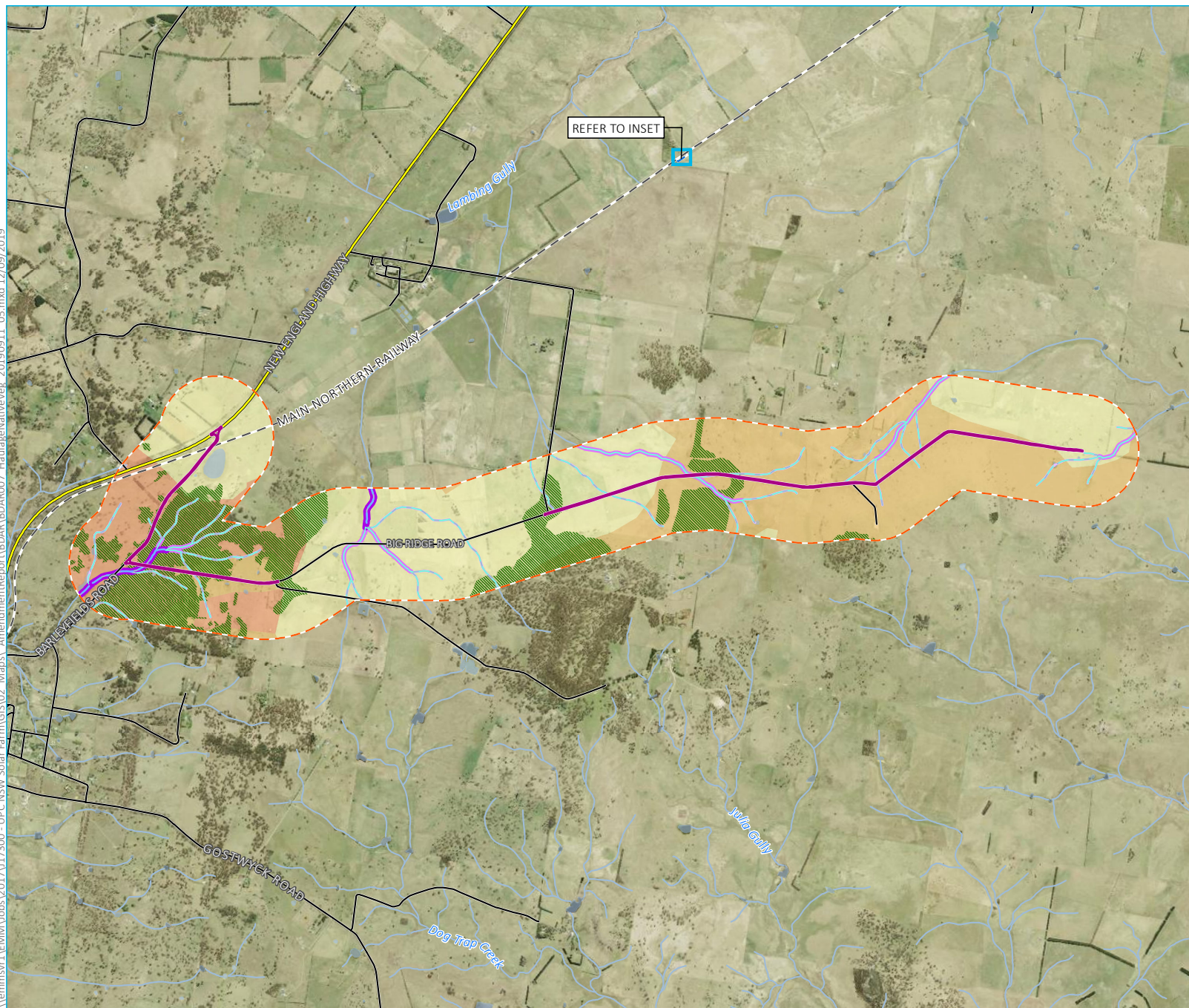
Mapping of native vegetation within a 500 m buffer of the subject land (linear assessment) was undertaken using the Northern River Catchment Management Authority Native Vegetation Mapping (VIS map 524) and Border Rivers Gwydir / Namoi Region Version 2.0. (VIS map 4467 www.data.nsw.gov.au).

Regional mapping of plant community types (PCTs) within the 500 m buffer includes:

- Broad-leaved Stringybark;
- New England Stringybark – Peppermint;
- Yellow Box-Blakely's Red Gum;
- Yellow Box-Broad-leaved Stringybark; and
- candidate native grasslands;

The native vegetation extent (mapped by EMM) within the road upgrade disturbance area is 0.58 ha. When combined with the 500 m buffer, the native vegetation extent is 208.10 ha (refer to Figure 1.2). Given that the combined area of the road upgrade disturbance area and the 500 m buffer is 1,098.10 ha, the percentage of native vegetation cover is estimated to be approximately 19 %.

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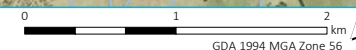
- KEY**
- Road upgrade disturbance boundary
 - 500 m buffer
 - Hardstand
 - Native vegetation
 - Main road
 - Local road
 - Watercourse/drainage line
 - Waterbody
 - Stream line order
 - 1st order
 - 2nd order
 - 3rd order
 - Riparian buffer
 - 10 m
 - 20 m
 - 30 m
 - Mitchell landscape
 - Moonbi - Walcha Granites
 - Niangala Plateau and slopes
 - Uralla Basalts and sands

Native vegetation extent

New England Solar Farm
Biodiversity development assessment
report addendum
Figure 1.2



Source: EMM (2019); DFSI (2017); GA (2011); DPI (2019); OEH (2015)



2 Native vegetation

This section provides an update on the description of native vegetation provided in Chapter 4 of the BDAR (Appendix C of the EIS). This section also provides additional consideration of the identification of PCTs and vegetation zones within the subject land, where this differs from the development site.

2.1 Methods

The eastern portion of Big Ridge Road (approximately 2.4 km) and the hardstand area were assessed as part of the BDAR (refer to Section 4.3 of Appendix C of the EIS). Data from the BDAR has been used to assess the vegetation condition along this particular section of Big Ridge Road and the hardstand area. Vegetation integrity was assessed using previously collected BAM plot data.

The remainder of the road upgrade disturbance area was not assessed as part of the BDAR. Additional field surveys were required to verify vegetation condition in this area.

Vegetation mapping and habitat assessment for threatened species was undertaken on 12 and 13 August 2019. A significant part of the road upgrade disturbance area was traversed on foot, with the remainder viewed from vehicle, with vegetation mapped and aligned with NSW PCTs (refer to Appendix A). These PCTs were stratified into vegetation zones based on their broad condition state and grouped according to their quality and levels of disturbance.

The winter timing of the vegetation mapping was not conducive to collecting plot data, given that many groundcover species were not detectable or identifiable at this time. Furthermore, the current drought and recent grazing pressure within the road upgrade disturbance area, further reduced the validity of conducting plots.

In lieu of the lack of plot data to calculate vegetation integrity scores for the western portion of the road upgrade disturbance area, benchmark data for the identified PCTs was used. Whilst this is likely to have resulted in an overestimation of vegetation integrity (as the vegetation is likely to be below benchmark condition), this approach was taken to allow for the timely completion of this report.

2.2 Results

2.2.1 Vegetation description

For the purposes of describing vegetation condition, the road upgrade disturbance area has been divided into the western and eastern portion as shown on Figure 1.2.

The hardstand area and vegetation within the eastern portion of Big Ridge Road was consistent with the vegetation description provided in the BDAR for vegetation within the development site.

The vegetation along the remainder of the road upgrade disturbance area (ie western portion of Big Ridge Road and Barleyfields Road (north)) is typically in higher condition than the vegetation within the development site. The woodlands generally contain a higher coverage of canopy species with a native midstory, inclusive of regenerating canopy species. The groundcover is variable with a mixture of native and exotic species. Grassland areas consist of low diversity native grassland through to areas of exotic grassland with few native species.

Key disturbances within the subject land include invasion of pasture species from adjacent farmland, clearing associated with road and rail maintenance and grazing associated with travelling stock.

2.2.2 Plant community types and vegetation zones

Site investigations identified the presence of two PCTs within the subject land (refer to Appendix A). The PCT, vegetation formation and vegetation class (Keith 2004) are described within Table 2.1.

Table 2.1 Plant community types within the subject land with corresponding formation and class

Plant community type	Vegetation formation	Vegetation class	Area (ha)
510 - <i>Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion</i>	Grassy Woodlands	New England Grassy Woodlands	1.53
567 - Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Grassy Woodlands	New England Grassy Woodlands	0.19

In addition to the two PCTs identified within the subject land, exotic grassland was also identified. Note that exotic vegetation does not require further assessment in accordance with the BAM.

2.2.3 Vegetation zones

Each of the PCTs identified within the subject land were stratified into vegetation zones based on broad condition state, as per the method outlined in Section 4.2.2 of the BDAR and allocated a condition class as per the descriptions in Table 2.2. This process identified five vegetation zones.

Table 2.2 PCTs and vegetation zones mapped within the subject land

Vegetation zone	PCT	Condition	Location	Area (ha)
1	510 - <i>Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion</i>	Woodland	Road upgrade disturbance area (eastern portion)	0.13
2	510 - <i>Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion</i>	Pasture	Road upgrade disturbance area (eastern portion)	1.14
3	510 - <i>Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion</i>	Woodland_moderate	Road upgrade disturbance area (western portion)	0.02
4	510 - <i>Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion</i>	Derived native grasslands (DNG)	Road upgrade disturbance area (western portion)	0.26
5	567 - Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Woodland_moderate	Road upgrade disturbance area (western portion)	0.19
Total				1.74

Vegetation zones 1 and 2 and exotic grassland areas align with the BDAR and are described in Section 4.3.4 of Appendix C of the EIS. Exotic grassland within the subject land comprises 0.51 ha within the road upgrade disturbance area and 0.25 ha within the hardstand area.

Descriptions of the remaining vegetation zones are provided in Table 3.3 and Table 3.4, with their locations shown on the figures presented in Appendix A.

Table 2.3 **Description of vegetation zones 3 and 4**

Vegetation Zone 3 and 4: PCT 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

PCT ID	510
Common name	Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
Condition class and extent within subject land	• woodland_moderate; 0.02 ha; and • derived native grassland; 0.26 ha.
Description	<u>Woodland_moderate</u> The canopy is dominated by Yellow Box (<i>Eucalyptus melliodora</i>), Rough-barked Apple (<i>Angophora floribunda</i>), with less frequent Blakely's Red Gum (<i>Eucalyptus blakelyi</i>) and Ribbon Gum (<i>E. viminalis</i>). The midstory was fairly sparse consisting of Native Blackthorn (<i>Bursaria spinulosa</i>), Dean's Wattle (<i>Acacia deanei subsp deanei</i>), and Peach Heath (<i>Lissanthe strigosa</i>). Ground cover is predominately grassy and composed of a mixture of native and exotic grasses including Slender Rat's Tail Grass (<i>Sporobolous creber</i>), <i>Eragrostis</i> sp., and Red Grass (<i>Bothriochloa macra</i>). <u>Derived native grassland</u> The ground cover is grassy with similar native species to the woodland community. The derived native grassland typically has a higher exotic grass component with <i>Phalaris</i> sp, <i>Paspalum</i> sp. and Cocksfoot (<i>Dactylis glomerata</i>) recorded. Canopy species are absent with midstory species limited to the exotic Hawthorn (<i>Crataegus monogyna</i>).
Condition description	<u>Woodland_moderate</u> This zone occurs within the road reserve, as discrete strips of vegetation or connected to larger patches of adjacent woodland. The canopy and midstory are largely intact; however, disturbance due to earthworks is visible in several areas. Ground cover vegetation is dominated by native species; however, invasion of exotic pastures species is prevalent in several patches. At the time of the survey grazing pressure was high, with much of the vegetation having been grazed close to the ground. <u>Derived native grassland</u> This zone is subject to similar disturbances as the woodland areas including grazing from livestock and invasion by pasture species, especially where adjacent to pasture areas.
Characteristic species used for identification of PCT	PCT 510 is typically dominated by Rough-barked Apple, Yellow Box and/or Blakely's Red Gum according to the vegetation description in the BioNet Vegetation Classification. All of these species are present within the zone, with Yellow Box and Rough Barked Apple and Blakely's Red Gum being dominant. In addition, Ribbon Gum; a characteristic species of the PCT, were also recorded.
Justification of evidence used to identify the PCT	PCT 510 occurs on undulating areas at intermediate to high altitudes, which is consistent with the subject land, at approximately 1,000 m elevation with gently sloping or flat topography. The subject land occurs within the New England Tablelands IBRA bioregion, in which this PCT is known to occur. The PCT occupies deep, relatively fertile soils on a number of different geologies, but mainly sedimentary rocks and basalt. Site observations indicate that the PCT occurs on fairly deep soils, with limited rock outcropping present. Soil types within the subject land include both sedimentary and basalt derived soils, providing further consistency with the PCT.

Table 2.3 **Description of vegetation zones 3 and 4**

Vegetation Zone 3 and 4: PCT 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

Status	<u>Commonwealth <i>Environment, Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)</u> <i>Woodland_moderate – listed CEEC</i> The zone was assessed against the potentially aligned White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Critically Endangered Ecological Community (CEEC) (<i>EPBC Act Policy Statement 3.5 - White box - yellow box - Blakely's red gum grassy woodlands and derived native grasslands</i> (Department of the Environment and Heritage (DEH 2006))). The community is not in exemplary condition given that the ground cover is grazed, with low species diversity; however, the zone meets several other condition criteria including, greater than 2 ha patch size, and an average of 20 or more mature trees per ha and natural regeneration of the dominant overstory species. <i>Derived native grassland – not the listed CEEC</i> The derived native grassland zone does not meet listing criteria given that there are less than 12 native understory species, and the patch does not have either 20 mature trees per ha, nor natural regeneration of the overstory. <u>NSW <i>Biodiversity Conservation Act 2016</i> (BC Act)</u> <i>Woodland_moderate – listed EEC</i> This PCT is directly aligned with White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community (EEC). <i>Derived native grassland –listed EEC.</i> In contrast to the Commonwealth listing, the NSW guidelines specifically include highly disturbed sites, where few or native species are present. This is providing that vegetation, either understorey, or overstorey, or both, would under appropriate management, respond through natural regeneration. In the case of this zone, the condition of the vegetation would likely improve if grazing pressure was reduced further. Currently the road easement is used as a travelling stock route. Therefore, this zone is considered to form part of the EEC under the BC Act.
Estimate of percent cleared value of PCT	79%

Photograph 2.1 **PCT 510 Woodland moderate**



Table 2.4 **Description of vegetation zone 5**

Vegetation Zone 5 PCT 567 - Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion

PCT ID	567
Common name	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Condition class and extent within subject land	woodland_moderate; 0.19 ha
Description	The canopy is dominated by Broad-leaved Stringybark (<i>Eucalyptus caliginosa</i>) with Yellow Box (<i>E. melliodora</i>) and Rough-barked Apple (<i>A. floribunda</i>) also present. The midstory was well developed in most areas, consisting of Native Blackthorn, Dean's Wattle (<i>Acacia deanei subsp deanei</i>), Sticky Wattle (<i>A. viscidula</i>), Hop Bitter Pea (<i>Daviesia latifolia</i>) and Peach Heath (<i>Lissanthe strigosa</i>). Ground cover is predominately grassy composed of a mixture of native and exotic grasses including Slender Rat's Tail Grass (<i>Sporobolous creber</i>), <i>Eragrostis</i> sp., and Red Grass (<i>Bothriochloa macra</i>).
Condition description	This zone occurs within the road reserve, as discrete strips of vegetation or more often connected to larger patches of adjacent woodland. The canopy and midstory are largely intact; however, disturbance due to earthworks is visible in several areas. Ground cover vegetation is dominated by native species; however, invasion of exotic pastures species is prevalent in several patches. At the time of the survey grazing pressure was high, with much of the vegetation grazed close to the ground.
Characteristic species used for identification of PCT	PCT 567 is dominated by Broad-leaved Stringybark with a broad range of associates including Rough-barked Apple, Yellow Box and Blakely's Red Gum, all of which were recorded within this zone. Characteristic mid-story species which were recorded include Peach Heath, Hop Bitter Pea, and Native Blackthorn. Few native ground cover species were identified given the grazing pressure and winter survey timing, so this aspect was not useful in attributing the PCT.
Justification of evidence used to identify the PCT	PCT 567 is a very tall woodland or tall open forest, widespread on tablelands and low hills on a variety of substrates. The woodland recorded was tall, within an area of gently rolling hills matching the PCT attributes.
Status	<u>Commonwealth EPBC Act</u> <i>Woodland_moderate – not the listed CEEC</i> The zone was assessed against the potentially aligned White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Critically Endangered Ecological Community (CEEC) (<i>EPBC Act policy statement 3.5 - White box - yellow box - Blakely's red gum grassy woodlands and derived native grasslands</i> (DEH 2006)). The community is not considered to meet the listing as the dominant canopy species is Broad-leaved Stringybark, rather than one of the key characteristic canopy species (ie White Box (<i>Eucalyptus albens</i>), Yellow Box, or Blakely's Red Gum). <u>NSW BC Act</u> <i>Woodland_moderate – listed EEC</i> This PCT is directly aligned with White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community (EEC). The BC act determination refers to characteristic species including both Yellow Box and Blakely's Red Gum, which while not dominant, are present within the PCT.
Estimate of percent cleared value of PCT	62%

Table 2.4 **Description of vegetation zone 5**

Vegetation Zone 5 PCT 567 - Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion

Photograph 2.2

**PCT 567
Woodland
moderate**



2.2.4 Assessment of patch size

Two vegetation zones; PCT 510_woodland_moderate and PCT 567_woodland_moderate were allocated a patch size of 101 ha (refer to Table 2.5). Both vegetation zones are well connected to large areas of vegetation which are greater than 101 ha in size, which is the maximum size class in the BAM.

The remaining three zones were not considered intact vegetation, given that at least one of their strata were absent. Patch size is therefore determined to be zero for these vegetation zones.

Table 2.5 **PCTs and vegetation zones mapped within the subject land**

Vegetation zone	PCT	Condition	Patch size (ha)
1	510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	woodland	0
2	510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	pasture	0
3	510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	woodland_moderate	101
4	510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	DNG	0
5	567 - Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	woodland_moderate	101

2.2.5 Vegetation integrity score

The vegetation integrity score for each vegetation zone is presented in Table 2.6.

Table 2.6 **PCTs and vegetation zones mapped within the subject land**

Vegetation zone	PCT	Condition	Area (ha)	Vegetation integrity score
1	510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	woodland	0.13	11
2	510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	pasture	1.14	13.6
3	510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	woodland_moderate	0.02	100 (benchmark)
4	510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	DNG	0.26	41.6
5	567 - Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	woodland_moderate	0.19	100 (benchmark)

Notes: 1. Vegetation integrity scores for zones 1 and 2 were obtained from the BDAR, which was based on plot data.
2. Vegetation integrity scores for zones 3, 4 and 5 were assumed at benchmark condition, which is a conservative measure to account for an absence in plot data. Zone 4 is at benchmark condition for all grassland attributes, with attributes related to canopy and midstory inputted at zero, reflecting the derived grassland condition.

3 Threatened species

3.1 Habitat assessment

Concurrent with the vegetation mapping, a habitat assessment was undertaken seeking to identify the following fauna habitat features within the subject land:

- habitat trees including large hollow-bearing trees;
- availability of flowering shrubs and feed tree species;
- waterway condition;
- quantity of ground litter and logs; and
- searches for indirect evidence of fauna.

The habitat within vegetation zones 1 and 2 (refer Appendix A) are consistent with the BDAR and are not discussed further.

The majority of the road upgrade disturbance area is cleared of canopy and midstory vegetation. This habitat is likely to support fauna species which are able to persist in highly modified agricultural landscapes.

A smaller portion of woodland habitat occurs within the subject land, which contains a variety of key habitat features with the potential to support a greater diversity of fauna species. These habitat features include a diversity of Eucalypts, a midstory dominated by Acacia species, woody debris and leaf litter. Hollow-bearing trees are also present; however, no large hollows were observed with the potential to support breeding of large forest owls. There is a lack aquatic habitat within the subject land with any historically occurring watercourses no longer present, likely due to surrounding agricultural practices, including implementation of drainage contours and dams.

Aquatic habitat within a broader vicinity of the subject land is limited to small farm dams and the ephemeral Barleyfields Lagoon. Barleyfields lagoon is approximately 50 m from the subject land at its closest point. Given that the lagoon is highly ephemeral, its value to fauna is likely to be limited to highly mobile species such as waterbirds, which may be able to utilise a periodic resource. No impacts to the lagoon are anticipated as a result of the project or the proposed road upgrades.

3.2 Ecosystem credit species assessment

A list of ecosystem credit species predicted to occur within the road upgrade disturbance area, is provided in Table 3.1. This list has been generated by the BAM calculator, based on the mapped PCTs. The potential for these species to occur within the subject land was assessed in accordance with Section 6.2 of the BAM (OEI 2017).

Table 3.1 **Assessment of ecosystem credit species within the subject land**

Scientific name	Common name	Justification for exclusion
<i>Anthochaera phrygia</i>	Regent Honeyeater (foraging)	Excluded from PCT 510_dng as no suitable feed trees are present.
<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo (foraging)	Excluded from PCT 510_woodland_moderate and PCT 510_dng as no suitable feed trees are present.
<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Ba	Not excluded.
<i>Chthonicola sagittata</i>	Speckled Warbler	Excluded from PCT 510_dng as no woodland habitat present.
<i>Circus assimilis</i>	Spotted Harrier	Not excluded.
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper	Excluded from PCT 510_dng as no woodland habitat present.
<i>Daphoenositta chrysoptera</i>	Varied Sittella	Excluded from PCT 510_dng as no woodland habitat present.
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	Excluded from PCT 510_dng as no woodland habitat present.
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	Not excluded.
<i>Glossopsitta pusilla</i>	Little Lorikeet	Excluded from PCT 510_dng as no woodland habitat present.
<i>Grantiella picta</i>	Painted Honeyeater	Excluded from PCT 510_dng as no woodland habitat present.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle (foraging)	Excluded from all zones given the lack of preferred aquatic foraging habitat.
<i>Hieraaetus morphnoides</i>	Little Eagle	Not excluded.
<i>Lathamus discolor</i>	Swift Parrot (foraging)	Excluded from PCT 510_dng as no woodland habitat present.
<i>Lophoictinia isura</i>	Square-tailed Kite	Not excluded.
<i>Melanodryas cucullata cucullata</i>	Hooded Robin	Excluded from PCT 510_dng as no woodland habitat present.
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	Not excluded.
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat (foraging)	Excluded from PCT 510_dng as no woodland habitat present.
<i>Neophema pulchella</i>	Turquoise Parrot	Excluded from PCT 510_dng as no woodland habitat present.
<i>Ninox connivens</i>	Barking Owl	Not excluded.
<i>Ninox strenua</i>	Powerful Owl	Excluded from PCT 510_dng as represents poor foraging habitat.
<i>Petaurus australis</i>	Yellow-bellied Glider	Not excluded.
<i>Petroica boodang</i>	Scarlet Robin	Not excluded.
<i>Petroica phoenicea</i>	Flame Robin	Excluded from PCT 510_dng as no woodland habitat present.
<i>Phascolarctos cinereus</i>	Koala (foraging)	Excluded from PCT 510_dng as no woodland foraging habitat present.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Excluded from PCT 510_dng as no foraging habitat present.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	Not excluded.
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	Not excluded.
<i>Stagonopleura guttata</i>	Diamond Firetail	Not excluded.
<i>Tyto novaehollandiae</i>	Masked Owl (foraging)	Excluded from PCT 510_dng as no woodland foraging habitat present.

3.3 Species credit species assessment

3.3.1 Habitat constraints assessment

An assessment of habitat constraints for threatened species was undertaken in accordance with Step 2 of Section 6.4 of the BAM (OEH 2017). For those threatened species predicted to occur and for which habitat constraints or geographic constraints are listed, an assessment was undertaken to determine if those species can be excluded or require additional consideration. The results of this assessment are presented in Table 3.2.

Table 3.2 Assessment of geographical features and habitat constraints within the subject land

Scientific name	Common name	Feature	Sensitivity to gain	Habitat constraint present and justification	Further consideration required?
<i>Boronia granitica</i>	Granite Boronia	Rocky areas. Appropriate vegetation within 50 m of granite outcrops or slabs.	High	Appropriate granite outcrops, rocky crevices, granitic scree and shallow soils are absent.	No
<i>Burhinus grallarius</i>	Bush Stone Curlew	Fallen/standing dead timber including logs.	High	Woodland areas contain fallen timber.	Yes
<i>Callitris oblonga</i>	Pygmy Cypress Pine	East of Chandler River.	High	The subject land is west of the Chandler River.	No
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Cliffs. Within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within 2 km of old mines or tunnels.	Very high	None of the required features exist.	No
<i>Grevillea beadleana</i>	Beadle's Grevillea	Oxley Wild Rivers National Park or within a 10 km buffer of it.	High	Subject land is over 10 km west of Oxley Wild Rivers National Park.	No
<i>Myotis macropus</i>	Southern Myotis	Hollow bearing trees. Within 200 m of riparian zone. Bridges, caves or artificial structures within 200 m of riparian zone.	High	Whilst some hollow bearing trees exist, there are no adjacent riparian areas.	No
<i>Ninox strenua</i>	Powerful Owl (Breeding)	Within 5 km buffer of Macleay Gorges subregion.	High	Subject land is over 5 km from the Macleay Gorges subregion.	No
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines.	Very high	No such habitat features exist.	No

3.3.2 Identifying candidate species credit species for further assessment

To develop a list of species credit species for further assessment, an assessment was undertaken in accordance with Step 3 of Section 6.4 of the BAM (OEH 2017), as shown in Table 3.3.

Table 3.3 Species credit species and status and habitat suitability assessment

Common name	Scientific name	Candidate species	Justification
Flora			
Narrow-leaved Bertya	<i>Bertya ingramii</i>	No	Grows among rocks or in thin soils close to cliff-edges in dry woodland with she-oaks, wattles and tea-trees. No such rocky habitat with thin soils exists within the subject land.
Barrington Tops Ant Orchid	<i>Chiloglottis platyptera</i>	No	Grows in moist areas in tall open eucalypt forest with a grassy understorey, and also around rainforest edges. Found along the eastern edge of the New England Tablelands, from Ben Halls Gap to east of Tenterfield, and also in the Barrington Tops area. It generally occurs in rich brown loam soils. No suitable habitat exists within the subject land given that mesic rich brown loam soils are absent from the subject land. The high disturbance and grazing pressure also precludes this species from occurring.
Bluegrass	<i>Dichanthium setosum</i>	Yes	Bluegrass occurs on heavy basaltic black soils and red-brown loams with clay subsoil. It is often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. Locally common or found as scattered clumps in broader populations. Given this species can occur in disturbed areas and suitable soils types are present, this species has the potential to occur within the subject land.
Small Snake Orchid	<i>Diuris pedunculata</i>	No	The Small Snake Orchid grows on grassy slopes or flats. Often on peaty soils in moist areas and also on shale and trap soils, on fine granite, and among boulders. No suitable soil types exist within the subject land. The Small Snake Orchid is susceptible to grazing and with the high grazing pressure within the subject land the species is unlikely to occur.
Northern Blue Box	<i>Eucalyptus magnificata</i>	Yes	Grassy open forest or woodland on shallow, sandy or loamy soils. Occurs on moderately hilly sites and at the edge of gorges, usually at altitudes from 900–1,050 m. Known in NSW from only a few widely separate populations on the New England Tablelands, around Hillgrove east of Armidale and in the Glen Innes and Tenterfield region, where they occur individually or in small populations. This species cannot be excluded based on habitat basis alone.
Narrow-leaved Black Peppermint	<i>Eucalyptus nicholii</i>	Yes	This species is sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, being most common in central portions of its range. Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock. This species cannot be excluded based on habitat basis alone.
Tall Velvet Sea-berry	<i>Haloragis exalata</i> subsp. <i>velutina</i>	No	Grows in damp places near watercourses. This subspecies also occurs in woodland on the steep rocky slopes of gorges. No suitable habitat exists within the subject land.
Hawkweed	<i>Picris evae</i>	Yes	Where collected, the species abundance has been rare, locally occasional and locally frequent. All recent collections appear to come from modified habitats such as weedy roadside vegetation and paddocks. Its main habitat is open Eucalypt forest including a canopy of <i>Eucalyptus melliodora</i> , <i>E. crebra</i> , <i>E. populnea</i> , <i>E. albens</i> , <i>Angophora subvelutina</i> , <i>Allocasuarina torulosa</i> , and/or <i>Casuarina cunninghamiana</i> with a <i>Dichanthium</i> grassy understory. Soils are black, dark grey or red-brown (specified as shallow, stony soil over basalt for one collection) and reddish clay-loam or medium clay soils. The flowering and fruiting period is mainly October to January, with a few plants collected in flower or fruit until May. This species cannot be excluded based on habitat basis alone.

Table 3.3 Species credit species and status and habitat suitability assessment

Common name	Scientific name	Candidate species	Justification
Silky Swainson-pea	<i>Swainsona sericea</i>	Yes	Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes, sometimes in association with cypress-pines <i>Callitris</i> spp. This species has the potential to occur within the subject land owing to the presence of Box Gum woodland habitat.
Austral Toadflax	<i>Thesium australe</i>	Yes	Austral Toadflax occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast, often in association with Kangaroo Grass (<i>Themeda australis</i>). This species is a root parasite that takes water and some nutrients from other plants, especially Kangaroo Grass. This species is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands region. This species has the potential to occur within the subject land owing to the presence of grassy woodland and derived native grassland with Kangaroo Grass.
Fauna			
Amphibians			
Tusked Frog population in the Nandewar and New England Tableland Bioregions	<i>Adelotus brevis</i> - <i>endangered population</i>	No	Rainforests, wet forests and flooded grassland and pasture. They are usually found near creeks, ditches and ponds, and call while hidden amongst vegetation or debris. The subject land does not contain suitable aquatic breeding habitat, nor is there any adjacent breeding habitat.
Glandular Frog	<i>Litoria subglandulosa</i>	No	Glandular Frogs may be found along streams in rainforest, moist and dry eucalypt forest or in subalpine swamps. The subject land does not contain suitable aquatic breeding habitat, nor is there any adjacent breeding habitat.
Reptiles			
Pale-headed Snake	<i>Hoplocephalus bitorquatus</i>	Yes	Found mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest. The species may occur within woodland areas within the subject land.
Birds			
Regent Honeyeater (breeding)	<i>Anthochaera phrygia</i>	No	Mapped important areas are considered species credits under the BAM (OEH 2017). These areas do not require survey. The closest mapped breeding area of the Regent Honeyeater is the Bundarra-Barraba, with the most eastern extent over 22 km north-east of the subject land. The subject land is not within or close to a known breeding area.
Bush Stone-curlew	<i>Burhinus grallarius</i>	Yes	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Species has the potential to occur within woodland areas within the subject land.
Glossy Black-Cockatoo (Breeding)	<i>Calyptorhynchus lathami</i>	Yes	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur (<i>Casuarina</i> and <i>Allocasuarina</i> species). Dependent on large hollow-bearing eucalypts for nest sites. Although no foraging resources were present for the species there is potential for the species to nest with woodland areas within the subject land.

Table 3.3 Species credit species and status and habitat suitability assessment

Common name	Scientific name	Candidate species	Justification
White-bellied Sea-Eagle (Breeding)	<i>Haliaeetus leucogaster</i>	No	Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. The subject land is not close to any large waterbodies and the subject land does not present suitable breeding habitat.
Little Eagle (Breeding)	<i>Hieraaetus morphnoides</i>	Yes	Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. The species has the potential to nest within woodland areas within the subject land.
Swift Parrot (breeding)	<i>Lathamus discolor</i>	No	Mapped important areas are considered species credits under the BAM (OEH 2017). These areas do not require survey. The subject land is not within a mapped important area for the Swift Parrot and breeding only occurs in Tasmania.
Square-tailed Kite (breeding)	<i>Lophoictinia isura</i>	Yes	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. Nest sites generally located along or near watercourses, in a fork or on large horizontal limbs. The species has the potential to nest within woodland areas within the subject land.
Barking Owl (Breeding)	<i>Ninox connivens</i>	No	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. Requires large tree hollow for breeding which are absent within the subject land.
Masked Owl (Breeding)	<i>Tyto novaehollandiae</i>	No	Lives in dry eucalypt forests and woodlands from sea level to 1,100 m. Requires large tree hollow for breeding which are absent within the subject land.
Mammals			
Eastern Pygmy Possum	<i>Cercartetus nanus</i>	Yes	Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred. The species has the potential occur within woodland areas within the subject land.
Eastern Bentwing-bat (Breeding)	<i>Miniopterus schreibersii oceanensis</i>	No	Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. No caves habitat exists within the subject land.
Squirrel Glider	<i>Petaurus norfolcensis</i>	Yes	The Squirrel Glider inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. The species prefers mixed species stands with a shrub or Acacia mid-storey. The species relies on large old trees with hollows for breeding and nesting; however, trees need to be less than 50 m apart. The species may occur within woodland areas of the subject land.
Koala (breeding)	<i>Phascolarctos cinereus</i>	Yes	Koala inhabits eucalypt woodlands and forests, feeding on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. The subject land is within the Northern Tablelands Koala Management Area. One primary feed tree was recorded within the subject land, Ribbon Gum (<i>Eucalyptus viminalis</i>), though this was not dominant. Yellow Box, a secondary feed trees, were recorded within the subject land. The species may occur within woodland areas within the subject land.

Table 3.3 **Species credit species and status and habitat suitability assessment**

Common name	Scientific name	Candidate species	Justification
Grey-headed Flying-fox (Breeding)	<i>Pteropus poliocephalus</i>	No	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, for giving birth and rearing young. Treed habitat within the subject land is limited to open woodland, with no dense vegetation close to water. The species is unlikely to breed in the subject land.

Table 3.3 identifies 14 species which require further consideration in accordance with Section 6.4 of the BAM (OEH 2017). In order to expedite the biodiversity assessment, 10 species will be assumed present, where suitable habitat exists, including:

- Bluegrass;
- Hawkweed;
- Silky Swainson-pea;
- Austral Toadflax;
- Pale-headed Snake;
- Bush Stone-curlew;
- Glossy Black-Cockatoo (breeding);
- Eastern Pygmy Possum;
- Squirrel Glider; and
- Koala (breeding).

Four species were assessed by targeted field survey:

- Northern Blue Box;
- Narrow-leaved Black Peppermint;
- Little Eagle (breeding); and
- Square-tailed Kite (breeding).

3.3.3 Targeted species methods

i Northern Blue Box (*Eucalyptus magnificata*) and Narrow-leaved Black Peppermint (*Eucalyptus nicholii*)

All rough-barked and box-type bark trees within the subject land were assessed to determine the presence or absence of the species. These surveys were undertaken on foot over two days (12 and 13 August 2019) and focussed on the strip of vegetation either side of the existing roads/vehicular tracks.

ii Little Eagle breeding (*Hieraaetus morphnoides*) and Square-tailed Kite breeding (*Lophoictinia isura*) breeding

All large trees within the subject land were viewed to determine the presence or absence of large stick nests. The surveys were conducted concurrently with the threatened Eucalypt surveys.

3.3.4 Targeted species results

No threatened eucalypt species were identified during the targeted species surveys and it is concluded that neither the Northern Blue Box nor the Narrow-leaved Black Peppermint occur within the subject land.

The raptor breeding survey did not reveal any large stick nests; therefore, it is concluded that neither the Little Eagle nor the Square-tailed Kite breed within the subject land.

3.3.5 Species credit species

A summary of species credit species predicted to occur within the subject land, based on the PCTs present and as predicted by the credit calculator, is provided within Table 3.4. The table also includes an assessment of whether the subject land provides suitable habitat and whether the species will be impacted by the proposed works. The potential for a species to occur within the subject land was assessed in accordance with Step 3 of Section 6.4 of the BAM (OEH 2017).

Table 3.4 Assessment of candidate species with the potential to be impacted by the proposed works

Common name	Scientific name	Habitat present within the subject land	Impacted by proposed works	Justification
Flora				
Bluegrass	<i>Dichanthium setosum</i>	510_woodland_moderate 510_dng 567_woodland moderate	Assumed	Assumed present given the presence of suitable habitat.
Northern Blue Box	<i>Eucalyptus magnificata</i>	510_woodland_moderate 567_woodland moderate	No	Not recorded during targeted survey
Narrow-leaved Black Peppermint	<i>Eucalyptus nicholii</i>	510_woodland_moderate 567_woodland moderate	No	Not recorded during targeted survey
Hawkweed	<i>Picris evae</i>	510_woodland_moderate 510_dng 567_woodland moderate	Assumed	Assumed present given the presence of suitable habitat.
Silky Swainson-pea	<i>Swainsona sericea</i>	510_woodland_moderate 510_dng 567_woodland moderate	Assumed	Assumed present given the presence of suitable habitat.
Austral Toadflax	<i>Thesium australe</i>	510_woodland_moderate 510_dng 567_woodland moderate	Assumed	Assumed present given the presence of suitable habitat.
Fauna				
Amphibians				
Pale-headed Snake	<i>Hoplocephalus bitorquatus</i>	510_woodland_moderate 567_woodland moderate	Assumed	Assumed present given the presence of suitable habitat.
Birds				
Bush Stone-curlew	<i>Burhinus grallarius</i>	510_woodland_moderate 567_woodland moderate	Assumed	Assumed present given the presence of suitable habitat.
Glossy Black-Cockatoo (Breeding)	<i>Calyptrorhynchus lathamii</i>	510_woodland_moderate 567_woodland moderate	Assumed	Assumed present given the presence of suitable habitat.

Table 3.4 Assessment of candidate species with the potential to be impacted by the proposed works

Common name	Scientific name	Habitat present within the subject land	Impacted by proposed works	Justification
Little Eagle (Breeding)	<i>Hieraetus morphnoides</i>	510_woodland_moderate 567_woodland moderate	No	Not recorded during targeted survey.
Square-tailed Kite (breeding)	<i>Lophoictinia isura</i>	510_woodland_moderate 567_woodland moderate	No	Not recorded during targeted survey.
Mammals				
Eastern Pygmy Possum	<i>Cercartetus nanus</i>	510_woodland_moderate 567_woodland moderate	Assumed	Assumed present given the presence of suitable habitat.
Squirrel Glider	<i>Petaurus norfolcensis</i>	510_woodland_moderate 567_woodland moderate	Assumed	Assumed present given the presence of suitable habitat.
Koala (breeding)	<i>Phascolarctos cinereus</i>	510_woodland_moderate 567_woodland moderate	Assumed	Assumed present given the presence of suitable habitat.

4 Impact assessment (biodiversity values)

4.1 Potential direct, indirect and prescribed impacts

A detailed assessment of potential direct, indirect and prescribed impacts are provided within the BDAR (Appendix C of the EIS). The most relevant direct impacts of the proposed road upgrades include the clearing of native vegetation and the removal of potential threatened species habitat.

Unmitigated, the proposed road upgrades have the potential to result in minor indirect or minor prescribed impacts. Prescribed impacts, as per Section 8.2.1.2 of the BAM (OEI 2017), that are most relevant to this addendum include:

- vehicle collision with fauna; and
- fragmentation of habitats and associated impacts to connectivity and fauna movement.

Unmitigated indirect impacts that could occur as a result of the proposed road upgrades include:

- increased noise, vibration and dust levels; and
- increase in weeds and pathogens.

Increased vehicle movements associated with the project have the potential to result in increased fauna vehicle strikes and associated fauna mortality. Mitigation measures outlined in Section 5.2 of this report and Section 6.2 of the BDAR have been presented to reduce this risk.

The removal of native vegetation has the potential to result in fragmentation of fauna habitat, with resultant effects on fauna species movement, reproduction and gene flow. The impact of vegetation clearance on habitat fragmentation is anticipated to be negligible, given that the majority of the vegetation removal is associated with grassland, which offers little connectivity benefit. The removal of woodland vegetation is limited to a narrow strip either side of an existing road/vehicular track (refer to Section 2.4). This is unlikely to significantly reduce the ability of fauna to move across the landscape.

Construction activities may result in increased levels of noise and vibration. These impacts will be limited to relatively small sections of the subject land during road upgrades and impacts will be temporary in nature. Given the temporary nature of the disturbance and the ability for most species to move to other areas of adjacent habitat (that will not be impacted), significant impacts to fauna are not anticipated.

Increased movement of vehicles has the potential to transport weeds and pathogens into the subject land and adjacent vegetation. Mitigation measures to reduce the potential for the spread of weeds and pathogens are outlined in Section 6.2 of the BDAR.

4.2 Measures to avoid, minimise and mitigate impacts

UPC has selected an access route which utilises existing sealed roads and unsealed tracks for its entirety. For much of the route, no additional clearance is required. In sections where road widening is necessary, this is limited to narrow strips either side of the existing carriageway. The hardstand location was selected in an area of the rail corridor which is already disturbed and consists of exotic grassland of low biodiversity value.

Additional recommendations, including measures to mitigate residual impacts, after all measures to avoid and minimise impacts have been considered, are provided in Table 6.1 of the BDAR.

A biodiversity management plan (BMP) will also be prepared which will contain advice regarding the effective implementation of each of the biodiversity management and mitigation measures listed in Table 6.1 of the BDAR.

Measures to mitigate impacts specific to the road widening will include reduced speed limits for project-related vehicle movements, which will be detailed in the traffic management plan (TMP). Given that the access route utilises public roads, reduced speed limits for public vehicles may not be enforced (except during road upgrade works).

4.3 Serious and irreversible impacts

White Box Yellow Box Blakely's Red Gum Woodland is considered a potential entity to meet the serious and irreversible impacts (SAILs) principle (refer Appendix 3 of the BAM (OEH 2017)).

All five vegetation zones recorded within the subject land meet the criteria for the BC Act listing of White Box Yellow Box Blakely's Red Gum Woodland. Potential for SAILs to this ecological community have been considered in accordance with Section 10.2.2.1 of the BAM below.

a) The action and measures taken to avoid the direct and indirect impact on the potential entity for an SAIL.

UPC has selected an access route to the development site which utilises existing sealed roads and tracks for its entirety (refer to Section 5.2), with additional vegetation clearance restricted to narrow strips either side of the existing carriageway. This reduces clearance of the Box Gum Woodland to the least amount possible whilst allowing scope for modifications to detailed design and meeting relevant road specifications and safety measures.

b) The area (ha) and condition of the threatened ecological community (TEC) to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone.

The condition of the vegetation zones are described in detail in Section 3.2.3. The area and vegetation integrity scores are displayed in Table 4.1.

Two vegetation zones, PCT 510_pasture and PCT 510_woodland, have a vegetation integrity score of 13.6 and 11, respectively, which are both below the threshold requiring further assessment; therefore, these areas have not been considered further as per the BDAR.

In lieu of the lack of BAM plot data; vegetation zones 3, 4 and 5 have been assumed to be at benchmark condition. These vegetation zones comprise 0.26 ha of DNG and 0.21 ha of woodland. In reality, the DNG is likely to be below benchmark condition, given that livestock grazing pressure is relatively high and species diversity appears to be low. In many areas there is also a high presence of exotic pasture species.

The woodland areas have a largely intact canopy cover and midstory; however, it is also unlikely that the woodland areas are at benchmark, given grazing pressure from travelling livestock and historical earthworks associated with the original road construction. The ground cover does not appear to have a high native species diversity, noting that the field visit during winter was not favourable for detecting annual species. Risks of indirect impacts to the TEC as a result of the proposed road upgrades are low and further reduced to negligible levels through mitigation measures outlined in Table 6.1 of the BDAR.

Table 4.1 **Vegetation zones aligned with Box Gum woodland**

Vegetation zone	PCT	Condition	Vegetation integrity score	Area (ha)
1	510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	Woodland	11	0.13
2	510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	Pasture	13.6	1.14
3	510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	Woodland_moderate	100	0.02
4	510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	DNG	41.6	0.26
5	567 - Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Woodland_moderate	100	0.19
Subtotal of vegetation above BAM threshold				0.46
Total				1.74

- c) A description of the extent to which the impact exceeds the threshold for the potential entity that is specified in the Guidance to assist a decision-maker to determine a serious and irreversible impact.**

No condition thresholds have been provided to date.

- d) The extent and overall condition of the potential TEC within an area of 1,000 ha, and then 10,000 ha, surrounding the subject land.**

A combination of Northern River Catchment Management Authority (VIS map 524) and Border Rivers Gwydir / Namoi Region Version 2.0. (VIS map 4467) vegetation mapping was used to calculate the area of vegetation in the surrounding area which align with the TEC.

A total of 149.92 ha is mapped within a 1,000 ha buffer and 1,064.33 ha is mapped within a 10,000 ha buffer. Based on this mapping the clearance of 0.46 ha will represent a loss of 0.3% of the TEC within a 1,000 ha area and 0.04% within a 10,000 ha area.

- e) An estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration.**

Vegetation mapping to PCT level was obtained for Armidale Plateau IBRA subregion, of which 26,927.59 ha includes PCTs aligned with the TEC. The removal of 0.46 ha will contribute to a removal of 0.002 % of the TEC.

- f) An estimate of the area of the potential TEC that is in the reserve system within the IBRA region and the IBRA subregion.**

The total area of the TEC mapped within the IBRA region is 4,108.52 ha, with 313.67 ha mapped within the subregion.

The development, clearing or biodiversity certification proposal's impact on:

- g) Abiotic factors critical to the long-term survival of the potential TEC; for example, how much the impact will lead to a reduction of groundwater levels or the substantial alteration of surface water patterns.**

The proposed works will have minimal abiotic influence on the TEC with groundwater and surface water unlikely to be significantly altered.

- h) Characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants.**

The ecosystem functioning of the TEC is currently impacted by surrounding agricultural land use (cropping) and the current use of the existing roads. The upgrades to the road are likely to cause minor indirect impacts, none of which are likely to significantly exacerbate impacts to any functionally important species.

- j) The quality and integrity of an occurrence of the potential TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the potential TEC.**

The TEC is currently surrounded by agricultural land and is adjacent to an existing road. The widening of the road and subsequent increased traffic volumes during construction of the project will have negligible impacts, given that any increases in the magnitude of these impact are temporary and otherwise will remain consistent with the currently existing threats and indirect impacts. The sealing of currently unsealed roads and tracks will have a small benefit to the adjacent remaining TEC by reducing the amount of dust settling on the TEC.

- k) Direct or indirect fragmentation and isolation of an important area of the potential TEC.**

The TEC is adjacent to an existing road and is already subjected to fragmentation owing to surrounding agriculture. Removal of the TEC will be limited to a narrow strip either side of the current road alignment, which is considered unlikely to significantly exacerbate fragmentation or isolation of the TEC. The TEC will not be intersected at any point as a result of the road upgrades, remaining within the wider road reserve area.

- l) The measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion.**

The TECs will be offset in accordance with the BAM which, owing to management, will result in a functionally superior and viable community compared to that in the subject land. The TECs have been assumed to be at benchmark condition, whilst their actual condition is likely to be moderately lower. This is a conservative approach, resulting in higher offset requirements, ensuring net gain of the TEC.

4.4 Identification of impacts requiring offsets

This section provides an assessment of the impacts requiring offsetting in accordance with Section 10 of the BAM (OEH 2017).

4.4.1 Impacts on native vegetation

Impacts to native vegetation requiring offsets include:

- direct impacts on 0.02 ha of PCT 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion woodland_moderate;
- direct impacts on 0.26 ha of PCT 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion_derived native grassland; and
- direct impacts on 0.19 ha of PCT 567 - Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion woodland_moderate.

A summary of the ecosystem credits required for all vegetation zones is provided in Table 4.2. A total of 16 ecosystem credits are required to offset the residual impacts of the road upgrades. A credit report is provided in Appendix B.

Offsets will be provided in accordance with the biodiversity offset framework outlined in Section 6.5.

Table 4.2 Summary of ecosystem credits required for all vegetation zones within the subject land

PCT	Vegetation zone	Area (ha)	Vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Credits required
510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	woodland_moderate	0.02	100	0.0	-100	1
510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	DNG	0.26	41.6	0.0	-41.6	5
567 - Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	woodland_moderate	0.19	100	0	-100	10

4.4.2 Impacts on threatened species

Impacts to species requiring offsets include four threatened flora species and six fauna species. A summary of the species credits required for all vegetation zones is provided in Table 4.3. A total of 125 species credits are required to offset the residual impacts of the road upgrades. A credit report is provided in Appendix B.

Offsets will be provided in accordance with the biodiversity offset framework outlined in Section 6.6 of the BDAR.

Table 4.3 Summary of species credits required for the subject land

Common name	Species	Vegetation zone and area (ha)	Habitat condition	Biodiversity risk rating	Species credits
Bluegrass	<i>Dichanthium setosum</i>	510_woodland_moderate (0.02)	100	2	1
		510_dng (0.26)	41.6	2	4
		567_woodland moderate (0.19)	100	2	10
					15 (subtotal)
Hawkweed	<i>Picris evae</i>	510_woodland_moderate (0.02)	100	2	1
		510_dng (0.26)	41.6	2	5
		567_woodland moderate (0.19)	100	2	10
					16 (subtotal)
Silky Swainson-pea	<i>Swainsona sericea</i>	510_woodland_moderate (0.02)	100	2	1
		510_dng (0.26)	41.6	2	5
		567_woodland moderate (0.19)	100	2	10
					16 (subtotal)
Austral Toadflax	<i>Thesium australe</i>	510_woodland_moderate (0.02)	100	1.5	1
		510_dng (0.26)	41.6	1.5	4
		567_woodland moderate (0.19)	100	1.5	7
					12 (subtotal)
Pale-headed Snake	<i>Hoplocephalus bitorquatus</i>	510_woodland_moderate (0.02)	100	2	1
		567_woodland moderate (0.19)	100	2	10
					11 (subtotal)
Bush Stone-curlew	<i>Burhinus grallarius</i>	510_woodland_moderate (0.02)	100	2	1
		567_woodland moderate (0.19)	100	2	10
					11 (subtotal)
Glossy Black-Cockatoo (breeding)	<i>Calyptorhynchus lathami</i>	510_woodland_moderate (0.02)	100	2	1
		567_woodland moderate (0.19)	100	2	10
					11 (subtotal)
Eastern Pygmy Possum	<i>Cercartetus nanus</i>	510_woodland_moderate (0.02)	100	2	1
		567_woodland moderate (0.19)	100	2	10
					11 (subtotal)
Squirrel Glider	<i>Petaurus norfolcensis</i>	510_woodland_moderate (0.02)	100	2	1
		567_woodland moderate (0.19)	100	2	10
					11 (subtotal)
Koala (breeding)	<i>Phascolarctos cinereus</i>	510_woodland_moderate (0.02)	100	2	1
		567_woodland moderate (0.19)	100	2	10
					11 (subtotal)

Notes: 1. No species are candidates for serious and irreversible impacts (SAII).
2. All species were assumed present.

4.5 Impacts not requiring offsets

A number of vegetation zones were found to be in degraded condition. In line with the requirements of Section 10.3.2.2 of the BAM (OEH 2017), impacts to the vegetation zones in Table 4.4 do not require offsets.

Table 4.4 Summary of impacts not requiring offsets – native vegetation

PCT	Zone	Area (ha)	Vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Credits required
510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	510_pasture	1.14	11.7	0.0	-11.5	0
510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	510_woodland	0.13	11	0.0	-11	0

Areas not requiring assessment in accordance with Section 10.4 of the BAM (OEH 2017) include:

- existing roads;
- exotic vegetation, and
- cleared and highly disturbed land, particularly associated with cropping.

4.6 Biodiversity offset framework

Section 6.6 of the BDAR provides an outline of methods which UPC can use to compensate the impacts of the road upgrades, including purchasing credits, payment into the Biodiversity Conservation Trust (BCT) and establishment of a biodiversity stewardship site.

4.6.1 Purchasing credits

As stated in the BDAR, UPC may be able to purchase existing credits available on the market and retire these to satisfy their offset obligations. Initially, like-for-like options should be fully investigated before any variation criteria is explored under Clause 6.2 of the NSW Biodiversity Conservation Regulation 2017 (BC Regulation).

Like-for-like attributes for each of the species credit species, is the species itself. Like-for-like attributes for PCT 510 are provided in the BDAR and remain unchanged; however, PCT 567 was not recorded in the development site.

Like-for-like options for PCT 567 are the same as PCT 510 and are as follows:

- require hollows to be present in the offset vegetation;
- the community needs to be within any IBRA subregion that is within 100 km of the outer edge of the development site/subject land; or in one of the following IBRA subregions; Armidale Plateau, Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs; and
- PCT 510 can be offset with PCTs which meet the White Box Yellow Box Blakely's Red Gum Woodland TEC (including PCT's 2, 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 403, 421, 433, 434, 435, 436, 437, 451,

483, 484, 488, 492, 496, 506, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1601, 1606, 1608, 1611, 1691, 1693, 1695 and 1698).

4.6.2 Payment into the Biodiversity Conservation Trust

The BAM calculator provides a current credit price for the ecosystem credits required, noting that the credit prices are market-based and may fluctuate. Credit prices are typically updated on a quarterly basis (next update will be due 1 November 2019).

If UPC elects to pay into the BCT at current prices, the ecosystem credits will cost \$69,315.72 and species credits will cost \$48,008.46, with a combined total of \$117,324.18 (all prices are exclusive of GST).

4.6.3 Establishment of a biodiversity stewardship site

UPC may wish to establish a biodiversity stewardship agreement by acquiring suitable land or using any existing land holdings. This involves permanent conservation and management of the biodiversity values on the land. This is likely to be the most onerous option for UPC and the longest to implement; however, it may result in the least expensive method of meeting offset obligations.

5 Assessment of biodiversity legislation

5.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

An assessment of the impacts of the project on matters of national environmental significance (MNES), considering cumulative impacts of the development site and the subject land, was prepared. This determines whether referral of the project to the Commonwealth Minister for the Environment is required.

A likelihood of occurrence assessment considering each entity individually is provided in Appendix C.

Assessments of significance have been completed for entities which were either recorded or considered as having potential to occur (refer Appendix D) and included:

- one CEEC - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and derived native grassland;
- two vulnerable plant species - Bluegrass and Austral Toadflax;
- two critically endangered fauna species - Regent Honeyeater and Swift Parrot;
- two vulnerable fauna species - Painted Honeyeater and Koala; and
- two migratory species - Fork-tailed Swift (*Apus pacificus*) and White-throated Needletail (*Hirundapus caudacutus*).

All assessments concluded that no significant impacts on threatened entities are predicted to result from the project. Referral of the project to the Commonwealth Minister for the Environment for assessment is not required.

MNES relevant to the development site and subject land are summarised in Table 5.1.

Table 5.1 Assessment of the project against the EPBC Act

Matters of national environmental significance	Project specifics	Potential for significant impact
Threatened species	Ten flora species and nineteen fauna species have been recorded or are predicted to occur within the locality. The majority of these species are considered unlikely to occur within the development site and subject land owing to the high levels of disturbance present. Sup-optimal habitat is considered present for four threatened fauna species, namely Regent Honeyeater, Painted Honeyeater, Swift Parrot and Koala. Two threatened flora species have the potential to occur, namely Bluegrass and Austral Toadflax. The assessments of significance for these species concluded no significant impact.	Significant impact unlikely to result from the project.
Threatened ecological communities	Three threatened ecological communities, as listed under the EPBC Act, are predicted to occur within the locality. Woodland areas of PCT 510_woodland_moderate and PCT 567_woodland_moderate meet the condition thresholds for the White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland CEEC. An assessment of significance concluded no significant impact for the CEEC.	Significant impact unlikely to result from the project.
Migratory species	Twelve migratory species have been recorded or are predicted to occur within the locality. The development site and subject land does not provide important habitat for an ecologically significant proportion of any of these species. Assessments of significance were completed for two species, namely Fork-tailed Swift and White-throated Needletail, with a conclusion of no significant impacts.	Significant impact unlikely to result from the project.
Wetlands of international importance	The development site and subject land does not flow directly into a Ramsar site and the project is not likely to result in a significant impact. The nearest Ramsar wetland is the Gwydir wetlands, approximately 224 km north-west of the development site and subject land.	Significant impact unlikely to result from the project.

5.2 NSW Environmental Planning and Assessment Act 1979

5.2.1 State Environmental Planning Policy 44 – Koala Habitat

One Schedule 2 feed tree species, as defined within Schedule 1 of State Environmental Planning Policy 44 – Koala Habitat (SEPP 44) was identified within the subject land. It is estimated that Ribbon Gum comprises less than 15% of the tree species within the subject land. Therefore, the vegetation within the subject land is not considered potential Koala habitat as defined under SEPP 44. Koala has been assumed present within woodland areas of the subject land given that there are records within the immediate vicinity.

6 Conclusion

This addendum to the BDAR has been completed to consider any additional biodiversity impacts resulting from the proposed road upgrades which may be required to facilitate the safe movement of vehicles between the New England Highway and the development site. In addition, a temporary hardstand area may also be required to facilitate delivery of materials via rail movements along the Main Northern Railway line.

UPC has selected an access route which utilises existing roads and tracks in order to minimise the amount of vegetation clearing to provide adequate clearance for vehicle access. This has largely limited additional impacts to narrow strips of vegetation on either side of the existing carriageway. The hardstand location was selected in an area of the rail corridor which consists of exotic grassland of low biodiversity value.

The eastern portion of the road upgrade disturbance area occurs adjacent to the development site for the project, with vegetation and habitat consistent with those described in the BDAR. Sufficient survey effort was undertaken in the BDAR to conclude that the two vegetation zones present (ie PCT 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion_woodland and PCT 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion_pasture), were below the vegetation integrity score threshold and offsets are therefore not required for impacts to these areas.

A total of three vegetation zones were mapped in the western portion of the road upgrade disturbance area. These vegetation types are in a different condition to the zones identified and described in the BDAR and therefore required additional assessment. Vegetation was mapped to PCT and habitat features assessed; however, BAM plots were not undertaken given the suboptimal survey timing. In order to calculate offsets for the disturbance to these areas, vegetation was assumed to be at benchmark condition. A limited number of targeted surveys were undertaken for readily detectable species credit species. Where habitat was identified for species credit species, and no targeted surveys were undertaken, the species have been assumed present and credits have been calculated accordingly.

Impacts to native vegetation requiring offsets include:

- direct impacts on 0.02 ha of PCT 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion woodland_moderate (1 credit);
- direct impacts on 0.26 ha of PCT 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion_derived native grassland (5 credits); and
- direct impacts on 0.19 ha of PCT 567 - Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion woodland_moderate (10 credits).

The total number of ecosystem credits required to offset the proposed road upgrades is 16 credits.

Impacts to species credit species requiring offsets include:

- Bluegrass (15 species credits);
- Hawkweed (16 species credits);
- Silky Swainson-pea (16 species credits);
- Austral Toadflax (12 species credits);
- Pale-headed Snake (11 species credits);

- Bush Stone-curlew (11 species credits);
- Glossy Black-Cockatoo (breeding) (11 species credits);
- Eastern Pygmy Possum (11 species credits);
- Squirrel Glider (11 species credits); and
- Koala (breeding) (11 species credits).

The total number of species credits required to offset the proposed road upgrades is 125.

One TEC and candidate for SAILs, White Box Yellow Box Blakely's Red Gum Woodland was recorded within the subject land. This is assessed in Section 5.3 of this report with the impacts considered of low magnitude.

An assessment of the impacts of the project on MNES within the development site and subject land was prepared to determine whether referral of the project to the Commonwealth Minister for the Environment is required. The assessment concluded that no significant impacts on threatened entities are predicted to result from the project. Referral of the project to the Commonwealth Minister for the Environment for assessment is not required.

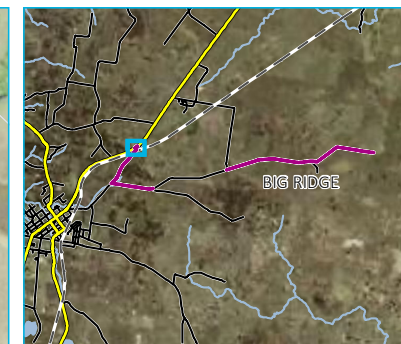
References

Commonwealth Department of the Environment and Heritage (DEH) 2006, *EPBC Act Policy Statement 3.5 - White box - yellow box - Blakely's red gum grassy woodlands and derived native grasslands*.

NSW Office of Environment and Heritage (OEH) 2017, *Biodiversity Assessment Method*.

Appendix A

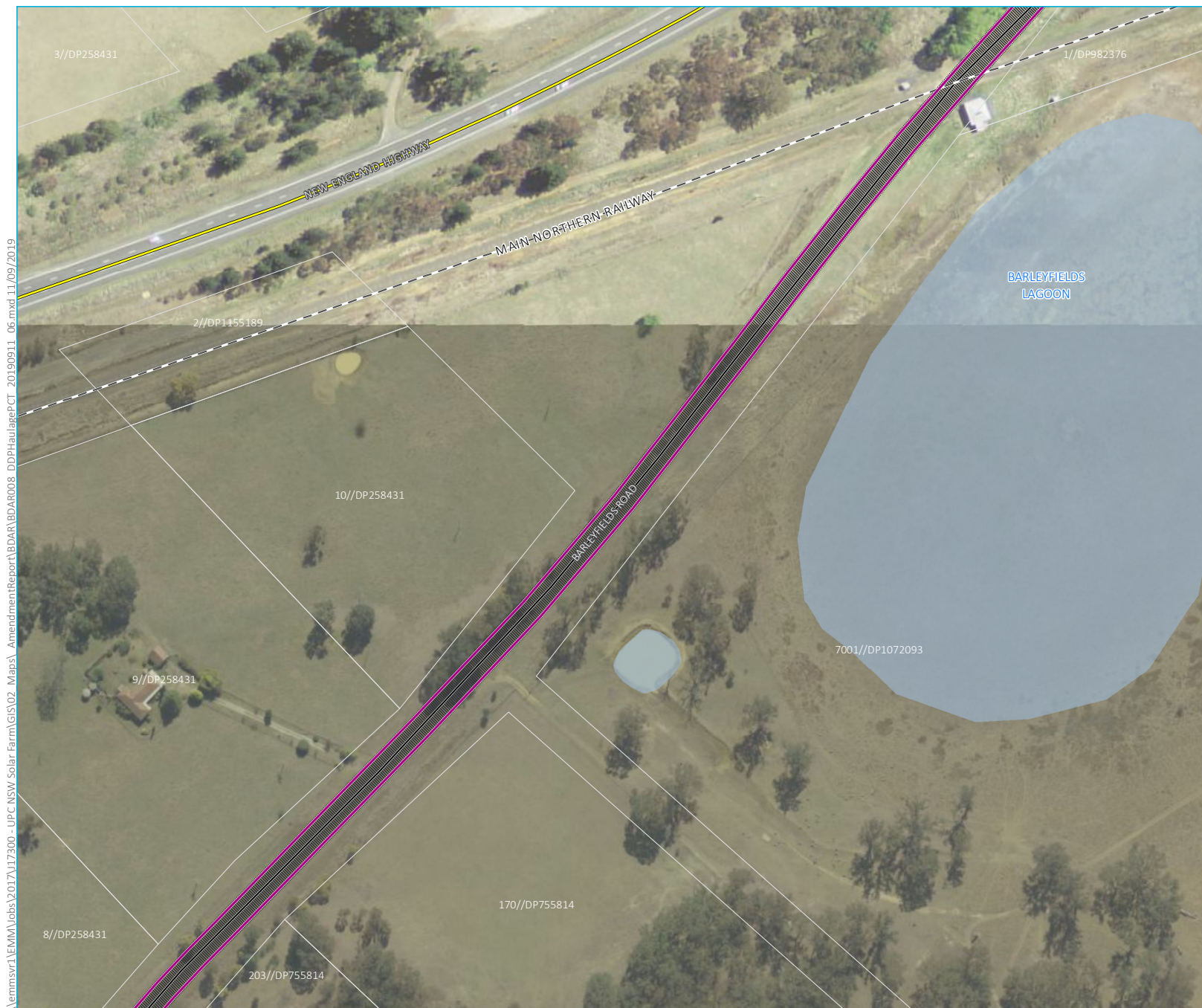
Plant community types and vegetation types within the subject land



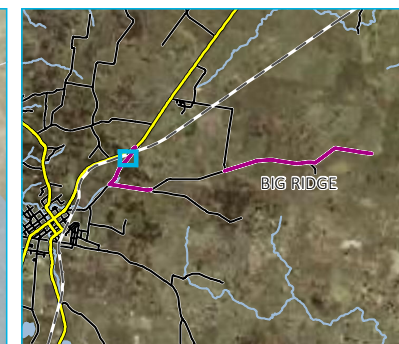
- KEY**
- Road upgrade disturbance boundary
 - Rail line
 - Main road
 - Local road
 - Vehicular track
 - Cadastral boundary
 - Maintained easment
 - Plant community type
 - Exotic grassland

Plant community types and
vegetation zones within the road
upgrade disturbance boundary

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Figure A.1



Source: EMM (2019); DFSI (2017); GA (2011)



KEY

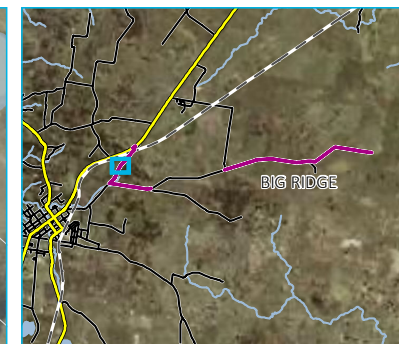
- Road upgrade disturbance boundary
- Rail line
- Main road
- Local road
- Cadastral boundary
- Maintained easment

Note: Vegetation mapping has been completed for the proposed disturbance boundary shown in this figure; however, existing disturbance from road construction and maintenance has reduced the level of clearance required. Where required, clearance in these areas will be restricted to minor areas that have been mapped but are not visible at this scale.

Plant community types and vegetation zones within the road upgrade disturbance boundary

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Figure A.2

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- KEY**
- Road upgrade disturbance boundary
 - Local road
 - Watercourse/drainage line
 - Cadastral boundary
 - Maintained easment

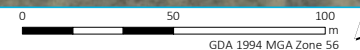
Note: Vegetation mapping has been completed for the proposed disturbance boundary shown in this figure; however, existing disturbance from road construction and maintenance has reduced the level of clearance required. Where required, clearance in these areas will be restricted to minor areas that have been mapped but are not visible at this scale.

Plant community types and vegetation zones within the road upgrade disturbance boundary

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Figure A.3



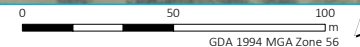
Source: EMM (2019); DFSI (2017); GA (2011)



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Source: EMM (2019); DFSI (2017); GA (2011)



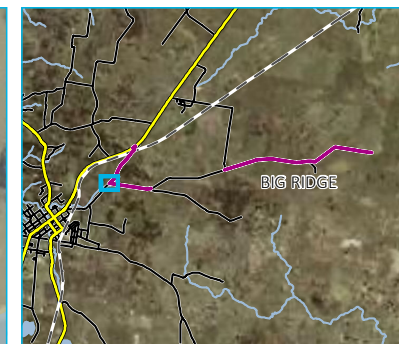
- KEY**
- Road upgrade disturbance boundary
 - Local road
 - Watercourse/drainage line
 - Cadastral boundary
 - Maintained easment

Note: Vegetation mapping has been completed for the proposed disturbance boundary shown in this figure; however, existing disturbance from road construction and maintenance has reduced the level of clearance required. Where required, clearance in these areas will be restricted to minor areas that have been mapped but are not visible at this scale.

Plant community types and vegetation zones within the road upgrade disturbance boundary

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Figure A.4

\\emmsvr1\EMM\Jobs\2017\17300 - UPC NSW Solar Farm\GIS\02 Maps\ AmendmentReport\BDAR\BOAR008 DDP\AulagePCT 20190911_06.mxd 11/09/2019



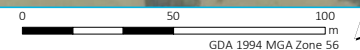
- KEY**
- Road upgrade disturbance boundary
 - Local road
 - Watercourse/drainage line
 - Cadastral boundary
 - Maintained easment
- Plant community type**
- 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (woodland, medium)
 - Exotic grassland

Plant community types and vegetation zones within the road upgrade disturbance boundary

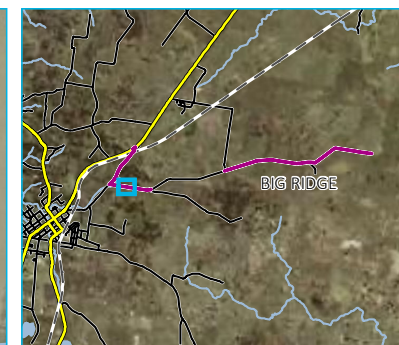
New England Solar Farm
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Figure A.5



Source: EMM (2019); DFSI (2017); GA (2011)



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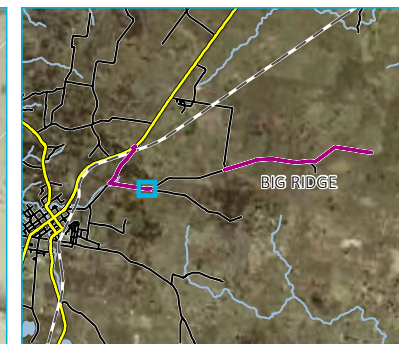


- KEY**
- Road upgrade disturbance boundary
 - Local road
 - Watercourse/drainage line
 - Cadastral boundary
 - Maintained easment
- Plant community type**
- 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (woodland, medium)
 - 567 - Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion (woodland, medium)
 - Exotic grassland

Plant community types and vegetation zones within the road upgrade disturbance boundary

New England Solar Farm
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Figure A.6

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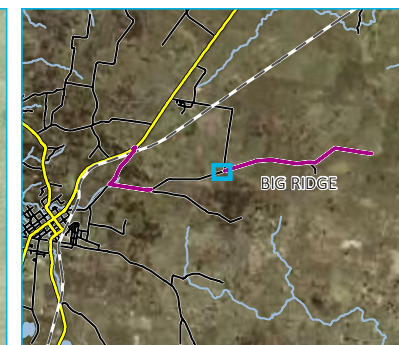


- KEY**
- Road upgrade disturbance boundary
 - Local road
 - Vehicular track
 - Cadastral boundary
 - Maintained easment
 - Plant community type**
 - 567 - Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion (woodland, medium)
 - Exotic grassland

Plant community types and vegetation zones within the road upgrade disturbance boundary

New England Solar Farm
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Figure A.7

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- KEY**
- Road upgrade disturbance boundary
 - Local road
 - Vehicular track
 - Watercourse/drainage line
 - Cadastral boundary
 - Maintained easment
- Plant community type**
- 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (woodland, medium)

Note: Vegetation mapping has been completed for the proposed disturbance boundary shown in this figure; however, existing disturbance from road construction and maintenance has reduced the level of clearance required. Where required, clearance in these areas will be restricted to minor areas that have been mapped but are not visible at this scale.

Plant community types and vegetation zones within the road upgrade disturbance boundary

New England Solar Farm
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Figure A.8

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- KEY
- Road upgrade disturbance boundary
 - Local road
 - Vehicular track
 - Watercourse/drainage line
 - Cadastral boundary
 - ▨ Maintained easment

Note: Vegetation mapping has been completed for the proposed disturbance boundary shown in this figure; however, existing disturbance from road construction and maintenance has reduced the level of clearance required. Where required, clearance in these areas will be restricted to minor areas that have been mapped but are not visible at this scale.

Plant community types and
vegetation zones within the road
upgrade disturbance boundary

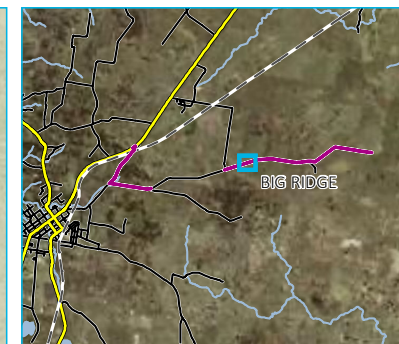
New England Solar Farm
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Figure A.9



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Source: EMM (2019); DFSI (2017); GA (2011)



KEY

- Road upgrade disturbance boundary
- Local road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- ▨ Maintained easment

Note: Vegetation mapping has been completed for the proposed disturbance boundary shown in this figure; however, existing disturbance from road construction and maintenance has reduced the level of clearance required. Where required, clearance in these areas will be restricted to minor areas that have been mapped but are not visible at this scale.

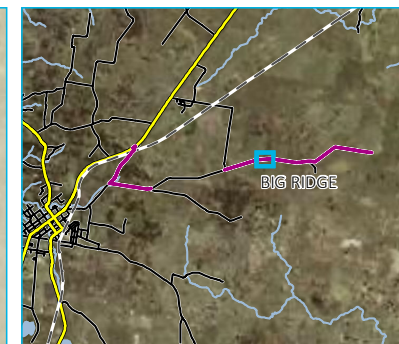
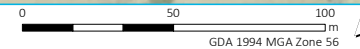
Plant community types and vegetation zones within the road upgrade disturbance boundary

New England Solar Farm
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Figure A.10

\\emmsvr1\EMM\Jobs\2017\17300 - UPC NSW Solar Farm\GIS\02 Maps\ AmendmentReport\BDAR\BOAR008 DDPH\au\agePCT 20190911_06.mxd 11/09/2019



Source: EMM (2019); DFSI (2017); GA (2011)



- KEY**
- Road upgrade disturbance boundary
 - Local road
 - Watercourse/drainage line
 - Cadastral boundary
 - ▨ Maintained easment
 - Plant community type**
 - 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (exotic grassland)
 - Exotic grassland

Note: Vegetation mapping has been completed for the proposed disturbance boundary shown in this figure; however, existing disturbance from road construction and maintenance has reduced the level of clearance required. Where required, clearance in these areas will be restricted to minor areas that have been mapped but are not visible at this scale.

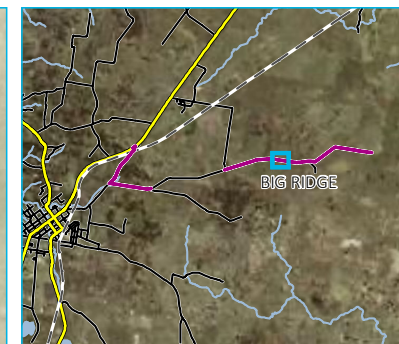
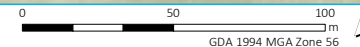
Plant community types and vegetation zones within the road upgrade disturbance boundary

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Figure A.11

\\lemmsvr1\EMM\Jobs\2017\17300 - UPC NSW Solar Farm\GIS\02 Maps\ AmendmentReport\BDAR\BOAR008 DDPH\au\agePCT 20190911_06.mxd 11/09/2019



Source: EMM (2019); DFSI (2017); GA (2011)



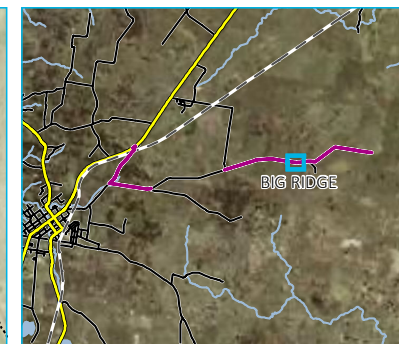
- KEY**
- Road upgrade disturbance boundary
 - Local road
 - Vehicular track
 - Watercourse/drainage line
 - Cadastral boundary
 - Maintained easment
- Plant community type**
- 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (exotic grassland)
 - Exotic grassland

Note: Vegetation mapping has been completed for the proposed disturbance boundary shown in this figure; however, existing disturbance from road construction and maintenance has reduced the level of clearance required. Where required, clearance in these areas will be restricted to minor areas that have been mapped but are not visible at this scale.

Plant community types and vegetation zones within the road upgrade disturbance boundary

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Figure A.12

\\emmsvr1\EMM\Jobs\2017\17300 - UPC NSW Solar Farm\GIS\02 Maps\AmendmentReport\BDAR\BDAR008 DDPHaulagePCT 20190911 06.mxd 11/09/2019



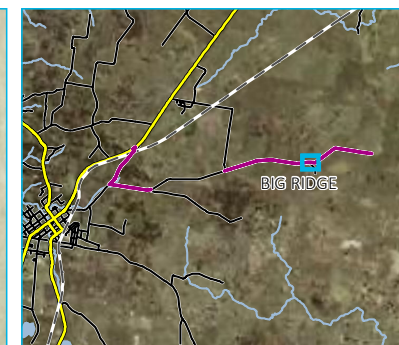
- KEY**
- Road upgrade disturbance boundary
 - Local road
 - Vehicular track
 - Watercourse/drainage line
 - Cadastral boundary
 - Maintained easment
- Plant community type**
- 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (exotic grassland)
 - Exotic grassland

Note: Vegetation mapping has been completed for the proposed disturbance boundary shown in this figure; however, existing disturbance from road construction and maintenance has reduced the level of clearance required. Where required, clearance in these areas will be restricted to minor areas that have been mapped but are not visible at this scale.

Plant community types and vegetation zones within the road upgrade disturbance boundary

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Figure A.13

\\emmsvr1\EMM\Jobs\2017\17300 - UPC NSW Solar Farm\GIS\02 Maps\ AmendmentReport\BDAR\BOAR008 DDPHaulagePCT 20190911_06.mxd 11/09/2019

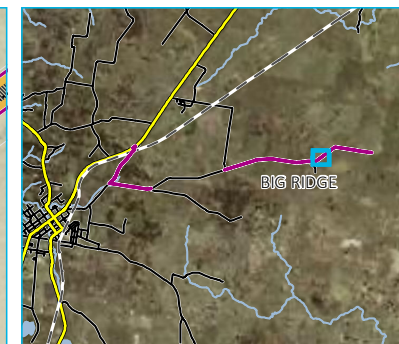


- KEY**
- Road upgrade disturbance boundary
 - Area divider
 - ➔ Eastern portion
 - ➔ Western portion
 - Local road
 - Vehicular track
 - Watercourse/drainage line
 - Cadastral boundary
 - Maintained easment
 - Plant community type**
 - 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (pasture)
 - Exotic grassland

Note: Vegetation mapping has been completed for the proposed disturbance boundary shown in this figure; however, existing disturbance from road construction and maintenance has reduced the level of clearance required. Where required, clearance in these areas will be restricted to minor areas that have been mapped but are not visible at this scale.

Plant community types and vegetation zones within the road upgrade disturbance boundary

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Figure A.14



- KEY**
- Road upgrade disturbance boundary
 - Vehicular track
 - Watercourse/drainage line
 - Cadastral boundary
 - Maintained easment
- Plant community type**
- 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (pasture)

Plant community types and
vegetation zones within the road
upgrade disturbance boundary

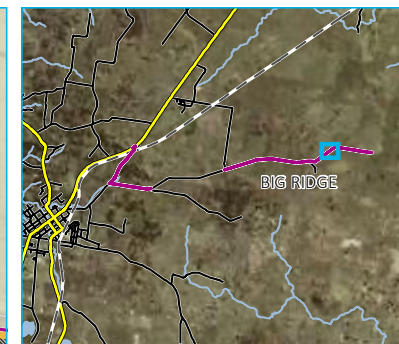
New England Solar Farm
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Figure A.15



\\lemmsvr1\EMM\Jobs\2017\17300 - UPC NSW Solar Farm\GIS\02 Maps\AmendmentReport\BDAR\BDAR008 DDPH\au\agePCT_20190911_06.mxd 11/09/2019



Source: EMM (2019); DFSI (2017); GA (2011)

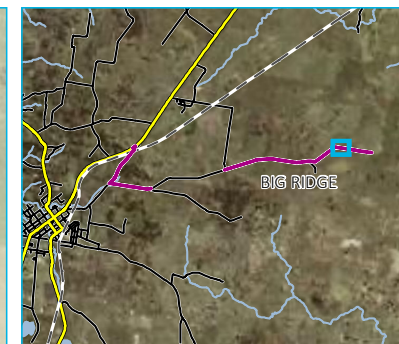


- KEY**
- Road upgrade disturbance boundary
 - Vehicular track
 - Watercourse/drainage line
 - Cadastral boundary
 - Maintained easment
- Plant community type**
- 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (pasture)

Plant community types and
vegetation zones within the road
upgrade disturbance boundary

New England Solar Farm
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Figure A.16

\\lemmsvr1\EMM\Jobs\2017\17300 - UPC NSW Solar Farm\GIS\02 Maps\ AmendmentReport\BDAR\BOAR008 DDPHaulagePCT 20190911_06.mxd 11/09/2019

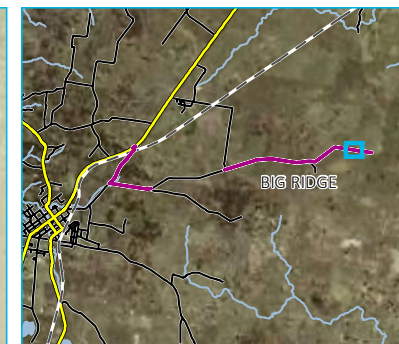


- KEY**
- Road upgrade disturbance boundary
 - Vehicular track
 - Cadastral boundary
 - Maintained easment
- Plant community type**
- 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (pasture)

Plant community types and
vegetation zones within the road
upgrade disturbance boundary

New England Solar Farm
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Figure A.17

\\lemmsvr1\EMM\Jobs\2017\17300 - UPC NSW Solar Farm\GIS\02 Maps\ AmendmentReport\BDAR\BOAR008 DDPH\au\agePCT 20190911_06.mxd 11/09/2019

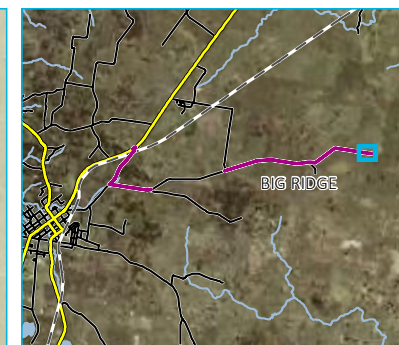
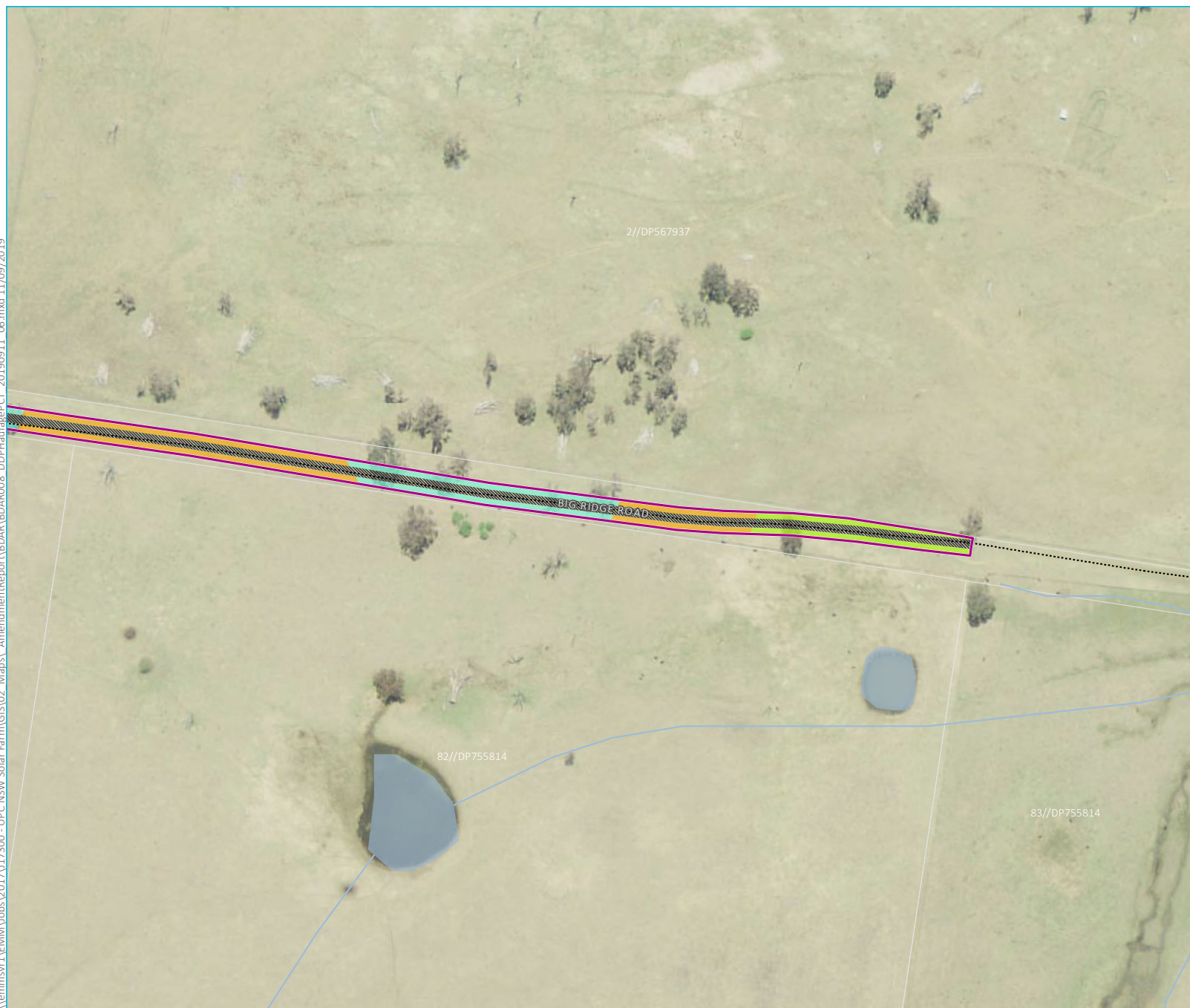


- KEY**
- Road upgrade disturbance boundary
 - Vehicular track
 - Cadastral boundary
 - Maintained easment
- Plant community type**
- 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (pasture)
 - 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (woodland)

Plant community types and vegetation zones within the road upgrade disturbance boundary

New England Solar Farm
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Figure A.18

\\lemmsvr1\EMM\Jobs\2017\17300 - UPC NSW Solar Farm\GIS\02 Maps\ AmendmentReport\BDAR\BOAR008 DDPHaulagePCT 20190911_06.mxd 11/09/2019



- KEY**
- Road upgrade disturbance boundary
 - Vehicular track
 - Watercourse/drainage line
 - Cadastral boundary
 - Maintained easment
- Plant community type**
- 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (pasture)
 - 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (woodland)
 - Exotic grassland

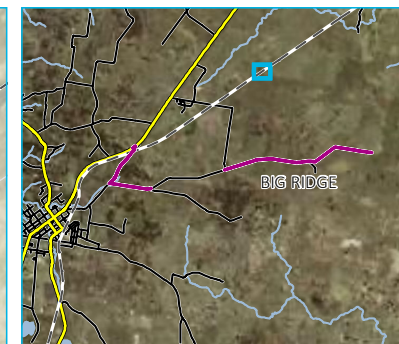
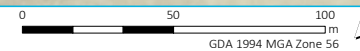
Plant community types and vegetation zones within the road upgrade disturbance boundary

New England Solar Farm
Biodiversity development assessment
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Figure A.19

\\lemmsvr1\EMM\Jobs\2017\17300 - UPC NSW Solar Farm\GIS\02 Maps\ AmendmentReport\BDAR\BOAR008 DDPHaulagePCT 20190911_06.mxd 11/09/2019



Source: EMM (2019); DFSI (2017); GA (2011)



KEY

- Hardstand
- Rail line
- Vehicular track
- Cadastral boundary
- Plant community type
- Exotic grassland

Plant community types and
vegetation zones within the
hardstand area

New England Solar Farm
Biodiversity development assessment
report addendum
Figure A.20

Appendix B

Credit reports

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00017140/BAAS17009/19/00017141	UPC road widening	30/08/2019
Assessor Name	Report Created	BAM Data version *
	10/09/2019	13
Assessor Number	BAM Case Status	Date Finalised
	Open	To be finalised
Assessment Revision	Assessment Type	
0	Major Projects	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAIL	Ecosystem credits
Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion								
1	510_woodland_moderate	100.0	0.0	0.25	High Sensitivity to Potential Gain	2.00	TRUE	1
2	510_dng	41.6	0.3	0.25	High Sensitivity to Potential Gain	2.00	TRUE	5

BAM Credit Summary Report

						Subtotal	6
Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion							
3	567_woodland_moderate	100.0	0.2	0.25	High Sensitivity to Potential Gain	2.00 TRUE	10
						Subtotal	10
						Total	16

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAIL	Species credits
Burhinus grallarius / Bush Stone-curlew (Fauna)						
510_woodland_moderate	100.0	0.02	0.25	2	False	1
567_woodland_moderate	100.0	0.19	0.25	2	False	10
					Subtotal	11
Calyptorhynchus lathami / Glossy Black-Cockatoo (Fauna)						
510_woodland_moderate	100.0	0.02	0.25	2	N/A	1
567_woodland_moderate	100.0	0.19	0.25	2	N/A	10
					Subtotal	11

BAM Credit Summary Report

<i>Cercartetus nanus / Eastern Pygmy-possum (Fauna)</i>						
510_woodland_moderate	100.0	0.02	0.25	2	False	1
567_woodland_moderate	100.0	0.19	0.25	2	False	10
					Subtotal	11
<i>Dichanthium setosum / Bluegrass (Flora)</i>						
510_dng	41.6	0.26	0.25	2	False	5
510_woodland_moderate	100.0	0.02	0.25	2	False	1
567_woodland_moderate	100.0	0.19	0.25	2	False	10
					Subtotal	16
<i>Hoplocephalus bitorquatus / Pale-headed Snake (Fauna)</i>						
510_woodland_moderate	100.0	0.02	0.25	2	False	1
567_woodland_moderate	100.0	0.19	0.25	2	False	10
					Subtotal	11
<i>Petaurus norfolcensis / Squirrel Glider (Fauna)</i>						
510_woodland_moderate	100.0	0.02	0.25	2	False	1

BAM Credit Summary Report

567_woodland_moderate	100.0	0.19	0.25	2	False	10
					Subtotal	11
<i>Phascolarctos cinereus / Koala (Fauna)</i>						
510_woodland_moderate	100.0	0.02	0.25	2	N/A	1
567_woodland_moderate	100.0	0.19	0.25	2	N/A	10
					Subtotal	11
<i>Picris evae / Hawkweed (Flora)</i>						
510_dng	41.6	0.26	0.25	2	False	5
510_woodland_moderate	100.0	0.02	0.25	2	False	1
567_woodland_moderate	100.0	0.19	0.25	2	False	10
					Subtotal	16
<i>Swainsona sericea / Silky Swainson-pea (Flora)</i>						
510_dng	41.6	0.26	0.25	2	False	5
510_woodland_moderate	100.0	0.02	0.25	2	False	1

BAM Credit Summary Report

567_woodland_moderate	100.0	0.19	0.25	2	False	10
					Subtotal	16
<i>Thesium australe / Austral Toadflax (Flora)</i>						
510_dng	41.6	0.26	0.25	1.5	False	4
510_woodland_moderate	100.0	0.02	0.25	1.5	False	1
567_woodland_moderate	100.0	0.19	0.25	1.5	False	7
					Subtotal	12

Appendix C

EPBC Act Protected Matters Likelihood of Occurrence

Table C.1 **Likelihood of occurrence assessment – threatened ecological communities**

Threatened Ecological Community	EPBC Act status	BC Act status ²	Likelihood of occurrence	Habitat preference	Rationale
New England Peppermint (<i>Eucalyptus nova-anglica</i>) Grassy Woodlands	CE	CE	Negligible	The ecological community occurs in northern NSW in the New England Tablelands. The tree canopy is typically dominated or co-dominated by New England Peppermint. Other associated tree species that may be present and may be co-dominant are Snow Gum (<i>Eucalyptus pauciflora</i>) and Mountain Gum (<i>Eucalyptus dalrympleana</i> subsp. <i>heptantha</i>). Understorey is made up of a dense, species-rich ground layer of grasses and herbs. Shrubs are typically sparse to absent. This ecological community mostly occupies sites in valley bottoms, flats or lower slopes, often in areas subject to cold air drainage. It may occur on basaltic, granitic or sedimentary substrates.	The species composition of the vegetation within the subject land is not consistent with this TEC. The PCTs within the subject land are not associated with this TEC.
Upland Wetlands of the New England Tablelands (New England Tableland Bioregion) and the Monaro Plateau (South Eastern Highlands Bioregion)	E	E	Negligible	The ecological community occurs in closed, high altitude topographic depressions that are not connected to rivers or streams. These wetlands occur on undulating, mostly basalt plateau with organic soils, forming in the lagoons, over dark chocolate loam. The distinguishing factor from other similar wetlands is the absence or near absence of peat underlying the vegetation, and the absence of heath through the wetland floor. Associated vegetation of this ecological community includes closed to mi-dense sedgeland and grassland. Deep lagoons tend to have vegetation on shores and shallow reaches whereas shallow wetlands have vegetation across the depression.	The species composition of the vegetation within the subject land is not consistent with this TEC. The PCTs within the subject land are not associated with this TEC.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CE	E	Present	This ecological community occurs along the western slopes and tablelands of the Great Diving Range through NSW in the New England Tableland. This ecological community can occur either as woodland or derived grassland. The ecological community must be, or have previously been, dominated or co-dominated by one or more of the following overstorey species: White Box (<i>Eucalyptus albens</i>), Yellow Box (<i>E. melliodora</i>) or Blakely's Red Gum (<i>E. blakelyi</i>). The community must have a predominately native understorey with 12 or more understorey species, shrubs are generally sparse or absent.	A total of 0.21 ha of Box Gum woodland, which meets the EPBC condition criteria, occurs within the subject land. An assessment of significance has been prepared for this community in Appendix D.

Table C.2 **Likelihood of occurrence assessment – threatened flora**

Scientific name	Common name	EPBC Act status ¹	BC Act status ²	Likelihood of occurrence	Habitat preference and rationale	Rationale
<i>Acacia pubifolia</i>	Velvet Wattle	V	E	Unlikely	Velvet Wattle occurs in NSW and Qld. In NSW it is known from two main populations, one north of Emmaville and the other near Warrabah National Park. The species prefers dry shrubby woodland on granite and metasediment soils.	This species is restricted to two locations that contain a very specific geology (granite and metasediment soils). The subject land lacks this geology and it is therefore unlikely that this species would occur.
<i>Cadellia pentastylis</i>	Ooline			Unlikely	This species occurs along the western edge of the North West Slopes from north of Gunnedah to west of Tenterfield. Also occurs in Queensland. The natural range of Ooline is from 24°S to 30°S in the 500 to 750 mm per annum rainfall belt. The species may form a closed or open canopy mixing with eucalypt and cypress pine species. There appears to be a strong correlation between the presence of Ooline and low- to medium-nutrient soils of sandy clay or clayey consistencies, with a typical soil profile having a sandy loam surface layer, grading from a light clay to a medium clay with depth.	No records of this species occur within the locality of the subject land. This species tends to occur further west near Gunnedah. It is therefore unlikely that this species would occur within the subject land.
<i>Callistemon pungens</i>	-	V	-	Unlikely	The species occurs from Inverell to the eastern escarpment in New England National Park. It occurs along rocky watercourses usually with sandy granite (or occasionally basalt) creek beds, and generally among naturalised species. Habitats range from riparian areas dominated by <i>Casuarina cunninghamiana</i> subsp. <i>cunninghamiana</i> to woodland and rocky shrubland. Flowering occurs over spring and summer, mostly in November.	The subject land lacks suitable rocky watercourses or sandy creek beds. Watercourses within the subject land lack suitable woodland or shrubland and are highly disturbed. This species was not recorded and is unlikely to occur within the subject land.

Table C.2 **Likelihood of occurrence assessment – threatened flora**

Scientific name	Common name	EPBC Act status ¹	BC Act status ²	Likelihood of occurrence	Habitat preference and rationale	Rationale
<i>Dichanthium setosum</i>	Bluegrass	V	V	Potential	Bluegrass occurs on the New England Tablelands. The species is associated with heavy basaltic black soils and stony red-brown hard-setting loam with clay subsoil. It is often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants, grazed land and highly disturbed pasture. Habitat is generally variously grazed, nutrient-enriched and water-enriched. The species overlaps the TEC White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.	Given this species can occur in disturbed areas and suitable soils types are present, this species has the potential to occur within the habitat adjacent to the subject land. An assessment of significance has been prepared for this species in Appendix D.
<i>Diuris pedunculata</i>	Small Snake Orchid	E	E	Unlikely	The Small Snake Orchid is confined to north east NSW, mainly found on the New England Tablelands. The species prefers moist areas, and has been found growing in open areas of dry sclerophyll forests with grassy understories, in riparian forests, swamp forests, and in sub-alpine grasslands and herbfields. It is not often found in dense forests or heavily shrubby areas. Soils are well-structure red-brown clay loams, although can also be found on peaty soils, or on shale and trap soils, on fine granite, and among boulders. Flowering occurs during August to October.	The subject land does not have the moist microhabitats preferred by this species. Furthermore, the closest record is 150 km from the subject land.
<i>Eucalyptus mckieana</i>	McKie's Stringybark	V	V	Unlikely	The McKie's Stringybark is confined to the drier western side of the New England Tablelands of NSW. It is found in grassy open forest or woodland on poor sandy loams, most commonly on gently sloping or flat sites. It o grows on a range of soil types, including deep clay loams but more commonly on sandy loams. The species overlaps the TEC White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.	The subject land is not on the drier western side of the New England Tablelands and therefore is out of the main species distribution of the species. This species is therefore unlikely to occur within the subject land.

Table C.2 **Likelihood of occurrence assessment – threatened flora**

Scientific name	Common name	EPBC Act status ¹	BC Act status ²	Likelihood of occurrence	Habitat preference and rationale	Rationale
<i>Eucalyptus nicholii</i>	Narrow-leaved Peppermint	V	V	Unlikely	Narrow-leaved Peppermint is sparsely distributed on the New England Tablelands. It occurs in grassy or sclerophyll woodland in association with many other eucalypts that grow in the area. It is often found on shallow soils of slopes and ridges, on infertile soils derived from granite or metasedimentary rock.	An examination of previous records indicate that the species has not been previously recorded within the locality. Nearest records occur to the east, near Armidale. The species is therefore considered unlikely to occur within subject land and the species was not recorded during the field surveys.
<i>Euphrasia arguta</i>		CE	CE	Unlikely	The species is known in the NSW north western slopes and tablelands. It grows in grassy areas near rivers at elevations up to 700 m above sea level, with an annual rainfall of 600 mm or regrowth vegetation following clearing of a firebreak.	The subject land is outside of the known range of the species. No suitable understorey vegetation is present. The habitat adjacent to the subject land is heavily grazed and disturbed, therefore the species is unlikely to occur.
<i>Haloragis exalata</i> subsp. <i>velutina</i>	Tall Velvet Sea-berry	V	V	Unlikely	Tall Velvet Sea-berry occurs on the north coast of NSW. It often occurs in damp places near watercourses and in woodland on steep rocky slopes. It is associated with the TEC White Box-Yellow Box-Blakely's Gum Grassy Woodland and Derived Native Grassland.	The subject land is highly disturbed as a result of historical grazing. The habitat is therefore considered to be unsuitable habitat for this species.
<i>Thesium australe</i>	Austral Toadflax	V	V	Potential	Austral Toadflax is found in very small populations scattered across eastern NSW. It occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. It is often found in association with Kangaroo Grass (<i>Themeda australis</i>).	Areas of box gum woodland may contain habitat for this species. An assessment of significance has been prepared for this species in Appendix D.

Notes: 1. EPBC and BC Act status: CE- critically endangered, E – endangered

Table C.3 **Likelihood of occurrence assessment – threatened fauna**

Scientific name	Common name	EPBC Act status ¹	BC Act status ²	Likelihood of occurrence	Habitat preference	Rationale
Birds						
<i>Anthochaera Phrygia</i>	Regent Honeyeater	CE	CE	Potential	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. These birds are also found in drier coastal woodlands and forests in some years. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany (<i>Eucalyptus robusta</i>) and Spotted Gum (<i>Corymbia maculata</i>) forests, particularly on the central coast and occasionally on the upper north coast. Birds are occasionally seen on the south coast.	The subject land is considered to contain suboptimal foraging habitat for the Regent Honeyeater. It is considered the species could potentially occur. An assessment of significance has been prepared for this species in Appendix D.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E	Unlikely	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (<i>Typha</i> spp.) and spikerushes (<i>Eleocharis</i> spp.).	The subject land does not contain suitable wetland or habitat. It is unlikely this species occurs within the subject land.
<i>Calidris ferruginea</i>	Curlew Sandpiper	CE	E	Unlikely	The Curlew Sandpiper is distributed around most of the Australian coastline, particularly in the Hunter Estuary within NSW. It mainly occurs on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters.	The subject land does not contain suitable wetland or estuarine habitat. It is unlikely this species occurs within the subject land.
<i>Erythrotriorchis</i>	Red Goshawk	V	CE	Unlikely	The Red Goshawk is endemic to Australia, sparsely	The subject land does not contain suitable permanent

Table C.3 **Likelihood of occurrence assessment – threatened fauna**

Scientific name	Common name	EPBC Act status ¹	BC Act status ²	Likelihood of occurrence	Habitat preference	Rationale
<i>radiatus</i>					distributed through northern and eastern Australia. It inhabits open woodland and forest, preferring a mosaic of vegetation types, large populations of birds (prey), and permanent water. They are often found in riparian habitats along or near watercourses or wetlands. Preferred habitats include mixed subtropical rainforest, <i>Melaleuca</i> swamp forest and riparian <i>Eucalyptus</i> forest of coastal rivers. Nests are made in tall trees within 1 km of a watercourse or wetland.	watercourses with suitable vegetation layers including mid-storey and understorey species.
<i>Grantiella picta</i>	Painted Honeyeater	V	V	Potential	The species is sparsely distributed from south-eastern Australia to north-western Queensland, with its greatest concentrations and breeding locations occurring on the inland slopes of the Great Dividing Range in NSW. It inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands of Black Box (<i>E. largiflorens</i>) and River Red Gum (<i>E. camaldulensis</i>), Box-Ironbark-Yellow Gum woodlands, Acacia-dominated woodlands, Paperbarks, Casuarina, Callitris, and trees on farmland or gardens. The species prefers woodlands which contain a higher number of mature trees, as these host more mistletoes. It is more common in wider blocks of remnant woodland than in narrower strips although it breeds in quite narrow roadside strips if ample mistletoe fruit is available.	The subject land contains suboptimal habitat for the Painted Honeyeater. It is considered the species could potentially occur. An assessment of significance has been prepared for this species in Appendix D.
<i>Hirundapus caudacutus</i>	White-throated Needletail	Mi, M, V		Potential	The White-throated Needletail is widespread in eastern and south-eastern Australia. In NSW this species extends inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland.	The species does not breed within Australia. Sub-optimal foraging habitat occurs within the subject land; therefore, the species could potentially occur. An assessment of significance has been prepared for this species in Appendix D.

Table C.3 **Likelihood of occurrence assessment – threatened fauna**

Scientific name	Common name	EPBC Act status ¹	BC Act status ²	Likelihood of occurrence	Habitat preference	Rationale
<i>Lathamus discolor</i>	Swift Parrot	CE	E	Potential	The Swift Parrot breeds in Tasmania during spring and summer, then migrates in the autumn and winter months to south-eastern Australia. In NSW, it mostly occurs on the coast and south-west slopes in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood (<i>C. gummifera</i>), Mugga Ironbark and White Box. Commonly used lerp infested trees include Inland Grey Box, Grey Box (<i>E. moluccana</i>) and Blackbutt (<i>E. pilularis</i>).	The subject land is considered to contain suboptimal habitat for the Swift Parrot. It is considered the species could potentially occur. An assessment of significance has been prepared for this species in Appendix D.
<i>Rostratula australis</i>	Australian Painted-snipe	E	E	Unlikely	The Australian Painted Snipe is restricted to Australia, most records from the south east, particularly the Murray Darling Basin. The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. The species also uses inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Nests are made on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	The subject land does not contain suitable wetland habitat. Therefore, it is unlikely this species occurs.
Frogs						
<i>Litoria castanea</i>	Yellow-spotted Tree Frog	E	CE	Unlikely	The Yellow-spotted Tree Frog is known from the New England Tableland. The species requires large permanent ponds or slow flowing 'chain-of-ponds' streams with abundant emergent vegetation such as bulrushes and aquatic vegetation. During breeding season, males call at night from the open water. During autumn and winter the Yellow-spotted Tree Frog shelters under fallen timber, rocks, other debris or thick vegetation.	The subject land lacks necessary aquatic habitat for this species, as such, this species is considered unlikely to occur.
Mammals						

Table C.3 **Likelihood of occurrence assessment – threatened fauna**

Scientific name	Common name	EPBC Act status ¹	BC Act status ²	Likelihood of occurrence	Habitat preference	Rationale
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Unlikely	In NSW this species has been recorded from a large range of vegetation types including: dry and wet sclerophyll forest; Cyprus Pine (<i>Callitris glauca</i>) dominated forest; tall open eucalypt forest with a rainforest sub-canopy; sub-alpine woodland; and sandstone outcrop country. The species requires a combination of sandstone cliff/escarpment to provide roosting habitat that is adjacent to higher fertility sites, particularly box gum woodlands or river/rainforest corridors which are used for foraging.	The subject land does not contain suitable roosting habitat, lacking caves and sandstone cliffs. Therefore, it is unlikely the species occurs.
<i>Dasyurus maculatus maculatus</i> (SE mainland population)	Spotted-tailed Quoll	E	V	Unlikely	This species has been recorded from a wide range of habitats, including: coastal heathlands, open and closed eucalypt woodlands, wet sclerophyll and lowland forests (OEH, 2017). Unlogged forest or forest that has been less disturbed by timber harvesting is preferable. Habitat requirements include suitable den sites such as hollow logs, tree hollows, rocky outcrops or caves. Individuals require an abundance of food, such as birds and small mammals, and large areas of relatively intact vegetation through which to forage. Home ranges are estimated to be 620–2,560 ha for males and 90–650 ha for females.	The subject land does not contain any suitable den habitat for the Spotted-tailed Quoll. The subject land is highly fragmented with habitat degradation due to livestock grazing. No suitable den sites were observed during the surveys.

Table C.3 **Likelihood of occurrence assessment – threatened fauna**

Scientific name	Common name	EPBC Act status ¹	BC Act status ²	Likelihood of occurrence	Habitat preference	Rationale
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	V	Unlikely	Inhabits a variety of vegetation types, including mallee, Bull Oak and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Roosts in tree hollows, crevices, and under loose bark. A slow flying agile bat, utilising the understorey to hunt non-flying prey - especially caterpillars and beetles - and will even hunt on the ground. The species has also been found to be much more abundant in habitats that have a distinct tree canopy and a dense, cluttered understorey layer.	Examination of previous records of this species indicates that this species has not previously been recorded within the locality, with its distribution occurring west of the subject land. This species is therefore considered unlikely to occur.
<i>Petauroides volans</i>	Greater Glider	V	-	Unlikely	The Greater Glider is restricted to eastern Australia. The Greater Glider is an arboreal nocturnal marsupial largely restricted to eucalypt forests and woodlands. It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. During the day it shelters in tree hollows, with a particular selection for large hollows in large, old trees.	The Greater Glider is unlikely to occur within the subject land as they favour moist eucalypt forests with dense cover and old trees. The habitat is highly degraded and grazed lacking vegetation cover and large patches of suitable eucalypt forest. As such, this species is considered unlikely to occur.

Table C.3 **Likelihood of occurrence assessment – threatened fauna**

Scientific name	Common name	EPBC Act status ¹	BC Act status ²	Likelihood of occurrence	Habitat preference	Rationale
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	V	E	Unlikely	In NSW the Brush-tailed Rock Wallaby occurs from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. This species occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. The Brush-tailed Rock Wallaby browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. The Brush-tailed Rock Wallaby is most active at night, spending day time sheltering/basking in rock crevices, caves and overhangs.	The subject land lacks rocky escarpments and cliffs with complex structures. Vegetation within the subject land is highly disturbed by grazing, lacking shrubs and dense understorey. Therefore, it is unlikely the Brush-tailed Rock-wallaby utilises this habitat.
<i>Phascolarctos cinereus</i>	Koala	V	V	Potential	The Koala has a fragmented distribution throughout eastern Australia. Within NSW it mainly occurs on the central and north costs with some populations in the west of the Great Diving Range. Koalas inhabit a range of temperate, sub-tropical and topical forest, woodland and semi-arid communities dominated by Eucalypt species (DoEE 2012). Koalas feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species (OEH 2018). Distribution is affected by altitude, temperature and leaf moisture.	The subject land contains Koala feed tree species, including Ribbon Gum (<i>Eucalyptus viminalis</i>). An assessment of significance has been prepared for this species in Appendix D.

Table C.3 **Likelihood of occurrence assessment – threatened fauna**

Scientific name	Common name	EPBC Act status ¹	BC Act status ²	Likelihood of occurrence	Habitat preference	Rationale
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Unlikely	The Grey-headed Flying-fox is generally found within 200 km of the eastern coast of Australia. They occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. This species feeds on the nectar and pollen of native trees, in particular <i>Eucalyptus</i> , <i>Melaleuca</i> and <i>Banksia</i> , and fruits of rainforest trees and vines.	Although this species has been occasionally recorded on the tablelands any occurrence is likely to be transient, preferring areas close to the coast. Camps of this species are considered unlikely to occur within proximity to the subject land.
Reptiles						
<i>Uvidicolus sphyrurus</i>	Border Thick-tailed Gecko	V	V	Unlikely	The Border Thick-tailed Gecko is found only on the tablelands and slopes of northern NSW and southern Queensland. The species is most common in the granite country of the New England Tablelands. This species often occurs on steep rocky or scree slopes, especially granite. Favouring forest and woodland areas with boulders, rock slabs, fallen timber and deep leaf litter. Commonly found in areas which often have a dense tree canopy, helping create a sparse understorey. The Border Thick-tailed Gecko is active during the night, sheltering by day under rock slabs, in or under logs, and under the bark of standing trees.	The habitat adjacent to the subject land lacks suitable dense canopy and has a paucity of suitable shelter site, with insufficient rock and woody debris. Furthermore, there are no records of the species within the vicinity of the subject land. As such, this species is considered unlikely to occur.

Table C.3 **Likelihood of occurrence assessment – threatened fauna**

Scientific name	Common name	EPBC Act status ¹	BC Act status ²	Likelihood of occurrence	Habitat preference	Rationale
<i>Wollumbinia belli</i>	Bell's Turtle	V	-	Unlikely	Within NSW, the species is found in the upper reaches of the Namoi, Gwydir and MacDonald Rivers on the North West Slopes. The Bell's Turtle inhabits narrow sections of rivers in granite country, preferring shallow to deep pools in upper reaches or small tributaries of major rivers. Favoured pools are generally less than 3 m deep, where there is a sandy or rocky substrate with small patches of weed. Much of the species habitat is now in grazing land where introduced willow trees grow alongside gum trees on the river banks. Nests are dug out in riverbanks of sand or loam between September and January.	The habitat adjacent to the subject land does not contain suitable aquatic habitat for the species. Nearby watercourses are outside of the known catchments where this species occurs. As such, this species is considered unlikely to occur.
Fish						
<i>Maccullochella peelii</i>	Murray Cod	V	-	Unlikely	The Murray Cod is endemic to the Murray-Darling River system in south-eastern Australia. It occurs in a range of flowing and standing waters, from small, clear rocky streams on the inland slopes and uplands of the Great Dividing Range, to the large turbid, meandering slow-flowing rivers, creeks, anabranches, and lakes and larger billabongs, of the inland plains of the Murray Darling Basin. Within these habitats they are often associate with complex structural cover such as large rocks, large snags and smaller structural woody habitat, undercut banks and over-hanging vegetation.	No suitable aquatic habitat is present within the subject land. As such, this species is considered unlikely to occur.

Notes: 1. EPBC and BC Act status: CE- critically endangered, E – endangered, V – vulnerable

Table C.4 **Likelihood of occurrence assessment – migratory species**

Scientific name	Common name	EPBC Act status1	BC Act status2	Likelihood of occurrence	Habitat preference and rationale
Migratory marine birds					
<i>Apus pacificus</i>	Fork-tailed Swift	Mi, M	-	Potential	The Fork-tailed Swift has been recorded in all regions within NSW. Many records occur east of the Great Divide, however some populations have been found west. The Fork-tailed Swift is almost exclusively aerial. Within Australia they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands. Habitats include riparian woodland and tea-tree swamps, low scrub and heathland or saltmarsh. Sometimes they can occur above rainforests, wet sclerophyll forest or open forest. The species does not breed within Australia. The habitat within the subject land may represent sub-optimal foraging habitat for this species. An assessment of significance has been prepared for this species in Appendix D.
Migratory terrestrial species					
<i>Monarcha melanopsis</i>	Black-faced Monarch	Mi, M	-	Unlikely	The Black-faced Monarch occurs around the eastern slopes and tablelands of the Great Divide. It mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland and warm temperate rainforest. It is also found in nearby open eucalypt forests, including in gullies with a dense, shrubby understorey as well as in dry sclerophyll forests and woodlands, often with a patchy understorey. The subject land lacks suitable dense shrubby vegetation for this species. As such, this species is considered unlikely to occur.
<i>Motacilla flava</i>	Yellow Wagtail	Mi, M	-	Unlikely	This species occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra. The subject land is highly disturbed and lacks suitable wet habitats for this species. As such, this species is considered unlikely to occur.

Table C.4 **Likelihood of occurrence assessment – migratory species**

Scientific name	Common name	EPBC Act status1	BC Act status2	Likelihood of occurrence	Habitat preference and rationale
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	Mi, M	-	Unlikely	The subject land is highly disturbed and is lacking suitable dense shrubby vegetation for this species. As such, this species is considered unlikely to occur. The Satin Flycatcher is widespread in eastern Australia and vagrant to New Zealand. Satin Flycatchers inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands. They also occur in eucalypt woodlands with open understorey and grass ground cover and are generally absent from rainforest. The species is mainly recorded in eucalypt forests dominated by Brown Barrel (<i>Eucalypt fastigata</i>), Mountain Gum (<i>E. Dalrympleana</i>), Mountain Grey Gum, Narrow-leaved Peppermint, Messmate or Manna Gum, or occasionally Mountain Ash (<i>E. Regnans</i>). Such forests usually have a tall shrubby understorey of tall acacias, for example Blackwood (<i>Acacia melanoxylon</i>).
<i>Rhipidura rufifrons</i>	Rufous Fantail	Mi, M	-	Unlikely	The subject land lacks suitable dense shrubby vegetation for this species, as such, this species is considered unlikely to occur. In east and south-east Australia, the Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as Tallow-wood (<i>Eucalyptus microcorys</i>), Mountain Grey Gum (<i>E. cypellocarpa</i>), Narrow-leaved Peppermint (<i>E. radiata</i>), Mountain Ash (<i>E. regnans</i>), Alpine Ash (<i>E. delegatensis</i>), Blackbutt (<i>E. pilularis</i>) or Red Mahogany (<i>E. resinifera</i>); usually with a dense shrubby understorey often including ferns.

Migratory wetlands species

Table C.4 **Likelihood of occurrence assessment – migratory species**

Scientific name	Common name	EPBC Act status1	BC Act status2	Likelihood of occurrence	Habitat preference and rationale
<i>Actitis hypoleucos</i>	Common Sandpiper	Mi, M	-	Unlikely	The Common Sandpiper is found along all coastlines of Australia and in many areas inland. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper forages in shallow water and on bare soft mud at the edges of wetlands. Roosting sites are typically on rocks or in roots or branches of vegetation, especially mangroves. The species is also associated with mangroves, and sometimes found in areas of mud littered with rocks or snags.
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Mi, M	-	Unlikely	The Sharp-tailed Sandpiper spends its non-breeding season in Australia. During this time the species is widespread along much of the coast and is very sparsely scattered inland, particularly in central and south-western regions. Within Australia the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast. They also use flooded paddocks, sedgeland and other ephemeral wetlands. Roosting occurs at the edges of wetlands, on wet open mud or sand, in shallow water or in sparse vegetation.

Table C.4 **Likelihood of occurrence assessment – migratory species**

Scientific name	Common name	EPBC Act status1	BC Act status2	Likelihood of occurrence	Habitat preference and rationale
<i>Calidris ferruginea</i>	Curlew Sandpiper	CE, Mi, M	-	Unlikely	Mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters. The subject land lacks suitable wetland habitat, as such, this species is considered unlikely to occur.
<i>Calidris melanotos</i>	Pectoral Sandpiper	Mi, M	-	Unlikely	The Pectoral Sandpiper prefers shallow fresh to saline wetlands. It is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. They forage in shallow water or soft mud at the edge of wetlands. The subject land lacks suitable wetland habitat for the Pectoral Sandpiper. As such, this species is considered unlikely to occur within the subject land.
<i>Gallinago hardwickii</i>	Latham's Snipe	Mi, M	-	Unlikely	Latham's Snipe extends inland over the eastern tablelands in south-eastern Queensland and to west of the Great Dividing Range in NSW. Within Australia it occurs in permanent and ephemeral wetlands, usually favouring open, freshwater wetlands with low, dense vegetation. They also occur in habitats with saline or brackish water, in modified or artificial habitats and areas located close to humans. It occurs in temperate and tropical regions of Australia. Foraging occurs in areas of mud and some form of cover. Roosting occurs on the ground near foraging areas, usually in sites providing some ditches or plough marks, among boulders or in shallow water. The subject land lacks suitable wetland habitat, as such, this species is considered unlikely to occur.

Table C.4 **Likelihood of occurrence assessment – migratory species**

Scientific name	Common name	EPBC Act status1	BC Act status2	Likelihood of occurrence	Habitat preference and rationale
Pandion haliaetus	Osprey	Mi, M		Unlikely	The Osprey is found right around the Australian coastline, common around the northern coast on rocky shorelines, islands and reefs. The species favours coastal areas, especially the mouths of large rivers, lagoons and lakes. The Osprey occurs in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia. They require extensive areas of open fresh, brackish or saline water for foraging. The subject land is outside the mapped range for the species. No suitable aquatic habitat is present. As such, this species is considered unlikely to occur.
Tringa nebularia	Common Greenshank	Mi, M		Unlikely	The Common Greenshank has been recorded within NSW in most coastal regions. It is widespread west of the Great Dividing Range. The species is found in a variety of inland wetlands and sheltered coastal habitats, varying in salinity. Habitats include embayments, harbours, river estuaries, deltas and lagoons. The edges of the wetlands occupied are generally of mud or clay, occasionally of sand, and may be bare of with emergent or fringing vegetation, including short sedges and saltmarsh, mangroves. The subject land lacks suitable wetland habitat, as such, this species is considered unlikely to occur.

Notes: 1. EPBC and BC Act status: CE- critically endangered, Mi – migratory, M – marine.

Appendix D

EPBC Act assessments of significance

This section includes an assessment of the potential direct and indirect impacts of the proposed action on MNES. The direct impact of the project is the clearance of vegetation. The impact assessment for this project assumes complete disturbance/removal of 38.2 ha of woodland habitat within the development site in addition to 0.34 ha of woodland and 1.39 ha of derived grasslands associated with the subject land. Where the species has the potential to occur in both the development site and the subject land, cumulative impacts have been considered.

The following section provides the criteria that must be considered in the assessment of all threatened species listed under the EPBC Act.

D.1 Significance impact guidelines

In determining the significance of impact associated with the project, the relevant criteria listed in the *Matters of National Environmental Significance – Significance Impact Guidelines 1.1* (DoE) (2013) was applied. This assessment has been undertaken for the following MNES values:

- critically endangered ecological community: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland;
- vulnerable plant species: Bluegrass and Austral Toadflax;
- critically endangered fauna species: Regent Honeyeater and Swift Parrot;
- vulnerable fauna species: Painted Honeyeater and the Koala; and
- migratory species: Fork-tailed swift and White-throated Needletail.

D.1.1 Significant impact criteria for critically endangered and endangered ecological communities

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- reduce the extent of an ecological community;
- fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;
- adversely affect habitat critical to the survival of an ecological community;
- modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;
- cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;
- cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
 - assisting invasive species, that are harmful to the listed ecological community, to become established;
 - or

- causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community; or
- interfere with the recovery of an ecological community.

D.1.2 Significant impact criteria for critically endangered and endangered species

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

- lead to a long-term decrease in the size of a population;
- reduce the area of occupancy of the species;
- fragment an existing population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population;
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;
- introduce disease that may cause the species to decline; or
- interfere with the recovery of the species.

D.1.3 Significant impact criteria for vulnerable species

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

- lead to a long-term decrease in the size of an important population of a species;
- reduce the area of occupancy of an important population;
- fragment an existing important population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of an important population;
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat;
- introduce disease that may cause the species to decline; or

- interfere substantially with the recovery of the species.

D.1.4 Significant impact criteria for migratory species

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

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;
- result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

D.2 Assessments of significance

Significant impact assessments have been prepared for species listed under the EPBC Act, in accordance with the criteria above.

D.2.1 White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

White Box Yellow Box Blakely's Red Gum Woodland (commonly referred to as Box-Gum Woodland) is an open woodland community (sometimes occurring as a forest formation), in which the most obvious species are one or more of the following: White Box *Eucalyptus albens*, Yellow Box *E. melliodora* and Blakely's Red Gum *E. blakelyi*. Intact sites contain a high diversity of plant species, including the main tree species, additional tree species, some shrub species, several climbing plant species, many grasses and a very high diversity of herbs. The community also includes a range of mammal, bird, reptile, frog and invertebrate fauna species. Intact stands that contain diverse upper and mid-storeys and groundlayers are rare.

Modified sites include the following:

- areas where the main tree species are present ranging from an open woodland formation to a forest structure, and the groundlayer is predominantly composed of exotic species; and
- sites where the trees have been removed and only the grassy groundlayer and some herbs remain.

Areas that are part of the Australian Government listed ecological community must have either:

- an intact tree layer and predominately native ground layer; or
- an intact native ground layer with a high diversity of native plant species but no remaining tree layer.

The vegetation assessment identified areas of woodland within the development site and subject land. However, due to historical disturbance the majority of this vegetation was found to be degraded and lacked many of the features of good quality woodland such as an intact canopy, midstory and groundcover. The assessment determined that only the better-quality areas of woodland within the road upgrade disturbance area with an intact canopy are likely to meet the EPBC listing criteria. It is therefore estimated that approximately 0.21 ha of this vegetation type will require removal. An assessment of significance has been prepared to address these impacts in accordance with the EPBC significant impact guidelines in Table D.1.

Table D.1 **Assessment of significance for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland**

Criteria	Discussion
1: reduce the extent of an ecological community	The total removal of up to 0.21 ha of vegetation commensurate with White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland will occur.
2: fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	The road upgrades will require vegetation clearing within an existing road reserve where the vegetation is already substantially fragmented by historical land clearing activities. The proposed road upgrades would therefore result in a minor increase in fragmentation of this community within the locality.

Table D.1 Assessment of significance for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Criteria	Discussion
3: adversely affect habitat critical to the survival of an ecological community	There is no critical habitat listed for this community. Critical habitat refers to areas critical to the survival of the ecological community and includes areas necessary for: • Recovery of the ecological community • Maintenance of genetic diversity and long-term evolutionary development; and • Reintroduction of the ecological community. The area of vegetation to be removed consists of a narrow margin of roadside vegetation that is already highly fragmented and disturbed. The majority of woodland will not be impacted and contribution to the persistence of the community.
4: modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	Given that the road upgrade involves mainly widening of an existing road, this is unlikely to modify or destroy abiotic (non-living) factors necessary for survival of the ecological community within the locality. The development is unlikely to affect groundwater levels, or substantial alteration of surface water drainage patterns.
5: cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	The road upgrade will require removal of a small number of trees and shrubs from the existing road reserve. Edge effects are likely to be similar following completion of the development and therefore composition of the community is unlikely to be substantially altered.
6a: cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: • assisting invasive species, that are harmful to the listed ecological community, to become established	There is potential for works associated with road upgrade to increase the spread of weeds throughout the study area. The risk of weed introduction can be managed through appropriate control measures. Provided appropriate weed control measures are adhered to it is unlikely that the proposal would cause a substantial reduction in the quality or integrity of the community.
6b: causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or	Existing agricultural activities in the surrounding locality may already result in occasional mobilisation of fertilisers, herbicides or other chemicals or pollutants. The development would not result in additional regular mobilisation of fertilisers, herbicides or other chemicals or pollutants. Provided that standard environmental management measures are implemented during the construction phase of the project, it is unlikely that chemicals or pollutants will be introduced into the community.
7: interfere with the recovery of an ecological community.	A national recovery plan has been prepared for this community. Mitigation measures such as weed control and vehicle hygiene protocols should also be implemented throughout the construction process to further minimise impacts to the community and maximise natural recovery within the locality.

Table D.1 Assessment of significance for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Criteria	Discussion
Conclusion	Based on the consideration of the above assessment criteria it is unlikely that the proposal will have a significant impact on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland as The removal of vegetation for the proposal would comprise only a minor fraction of this woodland in the wider locality. The road upgrade will not result in any substantial further fragmentation and/or isolation of any patches of the community beyond what already exists along the existing roadsides. The development would not cause a substantial reduction in the extent, quality or integrity of an occurrence of the community The development would not modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for the community's survival The development would not adversely affect habitat critical to the survival of the community The area to be impacted by the development is relatively small compared to the extent of the community likely to be present in the locality and as such would be unlikely to interfere with the recovery of the community.

D.2.2 Bluegrass (*Dicanthium setosum*)

Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, extending to northern Queensland. It occurs widely on private property, including in the Inverell, Guyra, Armidale and Glen Innes areas.

The species is mainly associated with heavy basaltic black soils and red-brown loams with clay subsoil. It is often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. The species is often collected from disturbed open grassy woodlands on the northern tablelands, where the habitat has been variously grazed, nutrient-enriched and water-enriched). It is open to question whether the species tolerates or is promoted by a certain amount of disturbance, or whether this is indicative of the threatening processes behind its depleted habitat. Associated species include *Eucalyptus albens*, *Eucalyptus melanophloia*, *Eucalyptus melliodora*, *Eucalyptus viminalis*, *Myoporum debile*, *Aristida ramosa*, *Themeda triandra*, *Poa sieberiana*, *Bothriochloa ambigua*, *Medicago minima*, *Leptorhynchos squamatus*, *Lomandra aff. longifolia*, *Ajuga australis*, *Calotis hispidula* and *Austrodanthonia*, *Dichopogon*, *Brachyscome*, *Vittadinia*, *Wahlenbergia* and *Psoralea* species. The species is locally common or found as scattered clumps in broader populations. The extensive distribution and wide environmental tolerances make predictions about suitable habitat difficult.

Assessment of Bluegrass within the development site, concluded that Bluegrass is unlikely to occur based on the degradation of the habitat, high livestock grazing pressure and lack of any individuals being recorded during targeted surveys.

The vegetation condition within the road upgrade disturbance area contains better quality habitat, which has a moderate possibility of containing a population of the species. Furthermore, targeted survey have not been undertaken. It is estimated that the road upgrades could potentially remove 0.47 ha of habitat (0.21 ha of woodland and 0.26 ha of derived grasslands) for this species. An assessment of significance for removal of this habitat has been prepared in accordance with the relevant EPBC significant impact guidelines in Table D.2.

Table D.2 Assessment of significance for Bluegrass

Criteria	Discussion
1: long-term decrease in population size	Due to habitat degradation and livestock grazing no areas within the road upgrade disturbance area are likely to contain optimal habitat for Bluegrass. Given that the road upgrade disturbance area will impact a small area of suboptimal habitat (0.47 ha) this is unlikely to cause a long-term decrease in the size of a local population.
2: reduce area of occupancy	It is unlikely that the loss of a small area of potential habitat (0.47 ha) will significantly reduce the occupancy of bluegrass within the road upgrade disturbance area. The impact on the potential occupancy area of this species is considered negligible.
3: fragment a population	The vegetation within the road upgrade disturbance area is fragmented and subject to disturbance. If bluegrass has been able to persist in such an over-cleared landscape it is unlikely that the loss of a small linear area of habitat (0.47 ha) would cause significant further fragmentation of a local population.
4: adversely affect critical habitat	No critical habitat has been defined for the species. Given that the habitat to be removed is considered to be degraded and there are no records of the species within the vicinity, it is unlikely that this habitat is critical to the survival of Bluegrass.
5: disrupt the breeding cycle of a population	The habitat to be removed is limited to a narrow strip either side of an existing carriageway. A substantial amount of habitat will remain which will allow for uninterrupted propagation of the species.
6: decrease availability or quality of habitat	The road upgrades will disturb a small area of suboptimal potential habitat (0.47 ha) for the species. Much large areas of similar habitat will be retained within the road reserve and wider vicinity.
7: result in invasive species	Without management, the increased machinery required during the construction of the project, has the potential to introduce novel weeds to the area. Weed control protocols will be undertaken in accordance with the BMP/CEMP, in order to minimise this risk.
8: introduce disease	This species is not known to be particularly susceptible to disease and the project will not introduce any disease relevant to the species.
9: interfere with recovery	Given that the habitat to be removed is considered to be suboptimal and does not include a known population of the species, it is unlikely that this habitat is important to the recovery of Bluegrass within the locality.
Conclusion	The project is unlikely to have a significant impact on blue grass: no habitat for Bluegrass was identified within the development site; only 0.47 ha of potential habitat will be removed within the road upgrade disturbance area; and the habitat to be removed is considered to be in low condition and is not considered to be important to the long-term survival of the species in the locality.

D.2.3 Austral Toadflax (*Thesium australe*)

Austral Toadflax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Although originally described from material collected in the SW Sydney area, populations have not been seen in a long time. It may persist in some areas in the broader region.

The species prefers grassland on coastal headlands or grassland and grassy woodland away from the coast. The species is a root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass (*Themeda australis*).

Due to a lack of habitat quality within the development site, Austral Toadflax is considered unlikely to occur; however, vegetation condition within the road upgrade disturbance area contains better quality habitat, which has a moderate possibility of containing a population of the species. It is estimated that the road upgrades could potentially remove 0.47 ha of habitat (to 0.21 ha of woodland and 0.26 ha of derived grasslands) for this species. An assessment of significance for removal of this habitat has been prepared in accordance with the relevant EPBC significant impact guidelines in Table D.3.

Table D.3 Assessment of significance for Austral Toadflax

Criteria	Discussion
1: long-term decrease in population size	Due to habitat degradation, no areas within the subject land are likely to constitute optimal habitat for Austral Toadflax, with occurrences of Kangaroo Grass limited to small patches. An examination of aerial imagery indicates that the vegetation within the road reserve is highly fragmented due to historical vegetation clearing. As such, it is unlikely that these areas would support a large population of Austral Toadflax. Given that the road upgrades will only disturb a small area of potential habitat (0.47 ha) this is unlikely to cause a long-term decrease in the size of a local population.
2: reduce area of occupancy	It is unlikely that the loss of a small area of potential habitat (0.47 ha) will significantly reduce the occupancy of Austral Toadflax within the road upgrade disturbance area. The impact of the project on the occupancy of this species is considered negligible.
3: fragment a population	The road upgrade disturbance area exists within a highly cleared landscape with poor existing landscape connectivity. The vegetation within the road upgrade disturbance area is similarly fragmented. If Austral Toadflax has been able to persist in such an over-cleared landscape it is unlikely that the loss of a small linear area of habitat (0.47 ha) would cause significant further fragmentation of a local population.
4: adversely affect critical habitat	No critical habitat has been defined for the species. Given that the habitat to be removed is degraded and there are no local records of the species, it is unlikely that this habitat is critical to the survival of Austral Toadflax.
5: disrupt the breeding cycle of a population	The habitat to be removed is considered limited to a narrow strip either side of an existing carriageway. A substantial amount of habitat will remain which will allow for uninterrupted propagation of the species.
6: decrease availability or quality of habitat	The road upgrades will disturb a small area of suboptimal potential habitat (0.47 ha) for the species. Much larger areas of similar habitat will be retained within the road reserve and wider vicinity.
7: result in invasive species	Without management, the increased machinery required during the construction of the project, has the potential to introduce novel weeds to the area. Weed control protocols will be undertaken in accordance with the BMP/CEMP, in order to minimise this risk.
8: introduce disease	This species is not known to be particularly susceptible to disease and the project will not introduce any disease relevant to the species.
9: interfere with recovery	Given that the habitat to be removed is considered to be highly degraded, it is unlikely that this habitat is important to the recovery of Austral Toadflax within the locality.

Table D.3 Assessment of significance for Austral Toadflax

Criteria	Discussion
Conclusion	The project is unlikely to have a significant impact on Austral Toadflax: no habitat for Austral Toadflax: was identified within the development site; only 0.47 ha of habitat will be removed within the road upgrade disturbance area; and the habitat to be removed is considered to be in low condition and is not considered to be important to the long-term survival of the species in the locality.

D.2.4 Regent Honeyeater (*Anthochaera phrygia*) – critically endangered

The Regent Honeyeater (*Anthochaera phrygia*) is endemic to mainland south-east Australia and is listed as a critically endangered species under the EPBC Act. The species has an extremely patchy distribution which extends from south-east Queensland, through New South Wales and the Australian Capital Territory, to central Victoria. However, it is highly mobile, occurring only irregularly in most sites, and in variable numbers, often with long periods with few observations anywhere.

Within the current distribution, there are four known key breeding areas where the species is regularly recorded. These are the Bundarra-Barraba, Capertee Valley and Hunter Valley districts in New South Wales, and the Chiltern area in north-east Victoria (DoE 2016). The project is closest to the Bundarra-Barraba breeding area. The eastern-most point of the Bundarra-Barraba breeding area is approximately 22 km north-east of the development site.

The species typically nest in the canopy of mature trees with rough bark, e.g. Ironbarks, Sheoaks (*Casuarina*) and Rough-barked Apple (*Angophora*). A cup-shaped nest is constructed in which two to three eggs are laid. Nests may be near or far from food resources; one nest has been recorded 700 m from a resource tree (Geering & French, 1998, cited in DoE 2016). Pairs now mostly nest solitarily, but historical records show in the past they often nested in loose aggregations (DoE 2016).

The Regent Honeyeater comprises a single population, with some exchange of individuals between regularly used areas (Garnett et al. 2011 cited in DoE 2016). The species can undertake large-scale nomadic movements in the order of hundreds of kilometres (OEH 2017c). Despite the ability of this species to migrate over large area it is likely that many historically used areas are no longer utilised due to the loss of important foraging habitat or habitat fragmentation resulting in the inability of regent honeyeaters to access these areas and because the areas have been colonised by larger more aggressive honeyeaters, such as the noisy miner.

There are no records of this species within the development site, with two records occurring adjacent to one another, approximately 8 km to the north-east of the development site. These are from within the Imbota nature reserve and dated from 1984 and 2000. The next closest records are the City of Armidale approximately 10 km to the north. More broadly, very few records are found within the locality of the development site, likely due to the over-cleared and agricultural landscape.

The species often inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes, targeting those which flower most profusely. Key eucalypt species identified in the National Recovery Plan for the Regent Honeyeater (DoE 2016) comprise Mugga Ironbark (*Eucalyptus sideroxylon*), Yellow Box (*E. melliodora*), White Box (*E. albens*), Yellow Gum (*E. leucoxylon*), Spotted Gum, Swamp Mahogany (*E. robusta*), Needle-leaf Mistletoe (*Amyema cabbagei*) which grows on River Oak (*Casuarina cunninghamiana*), Box Mistletoe (*A. miquellii*) and Long-flower Mistletoe (*Dendrophloe vitellina*). Other tree species may be regionally important. For example, the Lower Hunter Spotted Gum forests have recently been demonstrated to support regular breeding events of Regent Honeyeaters. Flowering of associated species such as Thin-leaved stringybark (*E.*

eugenioides), other stringybark species, and Broad-leaved Ironbark (*E.fibrosa*) can also contribute important nectar flows at times.

The species has the potential to fly over or utilise seasonal foraging resources within the development site and road upgrade disturbance area on a transient basis. Table D.4 provides an assessment of significance for the removal of 38.2 ha of woodland habitat within the development site and 0.34 ha of woodland habitat within the road upgrade disturbance area, in accordance with the relevant assessment criteria (Section F.1.1).

Table D.4 Assessment of significance for the Regent Honeyeater

Criteria	Discussion
1: long-term decrease in population size	The Regent Honeyeater occurs as a single, contiguous population (DoE 2016). An action that would lead to a long-term decrease of the Regent Honeyeater population would be one that is undertaken in a breeding area, or one that removes important foraging habitat. As the proposed action is not located in a known breeding area for the species, it is not expected to result in a long-term decrease in population size. The development site includes Yellow Box, identified as a key eucalypt species in the National Recovery Plan for the Regent Honeyeater (DoE 2016). However, potential foraging is likely to be limited owing to the relatively small patches sizes of woodland and the over cleared landscape, which would require the species to fly large distances between patches of woodland to forage. The habitat within the road upgrade disturbance area contains more optimal foraging habitat however the magnitude of the impact will be small, limited to less than 0.34 ha. It is unlikely that the species is reliant on foraging resources within the development site or road upgrade disturbance area, nor are any substantial numbers of the species likely to occur within these areas. As such, a long-term decrease in the population size is unlikely.
2: reduce area of occupancy	The Regent Honeyeater has not been recorded within the development site, with very occasional records in the surrounding locality; most of them historic and all in excess of an 8 km radius. The species is considered having potential to occur based on the presence of a key feed tree species, Yellow Box. The foraging habitat within the development site is considered sub-optimal based on the highly fragmented landscape. The habitat within the road upgrades disturbance area is more optimal foraging habitat however the magnitude of the impact will be small, limited to less than 0.34 ha. It is unlikely that the loss of a small area of sub-optimal foraging habitat will significantly reduce the occupancy of the species. The development site and road upgrade disturbance area are not likely to contain breeding habitat and is not within any key breeding area, as identified in the recovery plan. The impact of the project on the occupancy of this species is considered negligible.
3: fragment a population	The Regent Honeyeater occurs as a single, contiguous population (DoE 2016). This species is highly mobile and able to cross open areas in order to exploit seasonal foraging resources. The development site exists within a highly cleared landscape with very poor existing landscape connectivity. If the species is already able to persist in such an over-cleared landscape it is unlikely that the loss small patches of woodland (totalling 38.2 ha within the development site and 0.34 ha within the road upgrade disturbance area) will cause any effect of the ability of this species to move across the landscape.
4: adversely affect critical habitat	Habitat critical to the survival of the Regent Honeyeater includes, any breeding or foraging habitat in areas where the species is likely to occur (as defined in Figure 1 of the National Recovery Plan (DoE 2016)); and any newly discovered breeding or foraging locations. The development site and subject land is located over 22 km from the Bundarra-Barraba breeding area and is not listed within any of the associated subsidiary areas as listed in the Recovery Plan (DoE 2016). The species is known to utilise Rough-barked Apple, which occurs within the development site and subject land for nest construction, however it is unlikely that the development site would be selected for breeding, owing to lack of shelter and the sparse foraging resources. Most records of regent honeyeaters come from box-ironbark eucalypt associations, where the species seems to prefer more fertile sites with higher soil water content, including creek flats, broad river valleys and lower slopes.

Table D.4 Assessment of significance for the Regent Honeyeater

Criteria	Discussion
	A single key tree species listed in the recovery plan, Yellow Box, occurs within the development site. This species is scattered through the development site in low densities, typically only remaining on slopes and low ridgelines, with the most fertile areas completely cleared. The foraging habitat is considered poor, due to the sparse nature of the trees within the predominately cleared landscape. The large distance between trees would make foraging energetically inefficient and the lack of any shelter between paddock trees would likely leave the species vulnerable to competitive exclusion from Noisy Miner (<i>Manorina melanocephala</i>). The habitat within the road upgrades disturbance area is more optimal foraging habitat, given a high density of feed trees, however the magnitude of the impact will be small, limited to less than 0.34 ha. If the Regent Honeyeater occurs within the project area it is likely to be an occasional occurrence. Furthermore, it is likely to be a transient occurrence, whilst seeking more optimal areas of foraging habitat such as movements between coastal foraging areas and the Box-Ironbark communities on the western slopes. It is unlikely that the species is reliant on foraging resources within the project area, nor are any substantial numbers of the species likely to occur. Therefore, the project will not affect any habitat critical to the survival of the Regent Honeyeater.
5: disrupt the breeding cycle of a population	The development site and the subject land are not within a known breeding area for the species, with the closest key breeding area, the Bundarra-Barraba, 22 km to the north east. Considering that foraging habitat is sub-optimal, it is unlikely that the species would select the area for breeding. The energetic expenditure of foraging across large areas to supply enough food to raise chicks is likely to be prohibitive to breeding. Furthermore, the sparse, thinned and patchy woodland, with a complete absence of any small trees or shrubs is unlikely to provide sufficient protection for chicks from the aggressive Noisy Miner, which is listed as key threatening process. The woodland within development and subject land is not likely to be important in enabling the species to reach breeding condition given the sub-optimal nature of the foraging habitat. The project is not anticipated to have any impact on the breeding cycle of the Regent Honeyeater, considering that breeding is not likely to occur and foraging resources are considered sub-optimal.
6: decrease availability or quality of habitat	The species has not been recorded within the development site or subject land and if it does occur, it is likely to be on a transient basis only, passing through to more optimal areas of foraging habitat. With the majority of Box-Gum woodland areas avoided by iterative design, the clearance of sub-optimal foraging habitat is not likely to cause any discernible impact to the species, and the species will remain largely unaffected by the project.
7: result in invasive species	Without management, the increased machinery required during the construction of the project, has the potential to introduce novel weeds to the area. Weed control protocols will be undertaken in accordance with the BMP/CEMP, in order to minimise this risk. Currently there are few habitat values in the development site and subject land, relevant to the Regent Honeyeater, which are likely to be impacted by invasive species. For example, potential foraging resources are limited to remnant trees, with no recruitment occurring owing to grazing and management practices. Weed invasion would not result in any increased completion as there is no regeneration occurring.
8: introduce disease	This species is not known to be particularly susceptible to disease and the project will not introduce any disease relevant to the Regent Honeyeater.
9: interfere with recovery	The recovery of the Regent Honeyeater is closely linked the extent and quality of habitat, and recovery actions include the protection of intact (high quality) areas of Regent Honeyeater breeding and foraging habitat (DoE 2016). The development site and subject land is not within a known breeding or foraging area and is unlikely to provide breeding habitat. Although the habitats present provide a potential foraging resource; it is not considered high quality as the key eucalypt feed species, Yellow Box, is sparsely distributed across the landscape and does not occur in fertile valley areas, which are typically the

Table D.4 Assessment of significance for the Regent Honeyeater

Criteria	Discussion
	most productive. The potential habitat to be removed is small in area and at best, will only be utilised transiently basis. Therefore, it is unlikely that any individuals are reliant on the habitat and its removal will have no impact on the recovery of the species.
Conclusion	The project is unlikely to have a significant impact on the Regent Honeyeater as: the development site and subject land are not within a known breeding area, and does not provide optimal breeding habitat for the species; and if the species does occur, it is likely to be on a transient basis only, passing through to more optimal areas of foraging habitat.

D.2.5 Swift Parrot (*Lathamus discolor*) – critically endangered

The Swift Parrot (*Lathamus discolor*) is listed as a critically endangered species under the EPBC Act. This species migrates from its Tasmanian breeding grounds to south-eastern Australia in the autumn and winter months. In NSW, the species mostly occurs on the coast and south-west slopes in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations (OEH 2017). The species is not typically associated with the northern tablelands of NSW and detailed information within the national recovery plan (Saunders and Tzaros 2011) regarding regional distributions, is largely restricted to the Western Slopes and coastal areas.

Records of the Swift Parrot are largely absent from the southern and eastern portions of the Northern Tablelands, with a single record existing within a 10 km radius of the development site. This record was within the Imbota Nature Reserve, approximately 8 km north-east of the development site.

Favoured feed trees in NSW include Grey Box (*Eucalyptus microcarpa*), Yellow Box (*E. melliodora*), Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Blackbutt (*E. pillularis*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*).

The Swift Parrot is not considered to be dependent on habitat in the development site and subject land as optimal habitat is contain areas with a higher density of larger, preferred feed trees. However, the species has been assessed as having the potential to occur given the presence of feed trees identified in the species recovery plan (Birds Australia 2011).

Habitat for the Swift Parrot to be removed for the development consists of 38.2 ha of woodland habitat within the development site and 0.34 ha of woodland habitat within the road upgrade disturbance area. Table D.5 provides an assessment of significance for the removal of this potential foraging habitat, in accordance with the relevant assessment criteria (Section C.1.1).

Table D.5 Assessment of significance for the Swift Parrot

Criteria	Discussion
1: long-term decrease in population size	Within the development site foraging habitat is largely limited to sparse Yellow Box trees existing within a largely cleared agricultural landscape. It unlikely that the species would preference the area for foraging given the energetic expenditure of moving large distances between trees. Furthermore the sparse, thinned and patchy woodland, with a complete absence of any small trees or shrubs is unlikely to provide sufficient protection from the aggressive Noisy Miner. The habitat within the road upgrade disturbance area is more optimal foraging habitat, given the more dense occurrence of Yellow Box, however the magnitude of the impact will be small, limited to less than 0.34 ha.

Table D.5 Assessment of significance for the Swift Parrot

Criteria	Discussion
	It is unlikely that the species is reliant on foraging resources within the development site and road upgrade disturbance area, nor are substantial numbers of the species likely to occur. Further, the species does not breed on mainland Australia, and hence there is no potential for breeding habitat to be impacted. As such, there is not likely to be any population level impacts.
2: reduce area of occupancy	A total area of 38.2 ha of sub-optimal potential foraging habitat will be removed as a result of the project. Additionally, 0.34 ha of slightly more optimal habitat will require removal within the road upgrade disturbance area. This species is wide ranging, foraging within much of south east NSW, typically occurring in areas where profuse flowering of feed trees is occurring. It is unlikely that the loss of sub-optimal foraging habitat will significantly reduce the occupancy of the species. The species has not previously been recorded within the development site, with very sparse records existing within the region.
3: fragment a population	This species exists as a single population, is highly mobile and is able to cross open areas. The loss of potential foraging habitat, which occurs in an already highly fragmented landscape, will not cause any significant fragmentation effects.
4: adversely affect critical habitat	Habitats of particular importance to the Swift Parrot are outlined in the recovery plan for the species (Saunders 2011); including: - for nesting; - by large proportions of the Swift Parrot population; - repeatedly between seasons (site fidelity), or - for prolonged periods of time (site persistence). As the project is within mainland Australia, there is no potential for nesting occur. The species has not been recorded within the development site or subject land, with a single historical record existing within the locality (10 km buffer of the development site). There is no evidence of prolonged occurrence, repeat use or large number of the species occurring within the development site or surrounding locality. Therefore, the project will not affect any habitat critical to the survival of the Swift Parrot.
5: disrupt the breeding cycle of a population	The Swift Parrot breeds within Tasmania and has no potential to breed within the development site or subject land.
6: decrease availability or quality of habitat	The species has not been recorded within the development site or subject land and if it does occur is likely to be on a transient basis only, passing through to more optimal areas of foraging habitat. The Swift Parrot is not considered to be dependent on habitat in development site and subject land; the clearance of sub-optimal foraging habitat is not likely to cause any discernible impact to the Swift Parrot, and the species will remain largely unaffected by the project.
7: result in invasive species	Weed invasion impacting on habitat regeneration and health, and aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners are two key threats that invasive species pose on the Swift Parrot. Noisy Miners are already abundant within the development site and likely to be a resident feature in the highly cleared landscape. The project is not anticipated to exacerbate the occurrence of Noisy Miners. Without management, the increased machinery required during the construction of the project, has the potential to introduce novel weeds to the area. Weed control protocols will be undertaken in accordance with the BMP/CEMP, in order to minimise this risk. Currently there are few habitat values in the development site, relevant to the Swift Parrot, which are likely to be impacted by invasive species. For example, potential foraging resources are limited to remnant trees, with no recruitment currently occurring owing to grazing and management practices. Weed invasion would not result in any increased completion as there is no regeneration occurring.
8: introduce disease	This species is vulnerable to Psittacine Beak and Feather Disease however the proposed activity does not play a role in the introduction of this threat.

Table D.5 Assessment of significance for the Swift Parrot

Criteria	Discussion
9: interfere with recovery	The key action within the recovery plan for the Swift Parrot (Saunders 2011), which is relevant to the project, is the management and protection of Swift Parrot habitat at the landscape scale. The habitat within the development site is unlikely to be important for this species and there is expected to be no impact on its recovery as the result of the project.
Conclusion	It is unlikely that the species is reliant on foraging resources within the development site or the road upgrade disturbance area. Therefore, the habitat to be removed is unlikely to be important for the species and the project is not anticipated to have a significant impact on the Swift Parrot.

D.2.6 Painted Honeyeater (*Grantiella picta*) – Vulnerable

The Painted Honeyeater is endemic to Australia, ranging from north-eastern South Australia, through Victoria and New South Wales, and up to north-western Queensland and eastern Northern Territory (DoE 2015). Many of the species move to semi-arid regions after breeding season. The species is considered to have a single population (DoE 2015).

The Painted Honeyeater occurs within eucalypt forests/woodlands, riparian woodlands of black box and river red gum, box-ironbark-yellow gum woodlands, acacia-dominated woodlands, paperbarks casuarinas, callitris, and trees on farmland. Mistletoe is one of the key factors for the species habitat as their diet mainly consists of mistletoe fruits. However, they also feed on nectar from flowering eucalypts, as well as arthropods (DoE 2015). Favoured habitat is generally woodlands with higher numbers of mature trees containing mistletoes. The Painted Honeyeater is more commonly known to occur in wider blocks of remnant woodland rather than in narrow strips (DoE 2015).

Breeding occurs between October to March, within vegetation where mistletoe prevalence is high. Nests are made from plant-fibre, particularly mistletoe, spiders' webs and rootlets. Nests are placed in the outer foliage of trees and can sometimes be found in narrow roadside strips of vegetation where mistletoe fruit is available (DoE 2015).

Key threats to the Painted Honeyeater include clearing of breeding habitat, particularly in box-ironbark and boree woodlands. Grazing on private land inhibits tree recruitment, ultimately resulting in an uneven age structure of mistletoe host trees leading to the depletion of them. The presence of invasive species also affects the Painted Honeyeater, including competition with the Noisy miner (*Manorina melanocephala*), predation by the Black rat (*Rattus rattus*). Other threats include collision with road vehicles, decline in habitat trees through pasture activities and nest predation by other birds such as Pied Currawongs (*Strepera graculina*), pied and grey butcherbirds (*Cracticus nigrogularis* and *Cracticus torquatus*), and crows and ravens (*Corvidae*). Degradation of habitat by infestation of weeds is also a threat to the Painted Honeyeater (OEH 2017c).

The development site consists of highly fragmented woodland, with small patch sizes and an absence of mid story species. There is a lack of mistletoe and therefore a paucity of habitat features for the Painted Honeyeater. Woodland within the road upgrade disturbance area contains a higher density of trees with occasional mistletoe present. This area is within a highly fragmented landscape and is considered sub-optimal habitat for the species.

Table D.6 provides an assessment of significance for the removal of 0.34 ha of potential sub-optimal woodland habitat.

Table D.6 Assessment of significance for the Painted Honeyeater

Criteria	Discussion
1: long-term decrease in population size	The Painted Honeyeater occurs as a single, contiguous population (DoE 2015). An action that would lead to long-term decrease of the population would be one within breeding area or removing important foraging habitat. The Painted Honeyeater requires mistletoe for breeding and foraging habitat. The road disturbance area contains some mistletoe in low densities. It is unlikely that these isolated patches of woodland are favourable for the species. Therefore it is unlikely that the proposed development activities result in a long-term decrease in the Painted Honeyeaters population size.
2: reduce area of occupancy	The Painted Honeyeater has not been recorded within the road upgrade disturbance area, with very occasional records in the surrounding locality; most of which are historic. The foraging habitat is considered sub-optimal based on low records of the species and mistletoe being largely absent from the road upgrade disturbance area. Habitat removal for this species will comprise 0.34 ha of more sub-optimal potential. It is considered if these areas would be utilised by the species on a transient basis. It is unlikely that the loss of the small isolated patches of habitat will significantly reduce the occupancy of the species. The impact of the project on the occupancy of this species is considered negligible.
3: fragment a population	The Painted Honeyeater occurs as a single, contiguous population (DoE 2015). This species is highly mobile, travelling across most of the eastern side of Australia. The Painted Honeyeater can cross open areas in search for woodlands with ample mistletoe available. It is unlikely that the species population will become fragmented as a result of the road upgrades considering that the species is already able to disperse across agricultural landscapes.
4: adversely affect critical habitat	Habitat considered critical to the survival of the Painted Honeyeater includes breeding or foraging habitat. Habitat quality is considered sub-optimal given the low density of mistletoe present and its situation in an over cleared landscape. The Painted Honeyeater is more common within wider blocks of woodland (DoE 2015), providing more suitable foraging habitat. The Painted Honeyeater has not been recorded within the road upgrade disturbance area, should it occur, it is likely to be an occasional occurrence, considering vegetation within the development site does not provide critical foraging habitat.
5: disrupt the breeding cycle of a population	The Painted Honeyeater favours breeding habitat with an abundance of mistletoe. Habitat within the road upgrade disturbance area does not contain sufficient amounts of mistletoe to support the species during breeding season, therefore it is unlikely the project will disrupt the breeding cycle of the population.
6: modify, destroy or decrease availability or quality of habitat	The species has not been recorded within the road upgrade disturbance area. The species is may occasionally, occur passing through to more optimal foraging areas in the surrounding area. The removal of small areas of potential sub-optimal foraging habitat is unlikely to cause the decline of the species.
7: result in invasive species	The Painted Honeyeater is susceptible to the effects of invasive species including the introduction of weeds potentially degrading critical habitat, competition from Noisy Miners and predation by the Black Rat. Mitigation measures will be implemented to minimise the introduction or spread of invasive weeds. A BMP/CEMP will be prepared to outline weed control protocols in order to minimise the risk. Noisy Miners are abundant within the road upgrade disturbance area. However, it is unlikely that the project will exacerbate the abundance of the Noisy Minter. Similarly, black rats are potentially present within the area however it is unlikely that the project will exacerbate their abundance.
8: introduce disease	The Painted Honeyeater is not known to be susceptible to any disease and the project is unlikely to introduce a harmful disease to the Painted Honeyeater.
9: interfere with recovery	The Painted Honeyeater currently does not have a Recovery Plan.

Table D.6 **Assessment of significance for the Painted Honeyeater**

Criteria	Discussion
Conclusion	The project is unlikely to have a significant impact on the Painted Honeyeater as the habitat to be removed comprises a small area of potential habitat. No optimal breeding habitat occurs. If the species does occur within the locality, it is likely to occur on a transient basis considering foraging habitat is sparse and lacking abundance of mistletoe. Therefore it is considered the habitat to be removed is unlikely to have any significant effect on the Painted Honeyeater.

D.2.7 Koala – Vulnerable

Koala have been considered absent from the development site owing to a lack of suitable habitat, high fragmentation and by an absence of the species during targeted surveys.

Woodland within the road upgrade disturbance area is better connected than the development site, and the species has been recorded within close proximity to the western portion of the route. Given that targeted surveys have not been conducted in the road upgrade disturbance area, the species was assumed present in woodland, comprising a total area of 0.21 ha.

The Koala inhabits eucalypt woodlands and forests, feeding on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browsing species. The road upgrade disturbance area is within the northern tablelands koala management area. One primary food tree was recorded, Ribbon Gum (*Eucalyptus viminalis*). This species was recorded within the woodland areas, though was never dominant. Several secondary feed trees were recorded including Blakely's Red Gum and Yellow Box.

Table D.7 provides an assessment of significance for the removal of 0.21 ha of potential Koala habitat within the road upgrade disturbance area.

Table D.7 **Assessment of significance for the Koala**

Criteria	Discussion
1: long-term decrease in the size of an important population of the species	There are few records of Koala within the immediate vicinity of the road upgrade disturbance area and given low density of primary feed trees it is unlikely that an important population is supported. The removal of 0.21 ha of potential habitat is unlikely to cause any population level effects.
2: reduce area of occupancy of an important population	The loss of 0.21 ha of potential habitat is likely to be negligible, given that the majority of similar potential habitat within the vicinity will remain unaffected.
3: fragment an important population	Clearance will be restricted to a narrow strip of woodland either side of the existing carriageway, of up to a meter. The increase road width represents a very minor increase in fragmentation and no woodland patches will be intersected given that woodland will be retained within the road reserve.
4: adversely affect critical habitat	Habitat considered critical to the survival of the Koala includes both breeding and foraging habitat. Potential habitat within the road upgrade disturbance area has a low density of primary feed tree species with foraging resources largely restricted to secondary feed trees. If present Koala are likely to occur transiently in low densities. The 0.21 ha of habitat to be removed is unlikely to adversely affect habitat critical to the survival of this species.

Table D.7 Assessment of significance for the Koala

Criteria	Discussion
5: disrupt the breeding cycle of an important population	The small areas of habitat to be removed for represents a minor proportion of available habitat in the locality. The project would not isolate any areas of habitat or cause significant habitat fragmentation that would affect the breeding, foraging or dispersive movements of this species.
6: modify, destroy or decrease availability or quality of habitat	The 0.21 ha vegetation to be removed comprises a very small proportion of native vegetation within the locality. The area of vegetation to be removed is therefore not regarded to be critical for the long-term survival of the species in the locality.
7: result in invasive species	Mitigation measures will be implemented to minimise the introduction or spread of invasive weeds. A BMP/CEMP will be prepared to outline weed control protocols in order to minimise the risk. Invasive fauna species, including predators such as cats, dogs and foxes, are likely to be already present within the locality. The proposal would not significantly fragment or isolated any habitat nor result in any other changes that are likely to favour feral animals. The proposal is unlikely to increase the incidence of invasive predators.
8: introduce disease	No diseases that may cause the species to decline are likely to become established in the development site or subject land as a result of the project.
9: interfere with recovery	The proposal is inconsistent with the overall objectives of the DECC (2008) Recovery Plan for the Koala, given that potential Koala habitat requires clearance. The magnitude of the impact is considered negligible however, limited to 0.21 ha.
Conclusion	On consideration of the above criteria, the proposal is unlikely to have a significant effect on the Koala given that: • Koala density is likely to be low given the few primary feed trees present and the few historical records; and • Vegetation to be removed comprises a very small proportion of similar habitat vegetation retained within the road reserve and the surrounding locality. The development would not isolate or fragment any areas of potential koala habitat.

D.2.8 Migratory species

The following migratory species, as listed under the EPBC Act, have the potential to forage or roost within the development site and road upgrade disturbance area:

- Fork-tailed Swift (*Apud pacificus*) – migratory, marine; and
- White-throated Needletail (*Hirundapus caudacutus*) – migratory, marine.

The Fork-tailed Swift is known to occur throughout Australia. Within NSW the species has been recorded in all regions. The White-throated Needletail is widespread in eastern and south-eastern Australia. The species is known to extend to the western slopes of the Great Dividing Range (DoEE 2018a). Fork-tailed Swift occurs within a wide range of habitats include dry or open woodland, tea-tree swamps, within low scrub, heathland, saltmarsh, grassland, sandplains, open farmland and coastal sand-dune. Occasionally they will occur about rainforests and wet sclerophyll forest. The Fork-tailed Swift feeds on insects aerially among tree-tops in open forest (DoEE 2018a).

The White-throated Needletail occurs above most types of habitat, with the most common being woodland and heathland. The species is less often to occur within grasslands or swamps as they lack trees. the species forages aerially above a variety of habitats. The species will occasionally forage over recent disturbed areas. The White-throated Needletail roost in trees in forests and woodlands, among dense foliage in the canopy or in hollows (DoEE 2018b).

Both migratory species do not breed within Australia and are almost exclusively aerial, occurring over most habitat types.

The development site and the road upgrade disturbance area does not contain any areas of ‘important habitat’ for the two migratory species. The development site exists within a predominantly cleared agricultural landscape, highly prevalent in NSW. Potential foraging habitat includes cleared isolated patches of woodland with large numbers of exotic flora species.

The vegetation to be removed within the road upgrade disturbance area contains potential (sub-optimal) foraging habitat for the Fork-tailed Swift and White-throated Needletail. The habitats to be removed generally lack mid-storey and understorey dense foliage for optimal roosting habitat.

Table D.8 Assessment of significance for migratory species: Fork-tailed Swift and White-throated Needletail

Criteria	Discussion
1: substantially modify, destroy or isolate an area of important habitat	The habitat within the development site and road upgrade disturbance area is fragmented and degraded; hence these areas do not represent important habitat for migratory species. Sub-optimal foraging habitat for these species will be removed.
2: result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat	Exotic vegetation occurs within both the development site and road upgrade disturbance area. Development activities have the potential to introduce new exotic plant species; therefore, weed control protocols are recommended to be undertaken in accordance with the BMP/CEMP. Considering the development site does not contain any important habitat for migratory species and mitigation measures will be implemented, the development is likely to have a negligible impact on migratory species.
3: seriously disrupt the lifecycle of an ecologically significant proportion of the population	The Fork-tailed Swift and White-throated Needletail do not breed within Australia. The foraging habitat within the development site is unlikely to be important such that its removal would not be important for their lifecycle.
Conclusion	No important habitat was identified during the assessment. Sub-optimal foraging habitat exists, however, due to the minor scale of removal of this habitat, this is likely to have a negligible effect on these species.

Appendix E

Protected Matters Search Tool Results



EPBC Act Protected Matters Report

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

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

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 04/09/19 09:06:57

[Summary](#)

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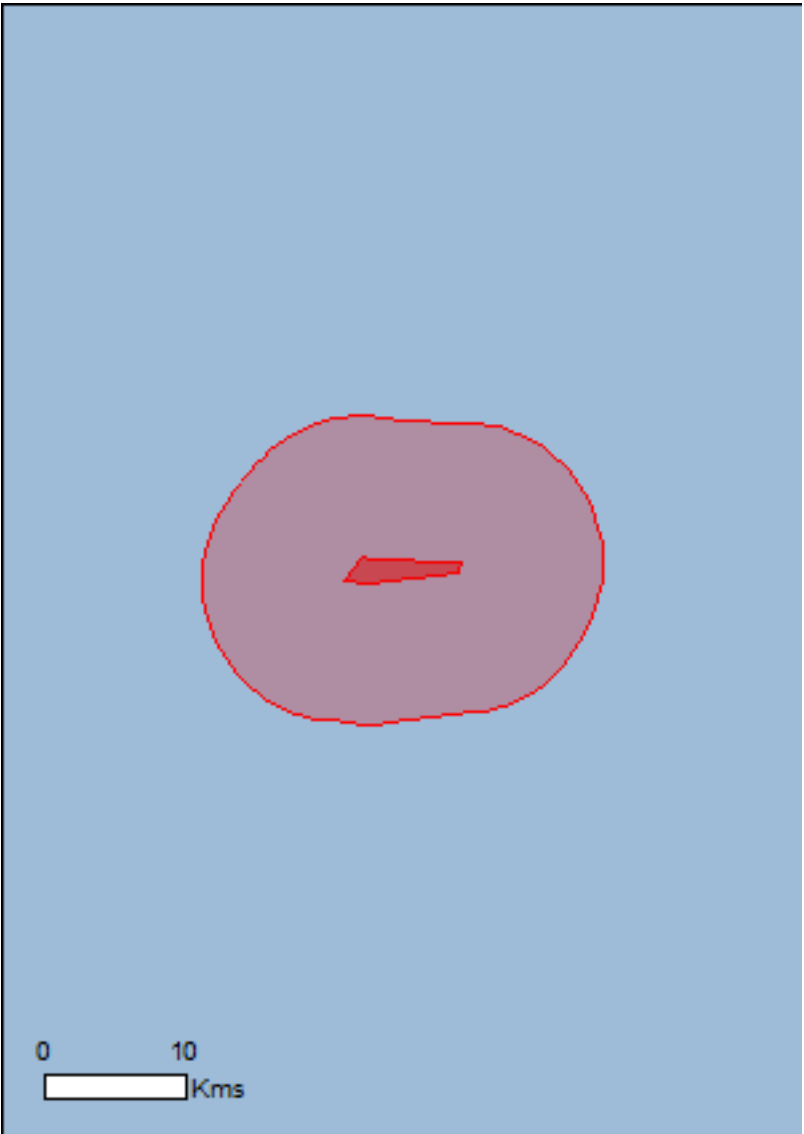
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Buffer: 10.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	29
Listed Migratory Species:	13

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	20
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	1
Invasive Species:	30
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)		[Resource Information]
Name	Proximity	
Banrock station wetland complex	1100 - 1200km	
Gwydir wetlands: gingham and lower gwydir (big leather) watercourses	200 - 300km upstream	
Riverland	1000 - 1100km	
The coorong, and lakes alexandrina and albert wetland	1200 - 1300km	

Listed Threatened Ecological Communities

[Resource Information]

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

Name	Status	Type of Presence
New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands	Critically Endangered	Community likely to occur within area
Upland Wetlands of the New England Tablelands (New England Tableland Bioregion) and the Monaro Plateau (South Eastern Highlands Bioregion)	Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species

[Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur

Name	Status	Type of Presence within area
Fish		
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Frogs		
Litoria castanea Yellow-spotted Tree Frog, Yellow-spotted Bell Frog [1848]	Critically Endangered	Species or species habitat likely to occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Acacia pubifolia Velvet Wattle [19799]	Vulnerable	Species or species habitat may occur within area
Cadellia pentastylis Ooline [9828]	Vulnerable	Species or species habitat may occur within area
Callistemon pungens [55581]	Vulnerable	Species or species habitat likely to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Diuris pedunculata Small Snake Orchid, Two-leaved Golden Moths, Golden Moths, Cowslip Orchid, Snake Orchid [18325]	Endangered	Species or species habitat likely to occur within area
Eucalyptus mckieana McKie's Stringybark [20199]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus nicholii Narrow-leaved Peppermint, Narrow-leaved Black Peppermint [20992]	Vulnerable	Species or species habitat likely to occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Haloragis exalata subsp. velutina Tall Velvet Sea-berry [16839]	Vulnerable	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Uvidicolus sphyrurus Border Thick-tailed Gecko, Granite Belt Thick-tailed Gecko [84578]	Vulnerable	Species or species habitat likely to occur within area
Wollumbinia belli Bell's Turtle, Western Sawshelled Turtle, Namoi River Turtle, Bell's Saw-shelled Turtle [86071]	Vulnerable	Species or species habitat may occur within area
Listed Migratory Species		
[Resource Information]		
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

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

Name
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Scientific & Industrial Research Organisation

Listed Marine Species	[Resource Information]
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* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species

Name	Threatened	Type of Presence
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		habitat may occur within area Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Extra Information

Regional Forest Agreements	[Resource Information]
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Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur

Name	Status	Type of Presence
within area		
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat may occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species

Name	Status	Type of Presence
Vulpes vulpes Red Fox, Fox [18]		habitat likely to occur within area Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643] Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area

Nationally Important Wetlands		[Resource Information]
Name		State
New England Wetlands		NSW

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-30.619844 151.526914,-30.621912 151.531892,-30.623241 151.591116,-30.62915 151.588197,-30.635058 151.531377,-30.633434 151.514555,-30.633286 151.514555,-30.633286 151.514555,-30.619844 151.526914

Acknowledgements

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

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

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

Please feel free to provide feedback via the [Contact Us](#) page.



Appendix C

Aboriginal cultural heritage assessment report addendum

Memorandum



Level 3, 175 Scott Street
Newcastle NSW 2300

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5 September 2019

To: Tim Kirk
From: Taylar Reid
Subject: J17300 - New England Solar Farm - Addendum to the Aboriginal cultural heritage assessment report

Dear Tim,

1 Introduction

1.1 Project background

UPC Renewables Australia Pty Ltd (UPC) proposes to develop the New England Solar Farm; a significant grid-connected solar farm and battery energy storage system (BESS) along with associated infrastructure, approximately 6 kilometres (km) east of the township of Uralla, which lies approximately 19 km south of Armidale in the Uralla Shire local government area (LGA) (the project).

The project is classed as a State Significant Development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). A development application (DA) and environmental impact statement (EIS) was submitted under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The DA and EIS for the project were publicly exhibited from 20 February to 20 March 2019.

As part of the EIS, EMM Consulting Pty Limited (EMM) prepared an Aboriginal cultural heritage assessment report (ACHAR) for the project, which included Aboriginal community consultation and an archaeological survey program (refer Appendix D of the EIS).

Following the public exhibition of the DA and EIS, two additional reports have been submitted to NSW Department of Planning, Industry and Environment (DPIE), namely:

- a response to submissions (RTS) report, responding to the matters raised in the regulatory and public submissions provided during the public exhibition period of the EIS; and
- an amendment report (AR), providing a description of the additional project refinements and changes that have been made since the public exhibition of the EIS. As part of the AR, EMM prepared an addendum to the ACHAR which included additional survey and assessment for Aboriginal scar trees and archaeological test excavation (Appendix E of the AR).

Since the submission of the RTS and AR, UPC has continued discussions with DPIE, NSW Roads and Maritime Services (RMS) and Uralla Shire Council in relation to potential road upgrades and intersection improvements that may be required to facilitate the safe movement of vehicles between the New England Highway and the development footprint for the project. As part of these discussions, the following roads and intersections have been identified as requiring additional works:

- intersection of New England Highway and Barleyfields Road;
- Barleyfields Road (north of the intersection with Big Ridge Road);

- intersection of Big Ridge Road and Barleyfields Road; and
- Big Ridge Road.

In their request for additional information (dated 2 August 2019), DPIE requested that UPC provide a schedule of the proposed road upgrade works, developed in consultation with Uralla Shire Council, and an assessment of the impacts of the upgrades.

UPC has engaged SCT Consulting PTY LTD (SCT) to identify suitable designs for the proposed road upgrades and intersection improvements. The proposed designs are likely to result in additional surface disturbance activities that were not assessed as part of the EIS and supporting ACHAR. Subsequently, this addendum to the ACHAR has been prepared to consider potential impacts to Aboriginal cultural heritage as a result of the proposed additional works and identify appropriate mitigation and management measures, where required.

In addition, as acknowledged in Section 2.4.4 of the AR, UPC has also been considering the potential use of the Main Northern Railway line for delivery of construction materials and project infrastructure. To facilitate this, part of Lot 2 of DP 982376 (within the rail corridor) may be required for a temporary hardstand, which would facilitate safe and efficient use of a mobile forklift, reach stacker or similar during unloading activities. This addendum to the ACHAR also considers potential impacts to Aboriginal cultural heritage as a result of the construction and use of the temporary hardstand during construction.

1.2 Purpose of this report

EMM has prepared this addendum to the ACHAR to present outcomes of additional consultation and survey and to provide an updated impact assessment and management measures in response to the findings of the additional archaeological investigations.

1.3 Description of proposed works

As noted in Section 1.1, SCT has been engaged by UPC to identify suitable designs for the proposed road upgrades and intersection improvements (ie the proposed works). The final design of the proposed works will be subject to further investigations by UPC and consultation with Uralla Shire Council and RMS.

To assess the maximum potential disturbance associated with the proposed works, corridors of 7 metres (m) (ie 3.5 m either side of the centreline) and 10 m (ie 5 m either side of the centreline) have been assessed along relevant sections of Barleyfields Road (north) and Big Ridge Road. In addition, the road reserves adjacent to the intersections of New England Highway and Barleyfields Road and Barleyfields Road and Big Ridge Road have also been surveyed.

Part of Lot 2 of DP 982376 (within the rail corridor) has also been surveyed as this may be required for a temporary hardstand, which would facilitate safe and efficient use of a mobile forklift, reach stacker or similar during unloading activities.

The maximum disturbance footprint which was the focus of the archaeological survey is presented in Figure 3.2.

2 Aboriginal consultation

The *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010) were used for completion of the ACHAR in order to satisfy the EIS requirements. Aboriginal parties registered their interest in the initial project and are referred to as registered Aboriginal parties (RAPs). RAPs were invited to provide cultural information about the area surrounding the project, were provided with draft assessment and fieldwork methods for review and were updated about the project by two consultation meetings, letters and emails. RAPs also participated in the archaeological surveys, test excavations and ongoing survey of additional areas proposed for the project.

EMM and UPC have worked closely with RAPs in formulating appropriate management measures for the Aboriginal cultural heritage values identified during the ACHAR, which involved RAPs review of the draft ACHAR and opportunity for input from RAPs during a consultation meeting on 19 October 2018 and again in March 2019 after provision of the ACHAR addendum report (Appendix E of the AR).

The RAPs were updated about the proposed works via email and letter (where no email was provided) and invited to participate in the field survey. This second addendum to the ACHAR was sent to RAPs for review and comment on 9 September 2019. Considering that there are timing constraints associated with lodgement of the overall AR to DPIE, any RAP responses received for this report will be addressed during the development of the project Aboriginal heritage management plan (AHMP).

Further details on the consultation process are provided in Appendix A of this report.

3 Background

3.1 Archaeological background

3.1.1 Overview of project ACHAR

As part of the project ACHAR, EMM completed targeted archaeological surveys with the support of RAPs. The surveys focused on the proposed development footprint and on areas likely to feature Aboriginal sites, but also extensively sampled areas and landscapes less likely to feature sites to test the survey predictions. The archaeological investigations provided an informative and representative example of the widespread occupation of Aboriginal people in the area. Notably, the eastern portion of Big Ridge Road which is part of the proposed works was previously surveyed as Transect 121 (T121). T121 was highly disturbed from road cuttings and grading and no Aboriginal objects were identified or predicted to occur as subsurface material.

In addition to the archaeological surveys, as part of the first addendum to the ACHAR, EMM and RAPs conducted test excavations which targeted five archaeologically sensitive areas. Test excavation identified archaeological deposit at sites NE27, NE70 and NE83. Excavation demonstrated that subsurface deposits on crests were confined by landform and did not tend to extend into adjacent landforms. Further details of the survey and test excavation results and their implications are presented in Chapter 4 of the addendum to the ACHAR (Appendix E of the AR).

The frequent distribution of open camp sites on elevated crests near watercourses, along with grinding groove sites, quarries and scarred trees show that the survey area was part of the landscape utilised by Aboriginal people for its natural resources. Notwithstanding, widespread historical disturbance (eg clearing, ploughing, road and vehicle tracks and rock-picking) may have affected their current representation in the landscape.

3.1.2 Relevant investigations

A recent study by Beck, Haworth and Appleton (2015) focussed on the resources of lagoons in the upland wetlands (Appleton et al 2015). They found that during the later Holocene, Aboriginal occupation in this area became more visible, including a high number of ceremonial sites in association with areas of greatest lagoon concentration. They hypothesised that the drier, more uncertain climate of the late Holocene would have concentrated game around larger lagoons which became the focus of consumption and exchange for Aboriginal people. They argued that the concentration of resources would have supported larger numbers of people often associated with ceremonial activity. The increase in social connectivity through ceremonial activity at this time may have been both a cause and effect of the spread of new technologies in stone implement manufacture and exchange. The study highlights that ceremonial places occur more frequently than in other regions and in clusters (Beck 2006).

The upland wetlands study involved archaeological excavations at a number of lagoons including Dangars Lagoon, Racecourse Lagoon and Barleyfields Lagoon. Although the results are yet to be published, EMM contacted John Appleton for a summary of the results. Appleton noted the paucity of results at Dangars Lagoon where only two to three artefacts were identified. Appleton identified that the historical modification of the lagoon and not knowing the true prehistoric water level may have affected the results (Appleton pers comm., July 2018). The most informative results were gathered from Barleyfields Lagoon, where optically stimulated luminescence (OSL) dating

has identified dates of possibly early Holocene occupation, which are currently the earliest dates in the region (Appleton pers comm., July 2018). The excavation also extended to the south of Barleyfields Lagoon into a quarry of silcrete where a number of subsurface silcrete artefacts were identified (Appleton pers comm., July 2018). There are five registered Aboriginal sites associated with Appleton’s study in the vicinity of intersection of New England Highway and Barleyfields Road and Barleyfields Road (north of the intersection with Big Ridge Road). These sites are discussed in 3.2.1 and shown on Figure 3.2.

3.1.3 AHIMS database search

A search of the Aboriginal Heritage Information Management System (AHIMS) register was completed on 6 August 2019. The search covered an area of approximately 18 km x 10 km centred on the area where the proposed works will take place. The aim of the search was to identify if any Aboriginal sites or places are registered within the area surrounding the proposed works; and to aid predictions for the area from the frequency and distribution of Aboriginal site types in the broader landscape. A copy of the AHIMS search is provided in Appendix A. The AHIMS search identified 95 Aboriginal sites. The site frequency results are displayed in Figure 3.1 and the closest sites to the area where the proposed works will take place are shown on Figure 3.2. It should be noted that of the 95 sites, 78 sites were identified as part of the archaeological surveys conducted as part of the preparation of the ACHAR.

The most common site type are isolated finds (n=48), representing 51% of the total number of identified site types. Modified trees (carved or scarred) represented 16% of the total number of site types. A range of grinding groove site types are also present in the search area, including grinding groove sites with stone artefacts and/or with associated potential archaeological deposits (PAD). The AHIMS search identified concentrations of stone artefact sites around local lagoons such as Barleyfields Lagoon and Racecourse Lagoon.

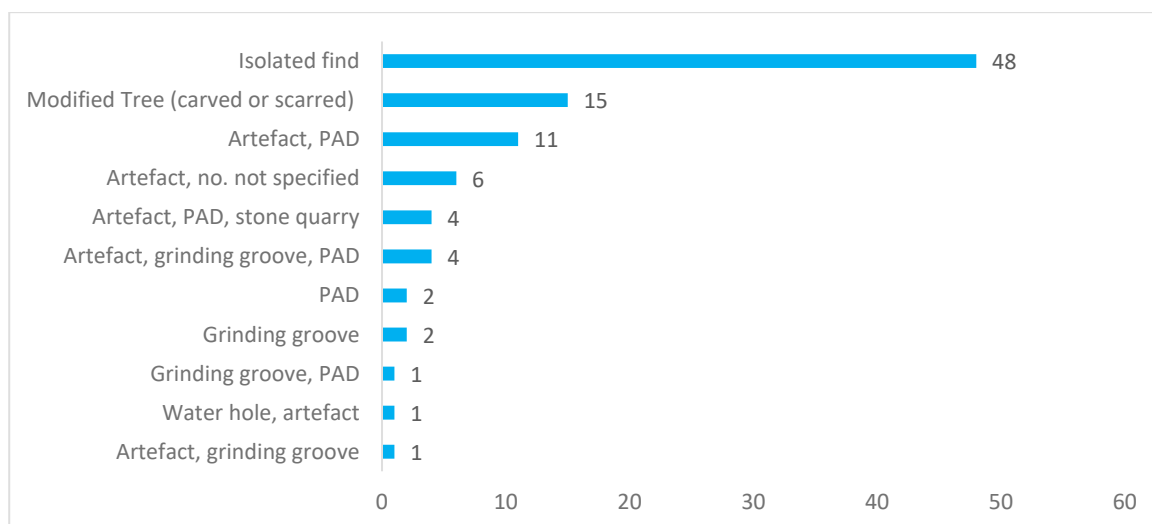
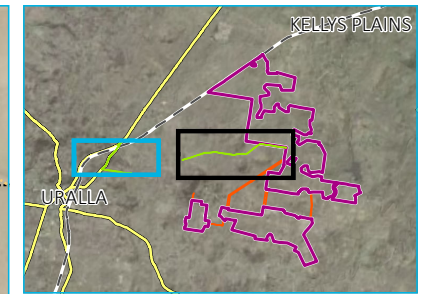


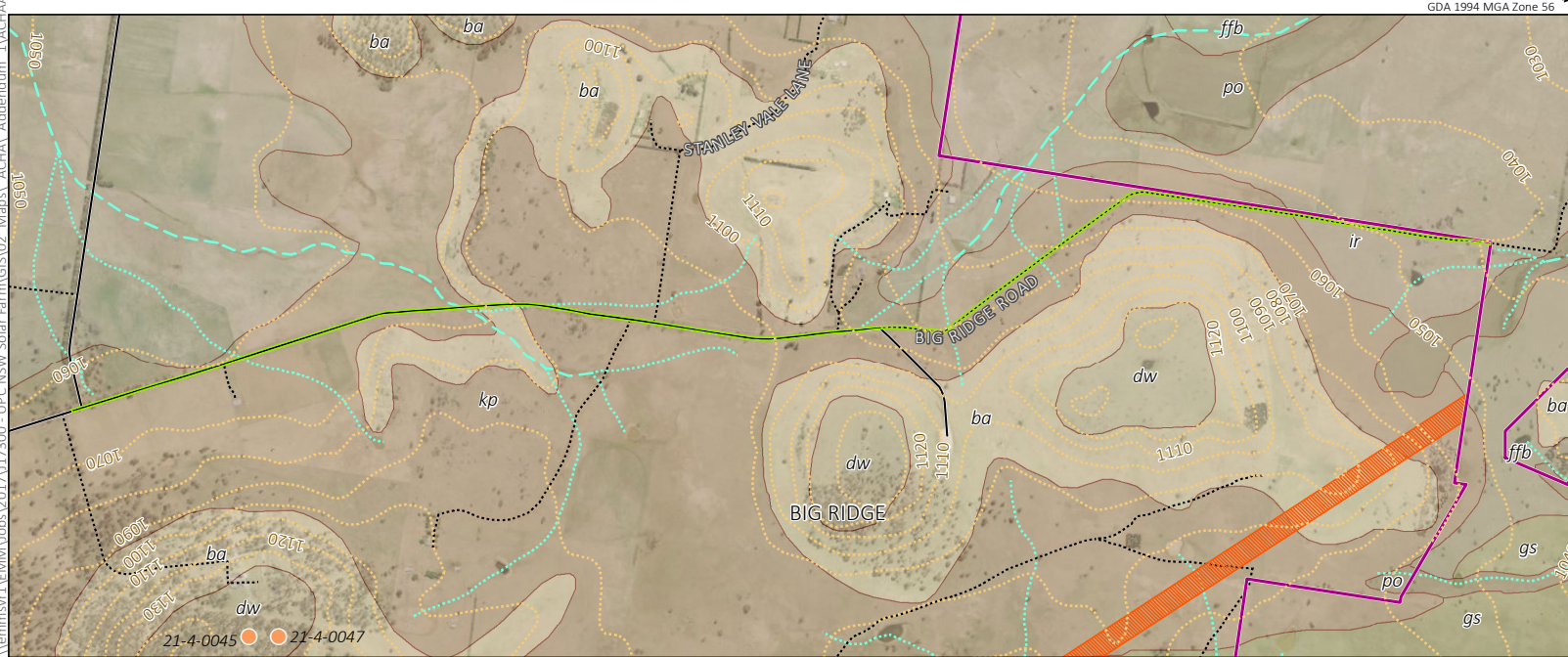
Figure 3.1 AHIMS search site frequency results

\\lemmsvr1\EMM\Jobs\2017\17300 - UPC NSW Solar Farm\GIS\02 Maps\ACHA\ Addendum 1\ACHA001 AHIMS 20190910 05.mxd 11/09/2019



KEY

- Maximum disturbance footprint (10-m-wide corridor)
- Solar array
- Potential site access/ETL easement/electrical cabling
- Rail line
- Main road
- Local road
- Vehicular track
- Contour (10 m)
- Strahler stream order
 - 1st order
 - 2nd order
 - 3rd order
- AHIMS site type
 - Modified tree
 - Stone artefact site
- Soil landscape
 - Bald Knob (ba)
 - Dangars Lagoon (dl)
 - Dwyers Range (dw)
 - Fairfield variant b (ffb)
 - Gostwyck (gs)
 - Ironstone (ir)
 - Julia Gully (jg)
 - Kellys Plains (kp)
 - Powers Creek (po)
 - Uralla variant a (ura)
 - Uralla (ur)



AHIMS sites within proximity of the proposed works

New England Solar Farm
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addendum report
Figure 3.2

There are no registered sites within the area where the proposed works will take place; however, there are seven sites in proximity of Barleyfields Road (north) and Big Ridge Road (AHIMS # 21-4-0108 to #21-4-0113 and #21-4-167). These sites consist of artefact scatters, a stone quarry (AHIMS #21-4-0113), and one isolated find (AHIMS #21-4-0108), which corresponds to the source of outcropping silcrete mapped under a variant of the Uralla soil landscape which is present in the area. AHIMS sites #21-4-0112, a sparse artefact scatter 40 m in length, and #21-4-0113, a stone quarry 50 m in length, are located approximately 20 m and 30 m from the proposed road upgrades, respectively (refer Figure 3.2). These sites are on the other side of the fence line in a paddock and do not continue into the disturbed and modified road reserve, which was confirmed during archaeological survey (refer Section 4 of this letter). As such, existing AHIMS sites are not expected to be harmed during the proposed works.

3.2 Environmental implications for archaeology

The project is within the New England Tablelands Bioregion which is a stepped plateau of hills and plains with elevations between 600 and 1500 m on Permian sedimentary rocks, intrusive granites and extensive Tertiary basalts (OEH 2016). The proposed works across low undulating plains and hills.

The main hydrological feature relevant to the proposed works is Barleyfields Lagoon on the eastern side of the junction of Barleyfields Road (north) and the New England Highway (identified as dl soil landscape in Figure 3.2). Rocky Creek, a 3rd order watercourse, intersects Big Ridge Road near the proposed intersection upgrade of Barleyfields Road. The stream is a low-lying depression which was dry at the time of survey. Rocky Creek branches into several 1st and 2nd order watercourses which drain to the east of Barleyfields Road.

There are several soil landscapes which are defined in the *Soil Landscapes of Armidale* (DECCW 2009). Soil landscape information builds on the underlying geology and describes what soils overlie the geology and where soils are likely to have been eroded or missing, exposing bedrock or where they have built up. The proposed works intersect with the Uralla, Ironstone, Kellys Plains and Bald Knob soil landscapes. In general, the Ironstone and Uralla soil landscapes have some potential to feature outcropping silcrete for Aboriginal use and the Ironstone, Bald Knob and Kellys Plains soil landscapes can feature outcropping basalt for stone hatchet preparation, but the occurrence of suitable raw material is rare.

Despite there being general potential for Aboriginal sites to occur in the landscape, particularly near Barleyfields Lagoon, prior land use is highly likely to have affected the area where the proposed works will take place. These areas are likely to have been modified by historical land use practices and past disturbances associated with land clearing and road development.

3.3 Predictive model

The predictive model is based on that presented in the project ACHAR, the results of the ACHAR addendum and are made with reference to the areas presented in the proposed works. The results from the predictive model are summarised in Table 3.1.

Table 3.1 **Predictive model of site location**

Site type	Predictions for project area
Open artefact sites and isolated finds	Open stone artefact scatters and isolated finds are the site types most likely to occur in the area where the proposed works will take place. These may occur anywhere as background scatter but are most likely to occur close to reliable sources of water (generally within 200 m). Although stone artefact sites may be present in these areas, their detection is dependent on favourable ground surface visibility conditions. Further, more recent ground disturbance, for instance through road development and farming will have an effect on the accuracy of the predictive model. High sensitivity for open stone artefact sites includes level to gently inclined, elevated landforms near high order streams including crests, spurs, terraces and lower slopes/foot slopes that were above regular inundation and provided good outlook. Smaller and lower density artefact scatters and isolated artefacts may occur near ephemeral tributaries (3rd order and below). This is most likely to occur along Barleyfields Road (north), which corresponds to the registered AHIMS sites adjacent to the road corridor. However, levels of previous disturbance will have a significant influence on the present of Aboriginal objects and their subsurface potential.
Scarred trees	Scar trees may occur where native vegetation has been preserved. Native vegetation adjacent to the road corridors has largely been cleared due to the initial construction of the roads; however, some clusters of trees have been maintained along both Barleyfields Road (north) and sections of Big Ridge Road. There are also clusters of trees around the junction of Barleyfields Road (north) and the New England Highway.
Stone arrangements	Stone arrangements are very rare but most likely to occur on elevated and relatively flat landforms (eg crests, terraces, ridges) nearby sources of outcropping cobbles or small boulders capable of being moved manually. The area most likely to feature suitable stones is the Uralla soil landscape, which encompasses Barleyfields Road (north), and the junction of Barleyfields Road and Big Ridge Road. However, it is very likely that they have been disturbed and/or destroyed by historical land use practices and construction of the road.
Quarries (stone or ochre)	The crests and upper slopes of the Bald Knob and Fairfield soil landscape may feature quarries of basalts or metabasalts but only if the material is of a suitable quality. The occasional outcrop or locally significant outcrops of surface basalt on the Kellys Plains soil landscape may feature basalt resources. Silcrete quarries may occur in the areas mapped as the Ironstone soil landscapes. AHIMS site #21-4-0112, a stone quarry, is approximately 20 m east of Barleyfields Road (north) (refer Figure 3.2). However, levels of previous disturbance will have a significant influence on the present of Aboriginal objects and their subsurface potential in the area of the proposed works.

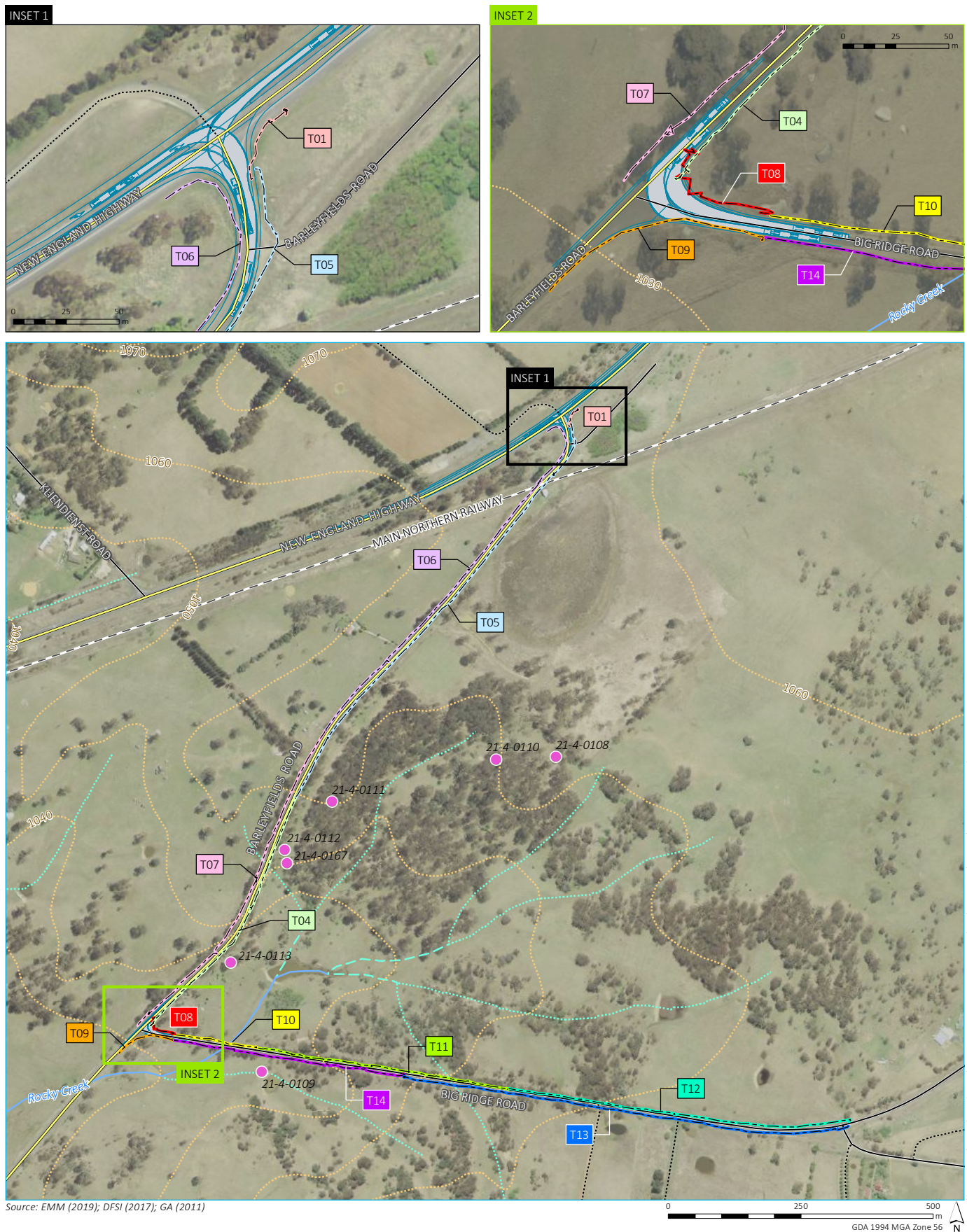
4 Archaeological survey

4.1 Overview

EMM conducted an archaeological field survey of the area where the proposed works will take place with the assistance of RAPs on 8 August 2019. An overview of the survey tracks completed for the survey in Figures 4.1 and 4.2.

The primary aims of the survey were to:

- identify Aboriginal archaeological sites and/or Aboriginal places with the assistance of Aboriginal knowledge holders;
- characterise the landscape to aid predictions of archaeological potential;
- identify sites or areas that may require further investigation;
- identify sites or areas to be avoided, if required; and
- identify areas with minor or negligible Aboriginal cultural heritage values that are most suitable for development.



KEY

Indicative intersection design

— Rail line

— Main road

— Local road

..... Vehicular track

..... Contour (10 m)

AHIMS site type

● Stone artefact site

Strahler stream order

..... 1st order

..... 2nd order

..... 3rd order

Heritage transect

— T01

— T04

— T05

— T06

— T07

— T08

— T09

— T10

— T11

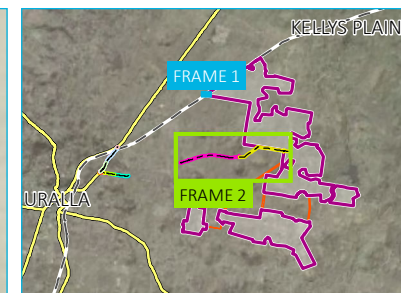
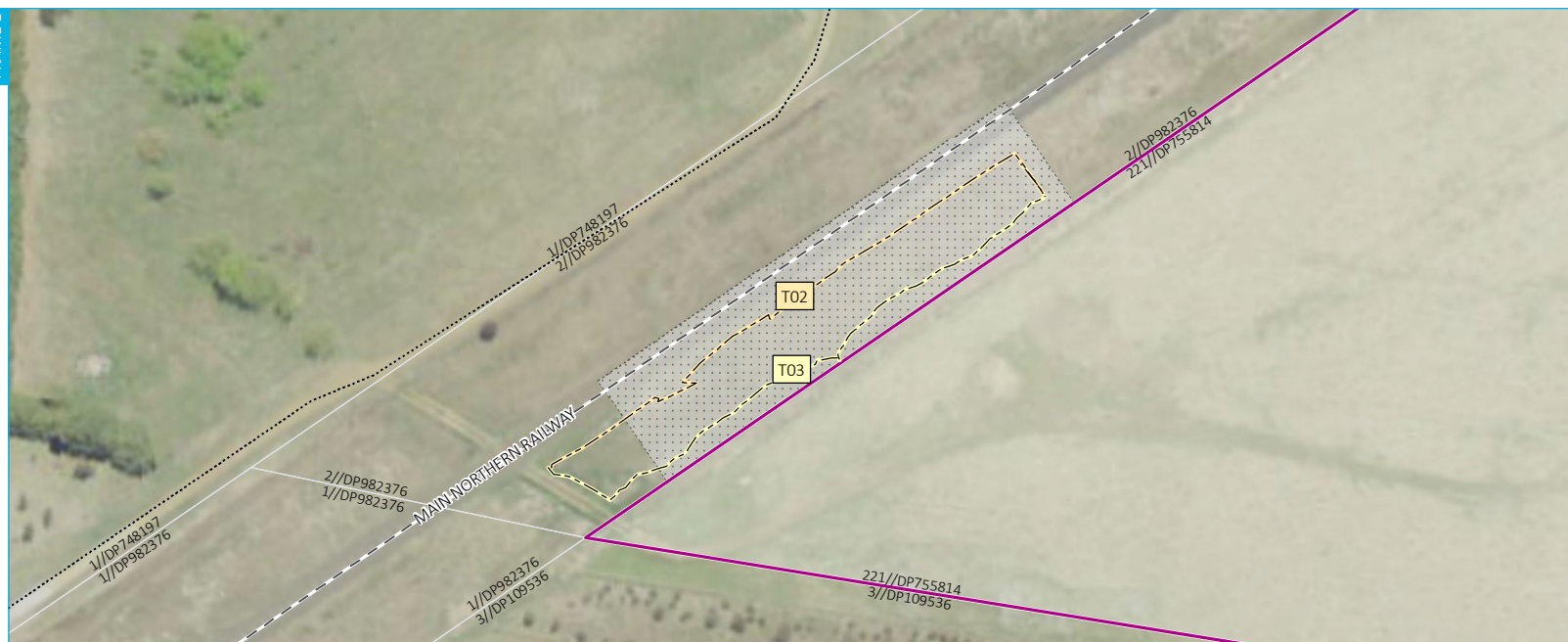
— T12

— T13

— T14

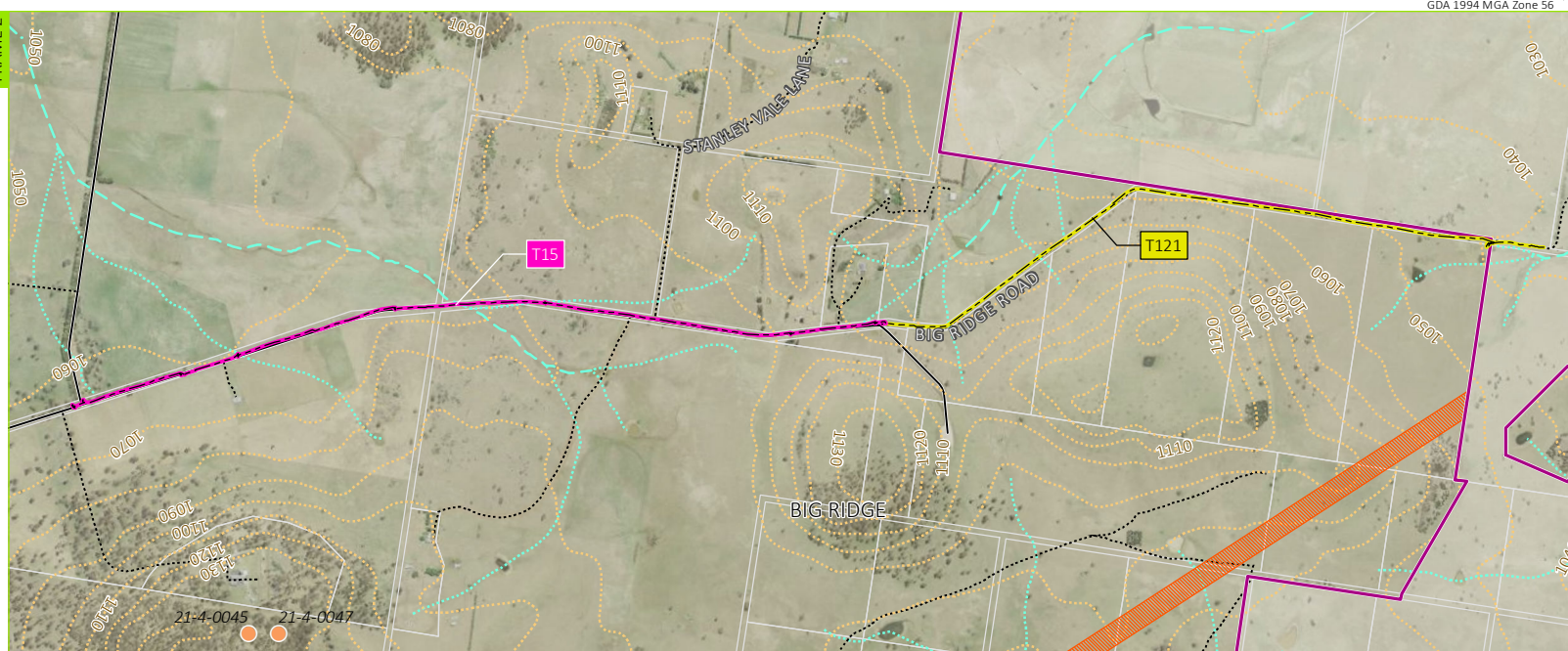
Survey transects – western section

New England Solar Farm
Aboriginal cultural heritage assessment
addendum report
Figure 4.1



KEY

- Solar array
- Potential site access/ETL easement/electrical cabling
- Hardstand in rail corridor
- Rail line
- Main road
- Local road
- Vehicular track
- Contour (10 m)
- Cadastre
- Strahler stream order
 - 1st order
 - 2nd order
- Heritage transect
 - T02
 - T03
 - T15
 - T121
- AHIMS site type
 - Modified tree



Survey transects – eastern section

New England Solar Farm
Aboriginal cultural heritage assessment
addendum report
Figure 4.2

4.2 Sampling strategy

The area considered for sampling was indicated by the widest possible boundary proposed for road widening, which extended approximately 5 m either side of the centre line of the road (ie a 10 m wide corridor). The two intersections of Barleyfields Road (north) and New England Highway, and Big Ridge Road and Barleyfields Road were surveyed out to the furthest extent of the footprint proposed for widening and intersection improvements. The road shoulder on the northern side of the New England Highway close to the intersection with Barleyfields Road (north) was not included in the survey effort (Figure 4.1); however, this area is in a highly disturbed context as a result of road grading and initial development of the highway, resulting in negligible archaeological potential.

Within Lot 2 of DP 982376 in the rail corridor, the EMM archaeologist and RAP representatives lined up 1 m apart and walked up and down the proposed hardstand footprint, covering a larger area to allow for changes in design if necessary.

The survey strategy was to cover all areas of the proposed footprint for the temporary hardstand, road upgrades and intersection improvements, with survey transects broken down into classes of landforms within the potential impact areas. The eastern extent of Big Ridge Road, where T121 was surveyed previously as part of the project ACHAR, was not included in the survey scope.

The project area along Barleyfields Road (north) in the vicinity of Barleyfields Lagoon was paid particular attention to as a result of the increased archaeological sensitivity as indicated by the presence of AHIMS sites and the lagoon itself.

4.3 Survey results

i Overview

The survey comprised of 14 walking transects and one vehicle-based transect (refer Figures 4.1 and 4.2). Survey transect 15 was conducted via vehicular passage as the project area along this section of Big Ridge Road contained a high level of ground disturbance related to the grading and cutting of the road through the landscape. Any mature trees were inspected for potential Aboriginal scars. GPS track log data indicates that each survey participant walked approximately 6 km. The vehicle-based transect covered an additional 3 km. The transects shown in Figure 4.1 and Figure 4.2 represent only where the archaeologist walked during survey (one person's movements). It does not accurately represent the transect width covered by the survey team, which generally involved coverage of the entire width of the road corridor from the edge of the sealed road to the fence line to inspect key elements such as rock outcrops and trees along the general transect alignment.

All mature trees in proximity to the area where the proposed works will take place were inspected for scars. One tree along survey transect 15 did possess a scar, but upon closer inspection both the EMM archaeologist and the RAPs agreed that due to its irregular shape it was likely the result of farming equipment rather than of Aboriginal origin.

Survey transect effective coverage data for the 15 transects is presented in Table 4.1 and the landform coverage data is summarised in Table 4.2. Examples of different landforms, ground surface visibility conditions and ground disturbance from road development and agricultural practices are shown in Plate 4.1 to Plate 4.8.



Plate 4.1 Survey transect 1 - view south-west showing disturbance from initial construction of the New England Highway



Plate 4.2 Survey transect 15 - view south-east showing scar determined to be the result of farming equipment



Plate 4.3 Survey transect 4 - view south of dislodged basalt boulders and regrowth vegetation in graded road verge



Plate 4.4 Survey transect 5 - view south showing disturbance from road grading and the initial construction of Barleyfields Road



Plate 4.5 Survey transect 15 - view east showing exposure and disturbance levels from cutting and tree inspection



Plate 4.6 Survey transect 14 - view west showing hillslope, visibility and disturbance levels from road cutting and build up



Plate 4.7 Survey transect 5 - view south-west showing historical disturbance levels through development of railway, Barleyfields Lagoon situated on the left side behind the railway building



Plate 4.8 Survey transect 5 - view south-east of dense grass covering a graded and dug-out road verge with Barleyfields Lagoon visible in the background

Table 4.1 **Survey transect effective coverage summary***

Transect	Survey method	Landform class	Area (m ²)	Exposure (%)	Visibility (%)	Effective survey coverage (m ²)	Effective survey coverage (%)	Description	Results / impacts
1	Pedestrian	Flat – plain	483	10%	40%	19	4%	South-eastern portion of the intersection of Barleyfields Road (north) and the New England highway, proposed widening of the entering lane onto Barleyfields Road (north). Highly disturbed context due to development of New England Highway and Barleyfields Road. Ironstone soil landscape overlying Sandon beds geology, outcropping sandstone material.	No Aboriginal objects identified. Low archaeological potential.
2	Pedestrian	Flat – plain	1,119	0%	10%	0	0%	South-eastern side of the rail corridor adjacent to railway line within Lot 2 of DP 982376. Highly disturbed context due to location within the rail corridor. Ironstone soil landscape overlying unnamed basalt flows.	No Aboriginal objects identified. Low archaeological potential.
3	Pedestrian	Flat – plain	1,017	0%	20%	0	0%	South-eastern side of the rail corridor adjacent to railway line within Lot 2 DP 982376. Highly disturbed context due to location within the rail corridor. Ironstone soil landscape overlying unnamed basalt flows	No Aboriginal objects identified. Low archaeological potential.
4	Pedestrian	Hillslope 1	4,418	10%	60%	2,651	60%	Eastern side of Barleyfields Road (north), basalt rock outcropping (10%). Highly disturbed context due to development of Barleyfields Road. Uralla erosional soil landscape overlying Uralla granodiorite.	No Aboriginal objects identified. Low archaeological potential.
5	Pedestrian	Flat – plain	7,348	0%	40%	0	0%	Eastern side of Barleyfields Road (north), hillcrest to flat, runs parallel to Barleyfields Lagoon on northern portion of road near the intersection with the Main Northern Railway, some granite and basalt rock outcropping (5%). Highly disturbed context due to development of Barleyfields Road and Main Northern Railway. Uralla variant a soil landscape overlying Uralla granodiorite.	No Aboriginal objects identified. Low archaeological potential.

Table 4.1 **Survey transect effective coverage summary***

Transect	Survey method	Landform class	Area (m ²)	Exposure (%)	Visibility (%)	Effective survey coverage (m ²)	Effective survey coverage (%)	Description	Results / impacts
6	Pedestrian	Flat – plain	6,475	20%	40%	518	8%	Western side of the intersection of Barleyfields Road (north) and New England Highway, proposed widening of the left exiting lane on to the New England Highway. Continues on north-western side of Barleyfields Road (north). Rock outcropping present (5%), likely granite. Highly disturbed context due to development of New England Highway and Barleyfields Road. Ironstone soil landscape overlying Sandon beds geology.	No Aboriginal objects identified. Low archaeological potential.
7	Pedestrian	Hillslope 1	5,838	10%	40%	234	4%	Western side of Barleyfields Road (north). Granite rock outcropping (5%). Highly disturbed context due to development of Barleyfields Road. Uralla soil landscape overlying Uralla granodiorite geology.	No Aboriginal objects identified. Low archaeological potential.
8	Pedestrian	Flat – plain	817	0%	10%	0	0%	North-eastern portion of the intersection of Big Ridge Road with Barleyfields Road, proposed widening of the left entering lane onto Big Ridge Road. Granite rock outcropping (30%). Highly disturbed context due to development of Big Ridge Road and Barleyfields Road. Uralla soil landscape overlying Uralla granodiorite geology.	No Aboriginal objects identified. Low archaeological potential.
9	Pedestrian	Flat – plain	926	0%	10%	0	0%	South-western portion of the intersection of Big Ridge Road with Barleyfields Road, proposed widening of the left exiting lane onto Barleyfields Road. Granite rock outcropping (50%). Highly disturbed context due to development of Big Ridge Road and Barleyfields Road. Uralla soil landscape overlying Uralla granodiorite geology.	No Aboriginal objects identified. Low archaeological potential.

Table 4.1 **Survey transect effective coverage summary***

Transect	Survey method	Landform class	Area (m ²)	Exposure (%)	Visibility (%)	Effective survey coverage (m ²)	Effective survey coverage (%)	Description	Results / impacts
10	Pedestrian	Flat – plain	1,309	0%	60%	0	0%	Northern side of Big Ridge Road, flat to hillslope, crosses over Rocky Creek a 3 rd order watercourse. Granite rock outcropping (10%). Highly disturbed context due to development of Big Ridge Road. Uralla soil landscape overlying Uralla granodiorite geology.	No Aboriginal objects identified. Low archaeological potential.
11	Pedestrian	Hillslope 1	3,959	30%	70%	831	21%	Northern side of Big Ridge Road, exposure high (50%) in some areas from sheetwash. Rock outcropping as pebbles and gravel (20%). Intersects a 1 st order stream that was dry at the time of survey. Highly disturbed context due to development of Big Ridge Road. Uralla soil landscape overlying Uralla granodiorite geology.	No Aboriginal objects identified. Low archaeological potential.
12	Pedestrian	Crest – hillcrest	5,401	0%	10%	0	0%	Northern side of Big Ridge Road, hillcrest to flat. Highly disturbed context due to development of Big Ridge Road and historic farming practices. Uralla to Kellys Plains soil landscape overlying unnamed deep lead gravels.	No Aboriginal objects identified. Low archaeological potential.
13	Pedestrian	Crest – hillcrest	6,895	0%	40%	0	0%	Southern side of Big Ridge Road, flat to hillcrest. Intersects a 1 st order stream that was dry at the time of survey. Highly disturbed context due to development of Big Ridge Road and historic farming practices. Uralla to Kellys Plains soil landscape overlying unnamed deep lead gravels.	No Aboriginal objects identified. Low archaeological potential.
14	Pedestrian	Hillslope 1	3,707	30%	60%	667	18%	Southern side of Big Ridge Road. Intersects Rocky Creek, a 3 rd order watercourse. Granite rock outcropping (20%) as stoned and gravel. Highly disturbed context due to development of Big Ridge Road. Uralla soil landscape overlying unnamed deep lead gravels and Uralla granodiorite.	No Aboriginal objects identified. Low archaeological potential.

Table 4.1 **Survey transect effective coverage summary***

Transect	Survey method	Landform class	Area (m ²)	Exposure (%)	Visibility (%)	Effective survey coverage (m ²)	Effective survey coverage (%)	Description	Results / impacts
15	Vehicle traverse	Flat – plain & hillslope 1	--	20%	70%	--	--	Stretch of Big Ridge Road. Landform plains – flat to hillslope, crest and descending hillslope. Highly disturbed context due to development of Big Ridge Road and historic farming practices. Kellys plains soil landscape overlying Sandon beds geology.	No Aboriginal objects identified. Low archaeological potential.

*In accordance with Requirement 5 of the Code, vehicular traverses have been excluded from survey coverage effectiveness calculations.

Table 4.2 Landform survey effective coverage summary

Landform class	Length (m)	Proportion of survey (%)	Area (m ²)	Effective coverage area (m ²)	Effective coverage %
Flat – plain (includes T1, T2, T3, T5, T6, T8, T9, T10)	2,437	39%	19,011	771	4%
Hillslope 1 (includes T4, T7, T11, T14)	2,240	36%	17,921	4,383	25%
Crest – hillcrest (includes T12 & T13)	1,537	25%	12,296	0	0%
Total	6,214 m	100%	49,228 m²	5,154 m²	-

In accordance with Requirement 5 of the Code, vehicular traverses have been excluded from survey coverage effectiveness calculations.

4.4 Discussion

No Aboriginal sites or areas of archaeological sensitivity were identified during the survey effort within the area where the proposed works will take place. This is primarily due to the high level of ground disturbance as a result of the development of the road and railway systems and historical farming practices in the surrounding area.

The location of Aboriginal sites identified by EMM archaeologists and participating RAPs during the project ACHAR phase indicate that areas of archaeological sensitivity are related to specific landforms in the region generally. In particular, the highest frequency of Aboriginal sites occurred on crests and rocky knolls (57%) followed by gently inclined hill slopes (30%) (refer Appendix D of EIS). Flats (6%) and watercourses (6%) represented the remaining landforms that contained Aboriginal objects.

The cluster of AHIMS sites near Barleyfields Lagoon, particularly AHIMS #21-4-0111 to #21-4-0113 which are on the eastern side of Barleyfields Road (north), are more a reflection of the lagoon's proximity; as these sites are not otherwise on particularly sensitive landforms. A thorough survey of the hillslope section of Barleyfields Road was completed, identified as survey transects 4 and 7, and where transect 4 transitions into transect 5 on the crest of the hillslope (see Figure 4.1). However, possibly due to the intensive construction and levelling of the road along this hillslope, no Aboriginal objects were identified on either side of the road corridor. This also has the implication that no areas of potential archaeological deposit occur there either.

Survey transects 8, 9, 10 and 14 are in proximity to or intersect with Rocky Creek, a 3rd order watercourse. Despite the proximity to water, the high level of ground disturbance associated with construction of Big Ridge Road decreases the archaeological sensitivity within this area.

Several of the transects were completed on featureless landforms away from reliable water sources. As a result, these areas have very low to negligible archaeological potential, particularly when considering the high level of ground disturbance associated with road and railway construction and historic farming practices.

Survey transects 11, 12, 13 and the eastern half of transect 15 traverse landforms/hillslopes that are often associated with Aboriginal sites; however, due to the level of ground disturbance and lack of suitable outcropping stone material, no areas of archaeological sensitivity were identified.

5 Impact assessment and management measures

No Aboriginal objects were identified as a result of the survey effort and it is unlikely subsurface archaeological deposits occur within the area of the proposed works. The presence of and/or potential value of Aboriginal objects

in the vicinity of Barelyfields Lagoon is severely reduced from levelling, cutting and grading completed as part of the sealed road and nearby highway in this area.

As noted in Section 4, no Aboriginal objects were identified as a result of the survey effort including the survey conducted for transect T121 as part of the ACHAR and it is unlikely that any archaeological deposits will be impacted. Should any Aboriginal objects be identified during the proposed works, they should be managed in accordance with the proposed AHMP that will be developed subsequent to project approval.

The following recommendations are based on the proposed works in their current design:

1. No further Aboriginal heritage assessment is required prior to the commencement of the proposed works.
2. If an object believed to be of Aboriginal origin is uncovered during the proposed works, all work in the immediate vicinity will cease and the find immediately reported to the work supervisor who will advise the site supervisor or other nominated senior staff member, who will carry out the recommendations stipulated in the AHMP.
3. In the event that suspected human skeletal remains are encountered, the following procedure must be followed:
 - all work in the vicinity will cease and the find immediately reported to the work supervisor who will advise the site supervisor or other nominated senior staff member;
 - the site supervisor or other nominated senior staff member will promptly notify the police and the State coroner (as required for all human remains discoveries); and
 - the site supervisor or other nominated senior staff member will contact DPIE for advice on identification of the skeletal material.

Yours sincerely,



Taylor Reid
Archaeologist
treid@emmconsulting.com.au

References

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Appendix A

Aboriginal consultation

Aboriginal Consultation Log: New England Solar Farm Consultation log	Contact type	Date	Comment
Notification of Haulage Road Upgrade survey and methods			
Organisation	Contact type	Date Sent	Comments
Nunawanna Aboriginal Corporation (NAC)	Email	05-Aug-19	Email to notify RAPs of proposed road upgrade work
Armidale Local Aboriginal Land Council	Email	05-Aug-19	Email to notify RAPs of proposed road upgrade work
Armidale and New England Gumbaynggirr Descendants	Email	05-Aug-19	Email to notify RAPs of proposed road upgrade work
Aaron Broad	Email	05-Aug-19	Email to notify RAPs of proposed road upgrade work
Les Townsend	Letter	13-Aug-19	Email to notify RAPs of proposed road upgrade work, tracking number 604 46858 402 092
Steven Ahoy	Email	05-Aug-19	Email to notify RAPs of proposed road upgrade work
Culturally Aware	Email	05-Aug-19	Email to notify RAPs of proposed road upgrade work
Nyakka Aboriginal Culture Heritage Corporation Archaeological and Cultural Heritage Consultants	Email	05-Aug-19	Email to notify RAPs of proposed road upgrade work
Nganyawana Clan Group	Email	05-Aug-19	Email to notify RAPs of proposed road upgrade work

Haulage Road Upgrade survey and methods			
Organisation	Contact type	Date Sent	Comments
Nunawanna Aboriginal Corporation (NAC)	Email	01-Aug-19	Emailed to find availability for survey efforts the following week
Steven Ahoy	Email	01-Aug-19	Emailed to find availability for survey efforts the following week
Armidale and New England Gumbaynggirr Descendants	Email	01-Aug-19	Emailed to find availability for survey efforts the following week
Nunawanna Aboriginal Corporation (NAC)	Email	05-Aug-19	Emailed survey work details for Thursday 8 August
Steven Ahoy	Email	05-Aug-19	Emailed survey work details for Thursday 8 August
Armidale and New England Gumbaynggirr Descendants	Email	05-Aug-19	Emailed survey work details for Thursday 8 August

25 September 2019

Responsible Officer: MC
U19/57

Tim Greenaway
UPC Renewables
Level 14
77 King Street
Sydney NSW 2000

Dear Tim

RE: New England Solar Farm - Proposed Road and Intersection Upgrades

Thank you for your letter in relation to the above matter dated 5 September 2019 (attached).

Council has formed the opinion that the current UPC road specification proposal presents as an unacceptable safety risk based on predicted traffic volumes, and that maintenance costs for the unsealed shoulders on sections 4 and 5 would be prohibitive. The safety rationale is supported by the Austroads Standard comparison below:

Road	Austroads Seal width - Traffic Lanes	Austroads Sealed shoulder each side	Total Seal Width	Council proposed	UPC proposed
Barley Fields Road New England Highway to Big Ridge Road	7.0	1.0	9.0	9.0	7.2
Big Ridge Road Seg 1	7.0	0.5	8.0	8.0	7.2
Big Ridge Road Seg 2	7.0	0.5	8.0	8.0	7.2
Big Ridge Road Seg 3	7.0	0.5	8.0	8.0	7.2
Big Ridge Road Seg 4	7.0	0.5	8.0	8.0	3.7
Big Ridge Road Seg 5	7.0	0.5	8.0	8.0	3.7

Council understands that sections 4 and 5 will have minimal traffic volumes post project construction, however this does not negate the need for this part of the route to be of a sufficient standard to minimise hazards during construction. In this context, Council believes that sections 4 and 5 should be sealed to a minimum width of 8 metres to the entry point of the lot proposed to be subdivided off for the sub-station.

Please contact Terry Seymour on 6778 6309 or email tseymour@uralla.nsw.gov.au should you wish to discuss this matter further.

Yours sincerely



David Aber
Acting General Manager

Enclosed:

1. NESF Road Upgrades – Response Letter to USC

5 September 2019

Mr David Aber
Acting General Manager
Uralla Shire Council
Po Box 106 Uralla NSW 2358

CC: Terry Seymour, Matt Clarkson, Uralla Shire Council

Dear David,

RE: New England Solar Farm - Proposed Road and Intersection Upgrades

Further to our letter to you titled New England Solar Farm – Proposed Road and Intersection Upgrades, dated 16 August 2019, we received a response by email from Terry Seymour, email dated 22 August 2019, attaching a list of queries and suggested road widening. Representatives of UPC and Uralla Shire Council (USC) met on 23 August 2019 to discuss the UPC submission and USC's queries and suggested road widening. Herewith, UPC now seeks to address USC's queries, provide an update of UPC's proposed commitments to road and intersection upgrades and provide an updated version of the New England Solar Farm – Traffic and Transport Assessment report (NESFTTA), prepared by SCT Consulting, dated 28 August 2019 (Annexure A).

USC Queries

The following provides SCT Consulting's response to each of the USC queries. These responses should be read in conjunction with the updated version of the NESFTTA report, dated 28 August 2019.

1) Table 3-2 – Peak Construction Volumes for Barleyfields Road – appears to be an error.

Table 3-1 refers to 672 extra AAWT, Table 3-2 (+364)

- a. Response: The figure of 672 (NESFTTA – Dated 14 August 2019) is correct as the initial assessment within the report is based on the peak traffic generation / distribution within the Environmental Impact Statement (EIS). A decision to reallocate all vehicles via the intersection of New England Highway / Barleyfields Road (north) was made as a result of the NESFTTA (Dated 14 August 2019).

As requested in our meeting on 23 August 2019 a table (**Table 1**) has been prepared which quantifies the distribution of traffic during both EIS and revised (current) conditions. This table reflects the updated construction traffic volumes provided in the NESFTTA (Dated 3 September 2019) as well as the following changes in construction vehicle access routes:

- i. All construction traffic to use Barleyfields Road (north); and
- ii. All construction traffic to use Big Ridge Road, not Munsies Road.

Table 1: NESF Construction / End state traffic volumes

Road	Existing AADT	Peak Construction traffic (EIS)	Total traffic including construction (EIS)	Peak Construction traffic (Revised)	Total traffic including construction (Revised)	End state construction traffic forecast
Barleyfields Road (North of Big Ridge Road)	419	672	1,091	552	971	449
Big Ridge Road (Segment 1)	119	672	791	552	671	149
Big Ridge Road (Segment 2)	54	600	654	552	606	84
Big Ridge Road (Segment 3)	54*	600	654	552	606	84
Big Ridge Road (Segment 4)	54*	600	654	552	606	84
Big Ridge Road (Segment 5)	0	600	600	552	552	30

* Volumes likely to be significantly lower than 54 due to location of traffic count and property accesses.

2) AAWT – used – inconsistent Table 2-1 – 6AM to 5PM to quantify existing traffic volumes. However Table 3-1 6AM to 6PM to measure Construction Traffic Volumes. Missing an hour for existing traffic volumes.

- a. Response: The table in question reflects the peak two hour periods in AM and PM peak that align with the nominated construction peak periods. This table has been repositioned in the report to Section 3.2.3 to provide greater clarity on the overall impact of construction vehicles on traffic volumes.

3) AAWT figures used as justifications, AUSTROADS Standards are developed around AADT. AAWT will give lower overall traffic volumes than AADT.

- a. Response: If utilising AAWT values, which focuses on weekday traffic only, a higher average traffic volume is realised when compared to AADT. This is due to the inclusion of commuter trip patterns. E.g. New England Highway volumes are approximately 400 vehicles higher using AAWT than AADT and Barleyfields Road is 14 vehicles higher using AAWT when compared to AADT. Worst case assessment was initially considered using AAWT however the NESFTA (Dated 28 August 2019) has now been updated to reflect AADT.

- 4) **Munsies Road not considered in this report – however there is an increase in the usage of this road – especially considering there is a residence right on edge of road in the unsealed portion – refer Pg 17 EIS (CI 2.3)**
 - a. Response: UPC noted during the meeting on 23/8/19 that Munsies Road will no longer be used for construction traffic. The comment is therefore no longer applicable.
- 5) **In Council's submission – requested that Gravel roads in front of residences be sealed for a length of 200m – consideration to intersection of Munsies Rd? Refer EIS CI 4.9 pg 56.**
 - a. Response: UPC noted during the meeting on 23/8/19 that Munsies Road will no longer be used for construction traffic. The comment is therefore no longer applicable.
- 6) **Report mentions Peak construction volumes for 8 months of the total 36 months of the project, however no quantification of non-peak volumes is given for comparison in this report. This comparison is required to place statements about reduced traffic into a quantifiable context.**
 - a. Response: Non-peak volumes are unable to be fully quantified due to the variability of traffic during the construction period. Further, UPC does not expect 'multiple peak periods' during construction, rather there will be a ramping-up and ramping-down of workforce and activity on site, with one peak period which may last for 8 months.
- 7) **Breakdown of delivery types – Rigid, Articulate, B-Double, also any HML / over width considered? With HML an assessment of several Structures will need to be done to confirm capacity.**
 - a. Response: Structural assessment comments are warranted. Heavy vehicle composition will be determined once detailed construction plans are developed, with this information to be contained in the construction Traffic Management Plan. This plan will be prepared by the lead construction contractor appointed by UPC and it will need to be put in place prior to commencing construction of the facility.
- 8) **Letter from UPC dated 16 August Clause 1.2, Table 2 and SCT Report Table ES1, ES2 CI 1.1, Figure 1-1, Table 2-3, Table 3-2, CI 4.1, Table 4-3 refers to Big Ridge with 4 segments, however UPC Letter CI 2.2 refers to 5 Segments. Would expect SCT report to be consistent?**
 - a. Response: Segment 5 is outside of SCT Consulting report scope as it refers to the internal road within the UPC site. For the purposes of assessment Big Ridge Road Segment 5 can be considered identical to Big Ridge Road Segment 4.

- 9) **Potential – Light vehicles still accessing from South Barley Fields and exiting from North Barley fields, is this still a possibility, what consideration has been given.**
- a. Response: This is not a possibility. All construction vehicle traffic will access / egress the site via Barleyfields Road (north) and Big Ridge Road. UPC has communicated to USC and the NSW Department of Planning, Industry and Environment that it will consolidate the access route for project construction vehicles to minimise disruption to the community.
- 10) **Report – mentions traffic lights as a potential option – concerns – Big Ridge Road – Barley Fields to Munsies – at least 3 properties access – this would then be uncontrolled access during light phases. Creates a potential for conflict and would not be acceptable.**
- a. Response: Noted. The use of traffic lights does not form part of the UPC proposed road upgrade and construction traffic management scope.
- 11) **Figure 2.3 Geometric layout – misleading shows better northbound storage than actual, also neglects to indicate closeness of Barley Fields Road to intersection**
- a. Response: Comment is related to the graphical display of SIDRA rather than the coding input. However, noting that the access proposal via Barleyfields Road (south) has been abandoned by UPC the comment is no longer relevant.
- 12) **Pg 21 commentary around 50kph speed restriction for heavy vehicles – this would also affect local land owners not associated with the development. Potential for drivers associated with the development only – how would this be implemented and enforced**
- a. Response: Implementation of speed management for construction vehicles would be addressed through a detailed construction Traffic Management Plan. UPC will consider speed limiting construction vehicles but based on discussions with Council, we do not propose to seek a change to the designated speed limit for the road.
- 13) **Pg 21 – 4.2 commentary around Barleyfields Nth road traffic volumes – increase of 334 vehicle movements – 222 light and 112 heavy - and Barley fields Sth – increase of 338 light vehicles – contrary to other comments about all traffic using Barleyfields Nth**
- a. Response: The respective figures of 334 and 338 vehicles are based on the initial peak traffic generation / distribution within the EIS. A decision to reallocate all vehicles via the intersection of New England Highway / Barleyfields Road (north) was made as a result of the NESFTTA (Dated 14 August 2019). This is not reflected in the above distribution. The construction traffic volume has now been updated to reflect a total daily generation of 552 vehicles. Table 1 provides clarity on the revised construction traffic distribution.

14) Clause 4.3 summary using AAWT traffic rather than AADT traffic in accordance with AUSTROADS to develop end state traffic volumes. AADT traffic for all roads actually higher – refer to EIS traffic data.

- a. Response: AAWT (average annual weekly traffic) is a measure of average daily traffic across weekdays only (5 day average). AADT (average annual daily traffic) additionally considers the weekends (7 day average). AAWT results in higher traffic volumes than AADT. Table 1 has been updated to reflect AADT volumes, noting that they are lower than AAWT.

15) No consideration in discussions given to the unsealed shoulder and total formation width in final cross section discussion. Refer to AUSTROADS Table 4.5 – Total Carriageway

- a. Response: It is noted that Council's proposed design for Barleyfields Road and Big Ridge Road is focused on construction traffic volumes and not end-state traffic volumes. This is not considered applicable as:
 - i. Application of the requirements within Austroads 'Guide to Road Design Part 3: Geometric Design' Table 4.5 (2017; p47) for a 1,000 – 3,000 AADT road way was previously proposed by Council prior to a revision in construction traffic volumes. Following this change the AADT, including construction traffic, is approximately 970. Application of the 500 – 1,000 AADT design requirement, as recommended by SCT Consulting, is considerable acceptable as it complies with the guidance of Austroads (2017) 'Guide to Road Design Part 3: Geometric Design' and is in keeping with the end state forecast for the roadway (449 AADT). The requirement to ensure a minimum sealed width of 7m for heavy vehicles is also achieved by the UPC proposal despite Barleyfields Road not being a designated heavy vehicle haulage route. Further, AADT does not comprise more than 15 per cent heavy vehicles. These are the two factors which application of this requirement is outlined within Austroads documentation on page 47.

Lastly, within Section 4.2.6 of Austroads (2017) 'Guide to Road Design Part 3: Geometric Design' (p46) a nominated traffic lane width of 3.5m is referred to as desirable. It is proposed to provide a painted centreline on Barleyfields Road, achieving a sealed width of 3.6m for each travel lane (including 0.5m sealed shoulders). Consideration of the current use of heavy vehicles on Barleyfields Road and Big Ridge Road, and their respective observed minimum widths of 5.8m and 5.0m, is noted.

The total proposed carriageway width to be provided on Barleyfields Road, including shoulders, is 9.2m (2x 3.1m lanes, 2x 0.5m sealed shoulders, 2x 1m unsealed shoulders).

- ii. For the Big Ridge Road alignment Council has nominated a total sealed width of 8m (two 3.5m lanes with 0.5m shoulders). This exceeds the requirements outlined in Table 4.5 for roads catering for vehicles between 1-150 AADT. (i.e. 3.7m sealed pavement with 2.5m unsealed shoulder). UPC's proposal to provide a 7.2m sealed width conforms with Austroads (2017) 'Guide to Road Design Part 3: Geometric Design' (Table 4.5; 2017; p47) and satisfies an average daily traffic volume of between 500-1,000. This is despite the maximum end state AADT being approximately 150 vehicles. Further the maximum AADT during construction, assuming no construction vehicles use Munsies Road, is approximately 670 vehicles. This falls within the Austroads proposed road design sealed width banding of 7.2m.

The Austroads requirement for an AADT of 500 – 1,000 vehicles proposes traffic lanes of 6.2m – 7.0m, being 2 x 3.1m lanes up to 2 x 3.5m lanes. As noted above Council's response to the UPC submission dated 14 August 2019 has suggested 7.0m sealed width requirement. This is considered excessive given the AADT Council references as justification is a short-term construction peak, of eight month duration. It is proposed to provide a total carriageway width of 9.2m which is compliant with Austroads (2017) 'Guide to Road Design Part 3: Geometric Design Table 4.5'. The above approach is considered acceptable for both Segment 1 and Segment 3 of Big Ridge Road, noting that Segment 2 is not proposed to be upgraded due to its existing width and alignment.

Segment 4 and 5 of Big Ridge Road are proposed to be upgraded to an 8.7m carriageway (3.7m sealed with 2x 2.5m unsealed shoulders). This approach conforms to Austroads (2017) requirements and aligns with the end state AADT (30 vehicles) for the road. During construction management procedures will be put in place to safely control the flow of traffic to / from site.

Where two way two lane operation of a sealed road is impacted all of UPC's proposed road widths satisfy the statement that 'A width greater than 4.5 m but less than 6.0 m may lead to two vehicles trying to pass with each remaining on the seal. This potentially increases head-on accidents. On two lane sealed roads, the total width of seal should desirably be not less than 7.2 m to allow adequate width for passing' (Austroads 'Guide to Road Design Part 3: Geometric Design'; 2017; p46). Whilst this is a desirable width it has been used as a guiding principal within the UPC sealed width proposal.

Speed management for heavy vehicles will be put in place on Big Ridge Road and Barleyfields Road to further mitigate safety risks. This will be developed within Construction Traffic Management Plans (CTMPs). It is noted that the provision of a straight roadway with overly generous width provisions has the potential to have a detrimental impact on road safety outcomes.

16) What methods will be used to ensure all traffic accessing the site uses Barleyfields Rd Nth Section and does not short cut. How will this be monitored and enforced

- a. Response: Implementation and enforcement of construction traffic access / egress routes would be addressed through a detailed construction Traffic Management Plan and associated communication plans. The responsibility for the preparation of these plans sits with the lead contractor to be appointed by UPC for the design and construction of the project, and will be submitted to the NSW Department of Planning, Industry and Environment for review, and to USC for comment. The timing of that is post-SSD approval, but prior to any on-site construction works.



USC Suggested Road Upgrade specification - based on Austroads Standard

The following was provided by USC in email received on 22 August 2019. The markup in BLUE is by UPC.

Road	Pre development traffic	Construction Traffic – Peak (revised)	Total Peak Traffic during construction	Operational / Post-Construction Total Traffic	Austrroads Seal width - Traffic Lanes (A)	Austrroads Sealed shoulder Each Side	Total Seal Width	Austrroads Total Shoulder Each Side (Includes sealed shoulder) UPC Proposed Total shoulder (C)	Austrroads total formation (A) + 2 (C)
Barley Fields Road NE Hwy to Big Ridge Rd	433	672	1105		7.0	1.0	9.0	2.0	11.0
UPC Response	419	552	971	449	6.2	0.5	7.2	1.5	9.2
Big Ridge Rd Seg 1	121	672	847		7.0	.5	8	1	9
UPC Response	119	552	671	149	6.2	0.5	7.2	1.5	9.2
Big Ridge Rd Seg 2	58	600	658		7.0	.5	8	1	9
UPC Response	54	552	606	84	6.2	0.5	7.2	1.5	9.2
Big Ridge Rd Seg 3	58	600	658		7.0	.5	8	1	9
UPC Response	54	552	606	84	6.2	0.5	7.2	1.5	9.2
Big Ridge Rd Seg 4	58	600	658		7.0	.5	8	1	9
UPC Response	54	552	606	84	3.7	0	3.7	2.5	8.7
Big Ridge Rd Seg 5	58	600	658		7.0	.5	8	1	9
UPC Response	0 #	552	552	30	3.7	0	3.7	2.5	8.7
Munsies Rd	25	69	94				7.2 (5)		8.7m (EIS) - unsealed

Big Ridge Rd Segment 5 does not currently exist.
Munsies Rd blanked out as UPC does not propose to use Munsies Rd for construction vehicles.

USC Notes:

- (1) Austrroads standard – AGRD03-16 Guide to Road Design Part 3: Geometric Design

- (2) Traffic Volumes – AAWT – NOT AADT – in accordance with AUSTRROADS – Using AADT – Total Traffic volumes will actually be higher than quoted – SCT Report has now been adjusted to AADT. AADT produces lower traffic volumes for the reasons detailed in our response to Query 14 above.
- (3) Used wider seal width to accommodate high percentage Heavy Vehicles (refer Austroads table 4.5 note 3, 6). Sealed Widths proposed by UPC are consistent with Austroads.
- (4) Big Ridge Rd Seg 5 – upgrade consistent with Seg 4. UPC has proposed the same.
- (5) Seal first 200m of Munsies Road adjacent to Residential Property near Big Ridge Road intersection. UPC do not intend to use Munsies Rd for construction purposes.

UPC Notes:

- (A) The above table has been updated by UPC on the basis that the Construction Traffic volumes are used as a guide only to aid in the selection of appropriate road widths for the designated traffic route. We note, that the permanent or end state traffic volumes are significantly less than the peak construction volumes, falling below AADT of 150 vehicles for the length of Big Ridge Road. Irrespective, UPC has selected to construct the road to a 9.2m wide carriageway, with the exception of Segments 4 and 5.
- (B) Applying the peak construction traffic to Austroads AGRD03-16 Guide to Road Design Part 3: Geometric Design, Barleyfields Road and all segments of Big Ridge Road fall into the Design AADT category of 500 – 1000 vehicles. The Traffic Lane width for this AADT category is 6.2 – 7.0m. UPC has used this as a guide in selecting a 6.2m traffic lane width for the following reasons:
- i. The AADT on which this design is based on is a short-term peak AADT which is many multiples more than the long-term forecast AADT for these roads; it is a temporary impact.
 - ii. All segments of Big Ridge Road fall into the lower end of this category and therefore the lower Traffic Lane width should be applied.
- (C) Austroads AGRD03-16 Guide to Road Design Part 3: Geometric Design – Table 4.5 at Note 6 says – *A minimum of 7.0m seal should be provided on designated heavy vehicle routes (or where AADT contains more than 15% heavy vehicles)*. Barleyfields Road and Big Ridge Road are not designated heavy vehicle routes, nor do these roads have more than 15% heavy vehicles in the operational phase of the project. Although this Austroads note does not apply to the project-related roads, UPC and SCT have used this as a guide for road design for construction vehicle traffic. By providing a 7.2m sealed carriageway for the length of the road where construction vehicles could interact with the general public, this note is satisfied.

Summary of UPC Commitments

The following road upgrades are proposed by UPC.

Road Intersections

UPC agrees with SCT's recommendation on the intersection upgrade and proposes to upgrade the Barleyfields Road and Big Ridge Road intersections in line with Appendix B. UPC notes that its consultations with NSW Roads and Maritime Services (RMS) regarding the New England Highway / Barleyfields Road intersection upgrade are ongoing, given RMS's responsibility for the New England Highway.

Uralla Shire Council Roads

UPC proposes the following road upgrades based on the assessment of traffic management and road upgrades presented by SCT Consulting.

Barleyfields Road

UPC propose to construct a sealed road width of 7.2m, being 2 x 3.1m sealed lanes with 0.5m sealed shoulders. In addition, a further unsealed shoulder of 1m both sides is proposed to create a total carriageway width of 9.2m. This proposed carriageway is consistent with the Austroads guide for both the short-term peak construction and operational traffic volumes.

Big Ridge Road - Segment 1

Segment 1 currently has a sealed pavement width of 5 to 5.6m. UPC propose to construct a sealed road width of 7.2m, being 2 x 3.1m sealed lanes with 0.5m sealed shoulders. In addition, a further unsealed shoulder of 1m both sides is proposed to create a total carriageway width of 9.2m. This proposed carriageway is consistent with the Austroads guide for both the short-term peak construction and operational traffic volumes.

Big Ridge Road (Segment 2)

No work to the existing sealed width is proposed as this segment currently conforms, with negligible difference, to the Austroads guide. This current carriageway is consistent with the Austroads guide for both the short-term peak construction and operational traffic volumes.

Big Ridge Road - Segment 3

Segment 3 is currently a narrow, unsealed carriageway with a minimum width of 3.8m. UPC propose to construct a sealed carriageway of 7.2m in width (2 x 3.1m sealed lanes with 0.5m sealed shoulders). In addition, a further unsealed shoulder of 1m both sides is proposed to create a total carriageway width of 9.2m. This proposed carriageway standard is consistent with the Austroads guideline for both the short-term peak construction and operational traffic volumes.

Big Ridge Road – Segment 4

Segment 4 is currently an unformed road. UPC proposes to construct a single lane 3.7m wide carriageway with an unsealed shoulder of 2.5m both sides, being a total carriageway width of

8.7m consistent with Austroads road requirements. This proposed carriageway standard is consistent with the Austroads guideline for operational traffic volumes. During construction, it is not anticipated that local traffic will use this segment of Big Ridge Road as it does not service any properties other than those that form part of the Project site. It is considered that traffic management can be put in place to manage traffic through Segment 4 during construction.

Big Ridge Road - Segment 5

UPC propose to continue Big Ridge Road in the paper road corridor to the location of the substation on the eastern side of the transmission lines and further as required. The carriageway is proposed to be consistent with Big Ridge Road (Segment 4); a single lane 3.7m wide carriageway with an unsealed shoulder of 2.5m both sides, being a total carriageway width of 8.7m consistent with the Austroads guide. This proposed carriageway standard is consistent with the Austroads guideline for operational traffic volumes. During construction, it is not anticipated that local traffic will use this segment of Big Ridge Road as this segment of Big Ridge Road does not currently exist in road form and forms part of the proposed Project site. It is considered that traffic management can be put in place to manage traffic through Segment 5 during construction.

UPC consider the proposed road upgrades to present a safe and appropriate haulage route to the site, during construction and throughout the solar farm operations, leaving the Council and the local community with a lasting positive impact from the Project.

We kindly request that Council provide a formal response to this letter and endorsement of the proposed road and intersection upgrade works.

Alternatively, please let me know if you would like to discuss further. I am contactable on the details provided below.

Regards,
UPC Renewables Australia Pty Ltd

A handwritten signature in black ink, appearing to read 'Tim Greenaway', written in a cursive style.

Tim Greenaway
NESF Project Director
0413 625 097

NESF Pty Ltd as trustee of the New England Solar Farm Trust

ACN 634 831 262

ABN 27 634 831 262

Suite 2, Level 2, 13 – 17 Castray Esplanade

Battery Point, TAS, 7004

30 September 2019

Iwan Davies

A/Team Leader, Energy & Resources | Planning & Assessments

NSW Department of Planning Industry and Environment

320 Pitt Street | GPO Box 39 | Sydney NSW 2001

Dear Iwan,

UPC assessment of Uralla Shire Council's feedback on proposed road upgrades for NESF

This letter articulates UPC's understanding of the divergence in position between Uralla Shire Council (Council) and UPC over the proposed road upgrades associated with the New England Solar Farm. UPC has been consulting with Council on the road upgrades since early 2019 and more intensively since our meeting with the Department of Planning, Industry, and Environment (DPIE) on 25 July 2019. As anticipated in that meeting, it has proven to be difficult to reach a conclusive agreement with Council on the interpretation of the Austroads standards and the appropriate level of road upgrades to be implemented.

The discussion below compares Council's assessment of the required standard of road upgrades in its letter dated 25 September 2019 against UPC's proposed road upgrades dated 5 September 2019, using the revised forecast traffic numbers issued by UPC, and based on the Traffic and Transport Assessment report prepared by SCT Consulting dated 3 September 2019 (TTA).

Please refer to Figure 1 below for a depiction of the site access route segments involving Barleyfields Road and Big Ridge Road Segments 1,2,3,4 (note: segment 5, which is contained within the project boundary, is not shown in Figure 1 immediately below, but is discussed in the notes and is shown in the detailed figure A.1 provided in Annexure A).

Figure 1-1 Key road corridors



Source: SCT Consulting; 2019

Figure 1: New England Solar Farm site access route

In Council's letter dated 25 September 2019 it states *"Council has formed the opinion that the current UPC road specification proposal presents an unacceptable safety risk based on predicted traffic volumes, and that maintenance costs for the unsealed shoulders on Section 4 and 5 would be prohibitive."* This statement is not considered to be based on reasonable or clearly articulated grounds for the reasons outlined below.

Barleyfields Rd and Big Ridge Rd Segments 1-3

- The UPC proposed upgrades of Barleyfields Rd and Big Ridge Rd Segments 1 to 3 are fully compliant to the Austroads (2017) *Guide to Road Design Part 3: Geometric Design* for the short-term peak construction traffic volume, and well in excess of the Austroads (2017) *Guide to Road Design Part 3: Geometric Design* requirements for post-construction.
- As articulated further below in the notes under Table 1, it is unclear why Council has based its proposed upgrades on a standard for traffic volumes that exceed projections.

Big Ridge Rd Segment 4

- It is noted that no formed road currently exists in Segment 4 - it is an unformed farm track that ends in a dead end and is utilised at present by project landholders. Please refer to Annexures A and B for more detailed information and photographs of Segment 4.
- The UPC proposed construction of Big Ridge Rd Segment 4 is fully compliant with Austroads (2017) *Guide to Road Design Part 3: Geometric Design* for forecast operational phase traffic volumes. During construction, the vast majority of traffic entering this segment will be project-related construction traffic which will be managed through the implementation of a Traffic Management Plan (TMP).

- The processes and controls to be implemented in the TMP will manage potential interactions on Segment 4. These may include:
 - a reduced speed limit for all project-related vehicles;
 - scheduled arrival and departure times. For example, vehicles can be held on-site during peak times until Segment 4 is clear so that priority is given to vehicles entering the site. Vehicle movements are likely to be predominantly unidirectional (entering in the morning and leaving in the afternoon).

Big Ridge Rd Segment 5

- No road currently exists within Segment 5 of Big Ridge Rd – it is a paper road which UPC has obtained consent from Council to include in the Development Application.
- The UPC proposed construction of Big Ridge Rd Segment 5 sits wholly within the project site. Construction traffic will leave Big Ridge Rd in Segment 4. The design of Big Ridge Rd Segment 5 can only be based on the operational phase forecast Annual Average Daily Traffic (AADT). To design and construct a road for a forecast AADT of 30 vehicles to the standard for an AADT of up to 1,000 vehicles as proposed by Council is not reasonable.
- UPC's proposed construction of Big Ridge Rd Segment 5 is therefore considered to be fully compliant with Austroads (2017) *Guide to Road Design Part 3: Geometric Design*.

General observations regarding safety concerns

- Sight distance along Big Ridge Road Segments 1-4 is generally of a high standard which, when combined with the proposed Austroads compliant carriageway width design, satisfactorily address Council's safety related concerns.
- A TMP will be prepared by UPC and/or its contractors prior to the commencement of construction. The plan will prescribe detailed processes and controls to be implemented to ensure safe use of the road network along the entire access route.
- Illustrative photographs are provided in Annexure B

Table 1 below summarises UPC's proposed road upgrades of 5 September 2019 and Council's response dated 25 September 2019.

Road	Traffic Volumes (AADT)				Entity	Austroads Seal width - Traffic Lanes (A)	Austroads Sealed shoulder Each Side	Total Seal Width	Austroads Total Shoulder (C)	Austroads total formation (A) + 2 (C)	Austroads Compliant for AADT
	Current traffic	Construction Traffic – Peak (revised)	Peak Traffic during construction	Operational Total Traffic							
Barley Fields Road NE Hwy to Big Ridge Rd	419	552	971	449	Council	7.0	1.0	9.0	2.0	11.0	1,000 – 3,000 ¹
					UPC	6.2	0.5	7.2	1.5	9.2	500 – 1,000
Big Ridge Rd Seg 1	119	552	671	149	Council	7.0	.5	8	1	9	500 – 1,000 ²
					UPC	6.2	0.5	7.2	1.5	9.2	500 – 1,000 ²
Big Ridge Rd Seg 2	54	552	606	84	Council	7.0	.5	8	1	9	500 – 1,000 ²
					UPC	6.2	0.5	7.2	1.5	9.2	500 – 1,000 ²
Big Ridge Rd Seg 3	54	552	606	84	Council	7.0	.5	8	1	9	500 – 1,000 ²
					UPC	6.2	0.5	7.2	1.5	9.2	500 – 1,000 ²
Big Ridge Rd Seg 4	54	552	606	84	Council	7.0	.5	8	1	9	500 – 1,000 ³
					UPC	3.7	0	3.7	2.5	8.7	1 – 150 ³
Big Ridge Rd Seg 5	0	0	0	30	Council	7.0	.5	8	1	9	500 – 1,000 ⁴
					UPC	3.7	0	3.7	2.5	8.7	1 – 150 ⁴

Table 1: Summary of current and projected traffic volumes and comparison of UPC vs Council proposed upgrades

In comparing the two sets of proposed upgrades summarised in the table above, it is noted that:

1. The upgrade for Barleyfields Road proposed by Council is consistent with the Austroads (2017) *Guide to Road Design Part 3: Geometric Design* for an AADT of 1,000 – 3,000 vehicles. This is in excess of the forecast short-term peak construction AADT of 971 vehicles and well in excess of the Operational Total Traffic volume of 449 vehicles and is therefore considered unreasonable. The UPC proposed design is compliant for an AADT of 500 – 1,000 vehicles, which covers both the construction peak and operational traffic volumes.
2. Big Ridge Road Segments 1 to 3 – the road upgrade proposed by Council and UPC are both compliant with Austroads (2017) *Guide to Road Design Part 3: Geometric Design*. The difference is Council is proposing a total sealed width of 8.0m and UPC is proposing a total sealed width of 7.2m. For an AADT of 500 – 1,000 vehicles, the Austroads (2017) *Guide to Road Design Part 3: Geometric Design* provides a range of sealed road width. UPC has selected the lower end of this range as:

- The AADT on which the design is based is a short-term / temporary construction traffic load
 - The Peak Construction AADT is 606 – 671, which is at the lower end of the 500 – 1,000 range.
 - Forecast end-state AADT ranges between 84 and 149 vehicles.
3. Big Ridge Road Segment 4 – during construction, only construction traffic will enter Segment 4 as it does not provide a thoroughfare to anywhere beyond the end of Segment 4 (refer Figure A.1). The construction traffic can be managed through the implementation of a TMP. As outlined in detail in Annexure A, the only landholders who would have any reason to utilise Segment 4 of Big Ridge Road are project-participating landholders. No more than 5 individuals are relevant in this context. These individuals will be consulted during the preparation of the TMP. It should also be noted that their need to access their properties via Segment 4 will be heavily reduced during construction (refer Annexure A for further discussion). UPC has based the road design on the operational traffic AADT of 84 vehicles. To construct a road for vehicle numbers of up to 1,000 AADT for a future road use of 84 vehicles AADT is not reasonable. In Council’s letter dated 25 September it states - *“Council has formed the opinion that the current UPC road specification proposal presents an unacceptable safety risk based on predicted traffic volumes, and that maintenance costs for the unsealed shoulders on Section 4 and 5 would be prohibitive.”* At the conclusion of construction, we understand UPC will need to return the road to Council in an acceptable standard. Beyond this timeframe, the very low projected use level of 84 vehicle movements per day will not require significant maintenance of the unsealed shoulder; hence this statement is not reasonable and not logical based on the projected road usage levels post-construction.
4. Big Ridge Road Segment 5 is wholly within the project site (refer Figure A.1). The road does not currently exist, is not currently used by anyone and will not be available to the public as it will be gated off. Access to the temporary site access / laydown area is within Segment 4, therefore construction traffic numbers should not be considered in the selection of road design for Segment 5. Therefore, design of Segment 5 is considered fully compliant to Austroads Design Guide.

In Council’s letter dated 25 September 2019 it states – *“Council understands that sections 4 and 5 will have minimal traffic volume post project construction, however, this does not negate the need for this part of the route to be of a sufficient standard to minimise hazards during construction. In this context, Council believes that sections 4 and 5 should be sealed to a minimum width of 8 metres to the entry point of the lot proposed to be subdivided off the sub-station.”*

As Big Ridge Road Segment 5 sits wholly within the project site during construction, the management of traffic and the construction of the currently non-existent road will be managed by the project construction team through the TMP. UPC would expect that similar to the other internal roads Segment 5 would be constructed to an all-weather road standard.

Acceptable Road Standard

Council has referred to the following table extracted from Austroads (2017) *Guide to Road Design Part 3: Geometric Design* as the acceptable standard for assessment of road widths. UPC has also used this referenced document in the determination of the proposed road upgrades.

The following tables are taken from SCT's report dated 3rd September 2019.

Table 2-2 Single carriageway rural road widths

Element	Design AADT				
	1–150	150–500	500–1000	1000–3000	> 3000
Traffic lanes (m)	3.7 (1 x 3.7)	6.2 (2 x 3.1)	6.2–7.0 (2 x 3.1/3.5)	7.0 (2 x 3.5)	7.0 (2 x 3.5)
Total shoulder (m)	2.5	1.5	1.5	2.0	2.5
Minimum shoulder seal (m)	0	0.5	0.5	1.0	1.5
Total carriageway (m)	8.7	9.2	9.2–10.0	11.0	12.0

Source: Austroads Guide to Road Design Part 3: Geometric Design; 2017; p47

Assessing the roads in their current condition against this standard

Table 2-3 Existing design conformance

Road	AADT	Design AADT Segment	Surveyed sealed width (traffic lanes only)	Nominated design width (traffic lanes only)	Nominated design width currently achieved
New England Highway	6,338	> 3,000	11m [^]	11m [^]	✓
Barleyfields Road	419	150 – 500	5.8m	6.2m	✗
Big Ridge Road (Segment 1)	119	1 – 150	5m – 5.6m	3.7m – 6.2m	✗
Big Ridge Road (Segment 2)	54	1 – 150	6.9m – 7.1m	3.7m – 6.2m	✓
Big Ridge Road (Segment 3)	54*	1 – 150	3.8 – 6.9m (unsealed)	3.7m (if sealed) 8.7 carriageway width	✗ [#]
Big Ridge Road (Segment 4)	54*	1 – 150	Not available (unsealed)	3.7m (if sealed) 8.7 carriageway width	✗ [#]

= Austroads does not reference unsealed road widths, assessment based on carriageway width.

* = AADT is overestimated given position of property access locations relative to survey location within Segment 2.

[^] = total width

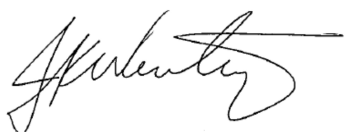
Source: SCT Consulting, modified from EMM Consulting; 2018, Matrix 2019 and Austroads; 2017

In the above table it is noted that only the New England Highway and Big Ridge Road (Segment 2) currently comply with the sealed traffic lane width requirements in Austroads (2017) *Guide to Road Design Part 3: Geometric Design*. The proposed upgrades by UPC are not only compliant with the Austroads standards for the end-state AADT traffic movements, but will also lead to a substantial increase in the condition and safety of the existing road network.

Proposed way forward

UPC kindly requests that DPIE condition appropriate road upgrade standards for the site access route along Barleyfields Road and Big Ridge Road as discussed in our meeting of 25 July 2019. We believe that the upgrades proposed by UPC in our letter to Council of 5 September 2019 are appropriate and reflect a correct and reasonable interpretation of the Austroads design standards. UPC welcomes the opportunity to meet with DPIE at its earliest convenience, along with our planning and environment consultants EMM and our specialist traffic consultants SCT, to resolve this matter in a timely manner.

Kind regards



Killian Wentrup

Killian Wentrup | Head of Solar Development
UPC Renewables Australia
A UPC Renewables and AC Energy Company

M: [+61 481 237 742](tel:+61481237742)

E: killian.wentrup@upc-ac.com

Annexure A – Detailed description of Segment 4 of Big Ridge Road

Current status of Segment 4

Segment 4 of Big Ridge Road is an unsealed, unformed farm track, approximately 2.2 km in length and provides access to the Northern Array area. The topography of this section of road is predominantly flat with very good sight due to very little roadside vegetation along the primarily straight alignment of Big Ridge Road, as shown in Photograph A3 and A4 below.

Existing daily traffic for the closest traffic survey location on Big Ridge Road, Segment 2, is approximately 54 vehicles. This is primarily traffic from project landholders. Surveys were not taken on Segment 4 due to their being no property accesses and the dead end nature of the road. Daily traffic in Segment 4 is reasonably assumed to be negligible.

Figure A.1 below has been prepared to provide context for Segment 4 with respect to expected road users, the development footprint, project boundary (ie involved lots) and the project landholder's residual land. As shown in Figure A.1, there are no residences or residential driveways accessible from Segment 4.

There are five landholders with potential to use Segment 4 to access their land. All of these landholders are project-involved landholders that UPC has formed a close relationship with over the last two years. UPC has entered into long term legal agreements with these landholders relating to their involvement in the project and the use of their land for the project site.

Along Segment 4 and the proposed access points to the development footprint there are four locked gates that provide project landholders access to their land on either side of Big Ridge Rd. This land is primarily used for sheep and cattle grazing with infrequent vehicle movement requirements.

During construction, four of the five landholders will either have no need or a heavily reduced need to access their land from along Segment 4, as they have internal access from elsewhere on their properties, avoiding potential interactions with the project's construction traffic. Only one of the five landholders is envisaged to need to access their property on a regular basis using Big Ridge Rd Segment 4 (because whilst part of their property will be used for the project the residual land will still be used for grazing, and they don't have an alternative access route). Regardless, any project landholders who require access to their residual land via Segment 4 of Big Ridge Road will be consulted by UPC and the construction contractors during preparation of the TMP.

Proposed upgrades to Segment 4

Outside of peak times, there is forecast to be 8 vehicles (ie 3 x light vehicles and 5 x heavy vehicles) entering the site per hour and 8 vehicles leaving the site per hour. This can be also be expressed as 1 vehicle entering the site every 7.5 minutes and 1 vehicle leaving the site every 7.5 minutes. At peak times in the morning and afternoon, a worst case scenario would be approximately 109 construction vehicles per hour. This is based on a directional split for

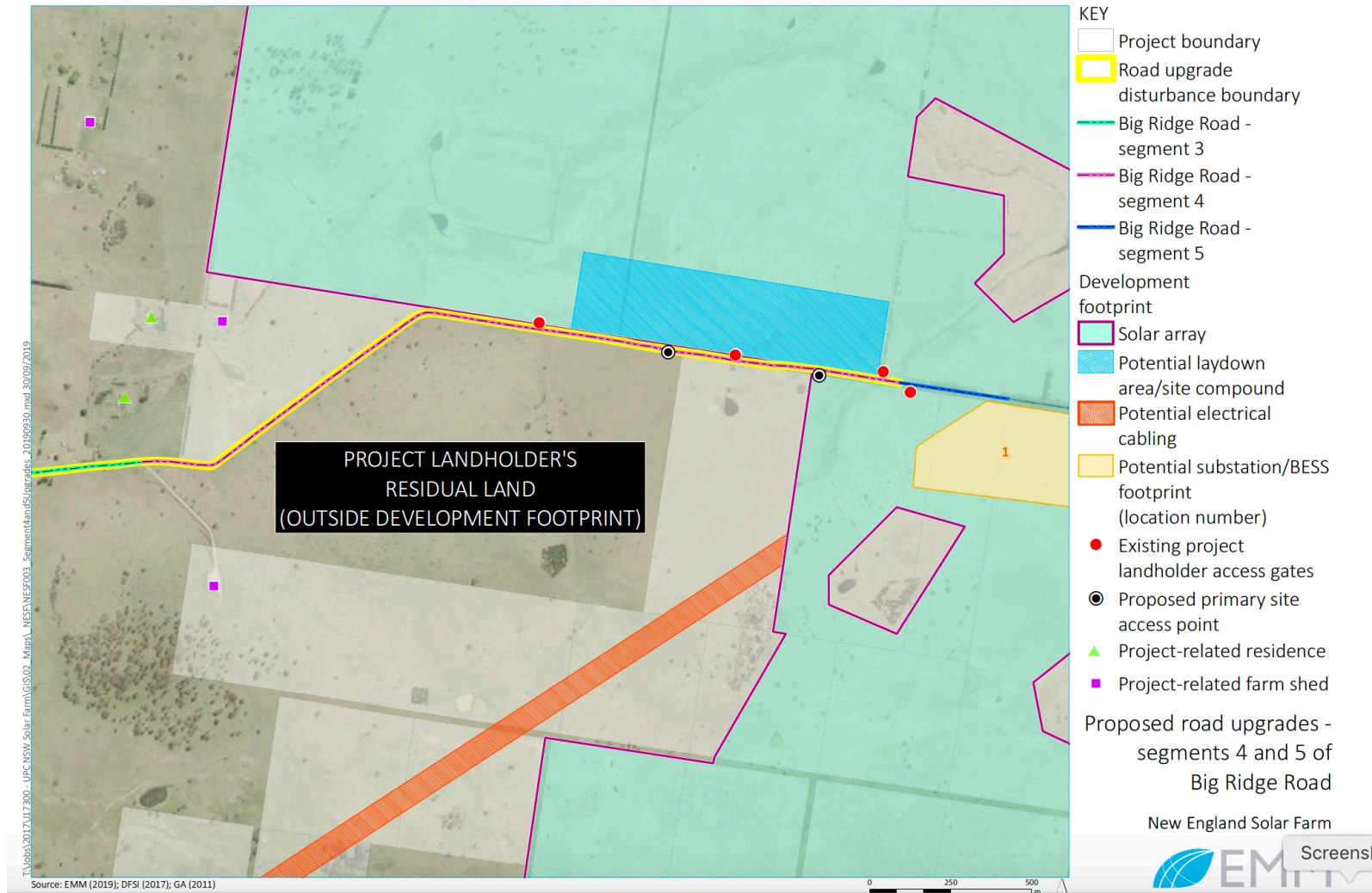
the AM peak of 104 (inbound) / 5 (outbound) which is inverted in the PM peak hour. Following construction, it is expected the daily traffic for this segment of Big Ridge Road to be no more than 30 vehicles (note: in the table above the indicated figure of 84 vehicles during operations is highly conservative as it includes the baseline traffic survey results from Segment 2 plus the estimated daily vehicles in Segment 4. The relevant design standard is the same, regardless).

To safely manage construction traffic along this segment of Big Ridge Road, prior to the construction of the New England Solar Farm, UPC propose to seal this segment of Big Ridge Road to a width of 3.7 m with an unsealed shoulder of 2.5 m either side. The total carriageway width will therefore be 8.7 m.

The maximum width for heavy vehicles is 2.5 m (reference: <https://www.nhvr.gov.au/road-access/mass-dimension-and-loading/general-mass-and-dimension-limits>). The proposed total carriageway width for Segment 4 would therefore allow two vehicles at this maximum width to pass each other safely with up to a total of 3.7 m available between the passing vehicles.

This upgrade represents a major improvement to the current condition of the road and aligns it with the long term daily traffic usage of this section of road according to the relevant Austroads standard. Following completion of construction, UPC will ensure the road condition is satisfactory for ongoing use and inclusion within the road network and consistent with expected daily usage of this segment of road.

Figure A.1 Proposed road upgrades – segments 4 and 5 of Big Ridge Road



Annexure B – Photographs of Big Ridge Road Segments 1-4



Photograph A.1: Big Ridge Road within Segment 2, approximately 2 km from intersection with Barleyfields Road, looking east



Photograph A.2: Big Ridge Road within Segment 3, approximately 4 km from intersection with Barleyfields Road, looking east



Photograph A.3: Big Ridge Road within Segment 4, approximately 8 km from intersection with Barleyfields Road, looking east



Photograph A.4: Big Ridge Road within Segment 4, approximately 8 km from intersection with Barleyfields Road, looking west



Photograph A.5: Big Ridge Road at entrance to the project site (Segment 5), looking east

Claire Burnes

From: Claire Burnes
Sent: Wednesday, 16 October 2019 2:16 PM
To: Claire Burnes
Subject: FW: New England Solar Farm - Barleyfields Rd / Big Ridge Rd Intersection
Attachments: Barleyfields Rd_Big Ridge Rd Intersection Upgrade Rev 1.pdf

Claire Burnes

Associate – Environment, Community, Approvals and Delivery



T 02 4907 4800
M 0477 717 272
D 02 4907 4804
in Connect with us

NEWCASTLE | Level 3, 175 Scott Street, Newcastle NSW 2300

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From: Terence Seymour <TSeymour@uralla.nsw.gov.au>
Date: Wednesday, 16 October 2019 at 1:40 pm
To: Tim Greenaway <tim.greenaway@upc-ac.com>
Cc: Tim Kirk <Tim.Kirk@upc-ac.com>, Matt Clarkson <MClarkson@uralla.nsw.gov.au>, "iwan.davies@planning.nsw.gov.au" <iwan.davies@planning.nsw.gov.au>, Kelvyn Tan <ktan@uralla.nsw.gov.au>
Subject: RE: New England Solar Farm - Barleyfields Rd / Big Ridge Rd Intersection

Hello Tim,

Based on the information provided below, the proposed intersection arrangements (as attached) at the Barleyfields Rd and Big Ridge Rd intersection appear to be appropriate and Council has no objection.

Kind regards

Terry Seymour

Director – Infrastructure and Development

Uralla Shire Council | Po Box 106 Uralla NSW 2358

p 02 6778 6309 | **f** 02 6778 6349 | **m** 0427 215 970

tseymour@uralla.nsw.gov.au | www.uralla.nsw.gov.au

From: Tim Greenaway [mailto:tim.greenaway@upc-ac.com]
Sent: Monday, 14 October 2019 5:21 PM
To: David Aber; Terence Seymour

Cc: Tim Kirk

Subject: Re: New England Solar Farm - Barleyfields Rd / Big Ridge Rd Intersection

Hi Terry

Further to our discussion earlier this afternoon on the design of the intersection of Barleyfields Rd and Big Ridge Rd and my email below. The following statement details the size of B-Double vehicle used in the intersection design and the swept path analysis. I also clarify below that this vehicle size may not cover the largest vehicle delivery to site for a small number of occasions and provide a copy of the relevant statement from the project Traffic Impact Assessment.

1. The intersection of Barleyfields Road and Big Ridge Road has been designed, in accordance with Austroads standards, to accommodate a 26m B-double vehicle. The design ensures that a B-double can remain stationary on Big Ridge Road whilst not impacting the tracking path of an opposing B-double turning into Big Ridge Road from Barleyfields Road. In the rare event, during construction, that a transformer was being delivered to the site a special traffic management plan would be prepared due to the vehicles size.
2. The following is an excerpt from the project Environmental Impact Statement – Appendix K - Traffic Impact Assessment –

Temporary traffic control arrangements may be required at the proposed primary access intersections during the peak stages of construction traffic activity and/or on days when deliveries by oversize vehicles are required for the delivery of larger construction items such as transformers. At this stage it is anticipated that approximately five 90 t deliveries and two 220 t deliveries may be required for the transformers that will form part of the solar array and grid substations, respectively. These will be delivered under permit and in consultation with RMS and Uralla Shire Council.

Please let me know if you have any further queries.

Regards

Tim

Tim Greenaway | NESF Project Director

UPC\AC Renewables Australia

A UPC Renewables and AC Energy Company



M: +61 413 625 097

E: tim.greenaway@upc-ac.com

Hobart: Suite 2, Level 2, 13-17 Castray Esplanade, Battery Point, TAS, 7004

Melbourne: Level 23, HWT Tower, 40 City Road, Southbank, VIC 3006

Sydney: Level 14, 77 King Street, Sydney NSW, 2000

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From: Tim Greenaway <tim.greenaway@upc-ac.com>

Date: Monday, 14 October 2019 at 1:42 pm

To: David Aber <daber@uralla.nsw.gov.au>, Terry Seymour <tseymour@uralla.nsw.gov.au>

Cc: Tim Kirk <Tim.Kirk@upc-ac.com>

Subject: New England Solar Farm - Barleyfields Rd / Big Ridge Rd Intersection

Hello David / Terry

Thanks for your letter confirming Council's position on the road upgrades. The Department has queried with us the status of discussions on the intersection upgrade at Barleyfields Rd and Big Ridge Rd.

I attach the technical drawing of the intersection we have previously issued to you, on 16 August and 5 September, it has not changed. Could you confirm, by exchange of emails is OK, that you have no objections to our proposed intersection works, contained in the attached.

Please note, you don't need to provide comment on the New England Hwy / Barleyfields Rd intersection as this is with RMS for review.

Thanks in advance,

Regards

Tim

Tim Greenaway | NESF Project Director
UPC\AC Renewables Australia
A UPC Renewables and AC Energy Company



M: +61 413 625 097

E: tim.greenaway@upc-ac.com

Hobart: Suite 2, Level 2, 13-17 Castray Esplanade, Battery Point, TAS, 7004

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Client
SCT CONSULTING
BAY, 9/9 MIDDLEMISS STREET
NORTH SYDNEY, NSW 2060
PHONE : (02) 9042 0591



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Level 1, 54 Union Street
Cooks Hill, Newcastle NSW 2300
T +61 2 4926 4811



Project
**NEW ENGLAND HIGHWAY SOLAR FARM
INTERSECTION UPGRADE**

Drawing Title
VEHICLE TURNING PATHS

Drawn JER	Date JULY 2019	Scale 1:500	A1	Q.A. Check	Date
Designed TB	Project No. NE190112	Dwg. No. SKC-011	Issue A		

FOR INFORMATION

P:\19\190112\190112\Drawings\SKC-011_Vehicle Turning Paths.dwg - Big Ridge Road\NE190112_SKT-A1.dwg
30 JUL 2019 9:36am

10 October 2019

Responsible Officer: MC
U19/57

Tim Greenaway
UPC Renewables
Level 14
77 King Street
Sydney NSW 2000

Dear Tim

RE: New England Solar Farm - Proposed Road and Intersection Upgrades

Following on from the meeting between Council staff and UPC representatives, I can confirm that Council has modified its position in regards to the road upgrades as previously detailed in the in the letter provided meeting with UPC on the afternoon of 9 October 2019.

Council has formed the opinion that the current UPC road specification proposal for segments 4 and 5 presents as an unacceptable safety risk based on predicted traffic volumes, and that maintenance costs for the unsealed shoulders on sections 4 and 5 would be prohibitive. The safety rationale is supported by the Austroads Standard comparison below:

Road	Austroads Seal width - Traffic Lanes	Austroads Min shoulder each side	Austroads Min sealed shoulder each side	Council proposed sealed width	UPC proposed sealed width
Barley Fields Road New England Highway to Big Ridge Road	6.2-7.0	1.5	0.5	7.2	7.2
Big Ridge Road Seg 1	6.2-7.0	1.5	0.5	7.2	7.2
Big Ridge Road Seg 2	6.2-7.0	1.5	0.5	7.2	7.2
Big Ridge Road Seg 3	6.2-7.0	1.5	0.5	7.2	7.2
Big Ridge Road Seg 4	6.2-7.0	1.5	0.5	7.2	3.7
Big Ridge Road Seg 5	6.2-7.0	1.5	0.5	7.2	3.7

Council understands that sections 4 and 5 will have minimal traffic volumes post project construction, however this does not negate the need for this part of the route to be of a sufficient standard to minimise hazards during construction. In this context, Council believes that sections 4 and 5 should be sealed to a minimum width of 7.2 metres to the entry point of the lot proposed to be subdivided off for the sub-station.

Please contact Terry Seymour on 6778 6309 or email tseymour@uralla.nsw.gov.au should you wish to discuss this matter further.

Yours sincerely



David Aber
Acting General Manager

Appendix C

TfNSW landowners consent

20 August 2019

Iwan Davies
A/Team Leader
Energy & Resources | Planning & Assessments
320 Pitt Street | GPO Box 39 | Sydney NSW 2001

Dear Iwan,

RE: LANDOWNER'S CONSENT FOR LODGEMENT OF APPLICATIONS RELATING TO THE DEVELOPMENT OF THE NEW ENGLAND SOLAR FARM, INVOLVING RAILCORP LAND

UPC Renewables proposes to establish a temporary hardstand area within RailCorp land to facilitate the delivery of equipment via rail for the New England Solar Farm. UPC is currently in discussions with Transport for NSW in relation to the secondary approvals which must be in place prior to construction of the hardstand commencing and also with respect to delivery of material by rail.

RailCorp, as owner of the site aforementioned, grants its consent, pursuant to Section 49(1) of the NSW Environmental Planning and Assessment Regulation 2000, to the lodgment by UPC Renewables Australia Pty Ltd (UPC) of a development application (or any other authority involved in the process of such application) for the project.

The consent given in this letter:

- (a) is given for the sole purpose of allowing the lodgment of a Development Application for the project; and
- (b) does not affect and is not capable of affecting the process to be undertaken by Transport for NSW in considering the Development Application.

Note that this letter of consent does not provide any approval to the installation of any infrastructure of Rail Corporation NSW Land, nor does it grant any approval to the delivery of equipment via rail, and that UPC Renewables will need to make an application via John Holland Rail (JHR) to obtain these approvals.

Should have any questions in relation to the above, please do not hesitate to contact me on 02 4907 7560 or at Vicki.Oszko@transport.nsw.gov.au

Yours sincerely



Vicki Oszko
Senior Manager, Property
Transport for NSW
NEWCASTLE NSW 2300

cc. Joanne Cheong – JHR
CRN Third Party Works - JHR
Mick Sanders - CRC

Appendix D

UNE Correspondence regarding accommodation availability



UNE Residential System Director's Office
directorres@une.edu.au

2 September 2019

To whom it may concern

I write to confirm that the University of New England is currently in discussion with Tim Greenaway, (NESF Project Director, UPC Renewables Australia) in respect to the provision of construction worker accommodation to support their associated New England Solar Farm project.

Both parties continue to consider this venture through their respective approval processes, with positive discussions ongoing for a solution to be in place for January 2020.

Yours sincerely

A handwritten signature in black ink, which appears to read 'Ashwin Bhutani', is positioned below the 'Yours sincerely' text.

Ashwin Bhutani
Director
UNE Residential System

Appendix E

Council correspondence in support of removal of the CAV

Claire Burnes

Subject: FW: New England Solar Farm - removal of workers camp
Importance: High

From: David Aber <DAber@uralla.nsw.gov.au>
Date: Thursday, 26 September 2019 at 10:23 am
To: Killian Wentrup <killian.wentrup@upcrenewables.com>
Subject: RE: New England Solar Farm - removal of workers camp

Thanks Killian

I am happy to confirm our discussion regarding the removal of the workers camp and that we are happy you are proceeding with the project on this basis. I agree that the best result for Uralla is that it would be beneficial if as many of the workers as possible could be housed in Uralla and or contractors sourced from Uralla.

Kind regards,

David Aber
Acting General Manager
Uralla Shire Council | PO Box 106 Uralla NSW 2358
p 02 6778 6303 | f 02 6778 6349
daber@uralla.nsw.gov.au | www.uralla.nsw.gov.au



From: Killian Wentrup [<mailto:killian.wentrup@upcrenewables.com>]
Sent: Wednesday, 25 September 2019 5:48 PM
To: David Aber
Cc: Tim Greenaway
Subject: New England Solar Farm - removal of workers camp

Dear David,

As you might recall when Tim Greenaway and I met with you and Michael Pearce in late July, one of the recent refinements UPC has made to improve the New England Solar Farm (NESF) project is dropping the need for the temporary workers accommodation camp that had been proposed at the end of the Big Ridge Rd. As Tim and I communicated to you at that time, we believe this is a positive outcome for the community and the region, as it will mean more workers will be sourced locally and more businesses in the New England region will benefit through the provision of accommodation services. As discussed, there were also a couple of residents near the northern area who had concerns about the proposed camp, and they are very pleased with the decision to drop it.

In our most recent discussions with the Department of Planning, Industry and Environment (DPIE) they have asked us to verify that this refinement had been discussed with Council and whether any concerns were raised. Our understanding is that Council did not have any concerns with the removal of the temporary workers camp and indeed saw the benefits.

If you were willing to reply to this email and clarify if my understanding is correct it would be highly appreciated. The intention is then with your permission to share it with Iwan Davies, the assessment officer at DPIE.

Thanks in advance if you are able to help with this request.

Kind regards

Killian

Killian Wentrup | Head of Solar Development
UPC Renewables Australia
A UPC Renewables and AC Energy Company



M: +61 481 237 742

E: killian.wentrup@upc-ac.com

Hobart: Suite 2, Level 2, 13-17 Castray Esplanade, Battery Point, TAS, 7004

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Appendix F

TfNSW letter and response

Iwan Davies
A/Team Leader
Resource and Energy Assessments
Department of Planning & Environment
GPO Box 39
SYDNEY NSW 2001

Attention: Tatsiana Bandaruk

Dear Mr. Davies

**SSD 9255 New England Solar Farm
Amended DA and Response to Submissions**

Thank you for your email correspondence dated 7 June 2019 inviting Transport for NSW (TfNSW) to review the subject matter.

TfNSW and John Holland Rail (JHR), who has been appointed by TfNSW to manage the Country Regional Network (CRN), have reviewed the documentation. It is noted that the Amended DA includes substantial amendments to the original DA to the extent that the development footprint is now limited to two solar array areas (the northern and central arrays) and the potential use of the railway line currently in operation from West Tamworth to Armidale which is referred to as the Main Northern Railway in the Amended Report.

Comments in relation to the Amended DA are provided in **Attachment A**.

It is noted that the Submission Report has provided responses to TfNSW's submission dated 28 March 2019. In this regards TfNSW requests that, should the subject proposal be approved, the Department should impose the conditions of consent as outlined in **Attachment B**.

Thank you again for the opportunity of reviewing the subject application. If you require any further information, please don't hesitate to contact Billy Yung, Senior Transport Planner, via email at billy.yung@transport.nsw.gov.au. I hope this has been of assistance.

Yours sincerely



20/6/2019

Mark Ozinga
**Principal Manager, Land Use Planning and Development
Customer Strategy & Technology**

CD19/04873

The potential use of the railway line

Comment:

The Amended Report (AR) includes new proposals, one of which is the use of the Main Northern railway line for train unloading, the other of which is access to the rail corridor for construction of a temporary hardstand. The AR also indicates that the proponent had initial consultation with John Holland Rail (JHR) in respect of the new proposals and is considering the new proposals as a viable option and their potential impacts on the rail corridor in association with the existing rail operations.

It should be noted that JHR's advice, as provided during the initial consultation, should be taken as a general guide only until such time as JHR fully review and approve detailed design plans.

Recommendation:

The proponent is recommended to continue consulting with JHR (contact David Ginns, Business Development Manager) in respect of the use of the railway and JHR's third party works team (CRN.3rdpartyworks@jhq.com.au) in respect of access to the rail corridor for construction of the temporary hardstand.

ATTACHMENT B – Recommended Conditions of Consent for SSD 9255

Excavation in, above, below or adjacent to rail corridors

The proponent is required to consult with TfNSW, or its agent of CRN (John Holland Rail), in respect of suitable protection arrangements required for the construction activities which will extend to within 25m of the rail corridor, including the design and installation of boundary fence.

Use of railway line

Should the use of the Main Northern railway line for train unloading and access to rail corridor for construction and use of a temporary hardstand proceed, the proponent must comply with TfNSW or its agent of CRN (John Holland Rail) standards in respect of the use of the railway line and access to the rail corridor.

Demolition and construction impacts

A Construction Environmental Management Plan (CEMP) and an Operational Environmental Management Plan (OEMP) should be prepared in consultation with TfNSW or its agent for the CRN (John Holland Rail) to ensure that any potential impacts or risks on the rail corridor during construction, operation or decommissioning are identified and appropriate mitigation measures put in place to adequately manage the identified risks.

Traffic Management

The proponent is required to prepare and provide Transport for NSW, or its agent of the CRN (John Holland Rail), with an assessment report stating potential impacts of construction traffic on the railway level crossings and identify mitigation measures if necessary.

Fencing

The proponent is required to submit an application to access the rail corridor for installing the boundary fences to John Holland Rail (TfNSW's agent of CRN) for its endorsement and for TfNSW's approval.

Access to the rail corridor and work access and possessions

Approval to work, access and track possession of the railway corridor or part thereof (or air space) must be assessed and endorsed by John Holland Rail (TfNSW's agent of CRN) prior to the actual proposed access in accordance with the relevant JHR's rules and procedures. Once assessed and endorsed, JHR will submit the approval sought by the proponent for TfNSW's approval/approval with conditions or no approval.

Derailment protection and other potential impacts of adjacent development on railway

The proponent is required to provide John Holland Rail (TfNSW's agent of CRN), prior to the commencement of construction activities, a risk assessment addressing the potential risks of the derailment including considerations of the characteristics of the site, the type of structure to be erected and track speed and whether this represents a risk to the integrity of the structure and demonstrating compliance with the relevant engineering standards.

Location of Emergency Access

The proponent is required to consult with TfNSW and its agent of the CRN (John Holland Rail) in relation to locations of emergency access points during preparation of the Emergency Response Plan (ERP).

ID	TfNSW comment	UPC response	TfNSW recommended consent condition	UPC response
TfNSW_1	Excavation in, above, below or adjacent to rail corridors <u>Comment</u> Clause 86 of ISEPP stipulates that the consent authority must not grant consent without consulting with the rail authority and obtaining concurrence consistent with clauses 86(2) – (5) in the event that the development involves the penetration of ground to a depth of at least 2m below ground level on land within 25m of a rail corridor. It is noted that the EIS does not contain details of excavation of the Proposal <u>Recommendation</u> The Response to Submissions (RtS) should outlined any proposed excavation in proximity to the rail corridor. If there is any such excavation, the proponent should undertake further analysis including a geotechnical and structural engineering assessment outlining the risks and mitigation strategies for all phases of the project (construction, operations and decommissioning) demonstrating that there will be no adverse impact on the stability and integrity of the rail corridor land and rail infrastructure. Note: If there is any such excavation, TfNSW will suggest a condition following the review of any material prepared as part of the RtS.	As part of the preparation of the AR and RTS, UPC and EMM has engaged in consultation with TfNSW and JHR. TfNSW indicated as part of this consultation that references to the ‘rail corridor’ in the TfNSW submission is taken to mean ‘rail land’. In relation to TfNSW’s comment, the rail land under consideration is identified as Lot 2 DP 982376, which is the adjacent land parcel that extends along the boundary of the northern array area. As part of this consultation, UPC provided addition detail to JHR in relation to proposed construction activities within the northern array area of the development footprint, which will extend to within 25 m of the rail corridor, specifically regarding: • the dimension of the material being driven (steel “piles” or “posts” which are the uprights which support the rows of panels); • the equipment being used to drive the posts in (pile driving machines); • the distribution of the posts within the area relevant to the rail corridor; and • the proposed location of boundary fencing. This information was considered by JHR’s principal track and civil engineer, and JHR subsequently confirmed that the proposed piling at an offset of 10 m from the rail corridor boundary would be acceptable, and that there were no concerns regarding potential impact on rail operations associated with works being undertaken at this 10 m offset. JHR noted that suitable protection arrangements would be required for the construction of the boundary fence, and that JHR’s review of the proposed fencing design	The proponent is required to consult with TfNSW, or its agent of CRN (John Holland Rail), in respect of suitable protection arrangements required for the construction activities which will extend to within 25m of the rail corridor, including the design and installation of boundary fence.	None required. Response provided by UPC as part of RTS acknowledged that suitable protection arrangements would be required for the construction of the boundary fence and that JHR’s review of the proposed fencing design will be required.

ID	TfNSW comment	UPC response	TfNSW recommended consent condition	UPC response
		will be required to ensure that it meets JHR's minimum standard. A new mitigation measure has been proposed.		
TfNSW_5	Demolition and Construction impacts <u>Issue</u> The northern array area is immediately adjacent to the rail corridor which contains the railway line currently in operation. It is vital for both TfNSW and JHR to be satisfied that the Proposal does not have any adverse impact on safe operation of the rail corridor and the existing rail infrastructure during construction and operation. In addition, the Environmental Impact Statement (EIS) states that once the project reaches the end of its investment and operational life, the project infrastructure will be decommissioned and all above ground facilities will be removed only during decommissioning. <u>Recommended Condition</u> The Proponent must submit to TfNSW, or its agent JHR, a Risk Assessment/Management Plan and Safe Work Method Statements detailing any impact on the rail corridor for each stage including construction, operation and decommissioning.	As committed in the EIS, the lead contractor appointed by UPC will prepare a CEMP and OEMP for the project, which will be prepared in consultation with TfNSW (or its agent) to ensure that any potential impacts or risks on the rail corridor during construction, operation or decommissioning are identified and appropriate mitigation measures put in place to adequately manage the identified risks. A mitigation measure has been revised.	A Construction Environmental Management Plan (CEMP) and an Operational Environmental Management Plan (OEMP) should be prepared in consultation with TfNSW or its agent for the CRN (John Holland Rail) to ensure that any potential impacts or risks on the rail corridor during construction, operation or decommissioning are identified and appropriate mitigation measures put in place to adequately manage the identified risks.	None required. Response provided by UPC as part of RTS acknowledged that CEMP and OEMP will be prepared in consultation with TfNSW (or its agent) to ensure that any potential impacts or risks on the rail corridor during construction, operation or decommissioning are identified and appropriate mitigation measures put in place to adequately manage the identified risks.

TfNSW_6 Traffic Management Issue The EIS demonstrates that the Proponent had previously discussed with JHR regarding consequential impacts of the Proposal on the level crossings as part of preparation of TIA and had subsequently obtained relevant advice from JHR. However, the EIS contains statements regarding JHR's previous advice which appear to be contradictory as Table 4.12 of the EIS seems to indicate that JHR advised of potential upgrades to the level crossings while Page 193 of the EIS states that JHR required no alterations to any of the level crossings. Please note that there are three (3) existing level crossings, two of which are identified as active level crossings with flashing lights at Barleyfields Road and Thunderbolts Way, one of which at Gostwyck Road is identified as a passive crossing with stop signs in the vicinity of the Land. In addition, the EIS indicates that the Proposal will result in the use of heavy construction machinery during the construction phase, which may also impact the level crossings. <u>Recommended Condition</u> The Proponent must bear the costs of upgrading the passive level crossing (or implement appropriate risk mitigation e.g. engagement of protection officers during the construction phase) at Gostwyck	As outlined in Section 5.8 of the AR, amendments to the development footprint have consolidated the proposed vehicle routes to the site, which now incorporate: - two access points to the northern array area via Barleyfields Road (north and south), then onto Big Ridge Road; and - one access point to the central array area via Barleyfields Road (north and south), then onto Big Ridge Road and turning right onto Munsies Road. As a result of these amendments, project related traffic is no longer proposed along Thunderbolts Way or Gostwyck Road, and therefore the existing level crossings on these roads will no longer be impacted by the project. As outlined in response to item 'Council_9' above, as part of ongoing project design and planning work and in consideration of the project amendments and associated traffic-related impacts as outlined in the AR, UPC has engaged an experienced traffic consultant to further quantify and assess potential impacts to local roads and intersections, including further consideration of potential impacts of construction traffic on the existing grade railway crossing on Barleyfields Road (north). Upon completion of this further work, and prior to commencement of on-site construction work, UPC will consult with TfNSW to confirm requirements for further assessment in consideration of the Australian Level Crossing Assessment Model. A new mitigation measure has been proposed.	The proponent is required to prepare and provide Transport for NSW, or its agent of the CRN (John Holland Rail), with an assessment report stating potential impacts of construction traffic on the railway level crossings and identify mitigation measures if necessary.	As noted previously, UPC engaged SCT Consulting PTY LTD (SCT) to identify suitable designs for the proposed road upgrades and intersection improvements. The proposed design for the intersection of the New England Highway and Barleyfields Road (north) is provided in the formal response to DPIE in relation to the proposed road upgrades. The proposed design removes the conflict, and associated delay, between right-turning vehicles accessing the New England Highway from Barleyfields Road (north). Additional modelling completed by SCT indicates that during construction, assuming the proposed intersection design is implemented at the intersection of the New England Highway and Barleyfields Road (north), the longest 95th percentile queue length on Barleyfields Road (north) is forecast to be 1.7 m (ie less than one car length). This demonstrates that there is no forecast impact on the operation of the Barleyfields Road level crossing, which is approximately 120 m south of the existing give way line intersection marking on Barleyfields Road (north) at the intersection with the New England Highway. Subsequently, no traffic controls and/or upgrades are proposed at the Barleyfields Road level crossing during construction. Following confirmation of the intersection upgrade design with RMS, UPC will determine whether any updates to the forecast impacts are required.
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ID	TfNSW comment	UPC response	TfNSW recommended consent condition	UPC response
	Road if TfNSW and JHR are of the view that it is necessary to upgrade the passive level crossing to accommodate the increased traffic during construction and/or operation. The Proponent must prepare and provide JHR with an assessment based upon the Australian Level Crossing Assessment Model in order to identify key potential risks regarding the level crossings at Barleyfields Road, Thunderbolt Way and Gostwyck Road, as a result of the increased use of the heavy machinery. In the event that such assessment finds that there will be significant increases in their use, Uralla Shire Council will also be requested to update the current Road Rail Interface Agreement to reflect the change to those level crossings in accordance with the Rail Safety National Law 2012.			
TfNSW_7	Fencing <u>Issue</u> The EIS states that the exact alignment of security fencing with respect to the development footprint will be determined by the Proponent in close consultation with each of the project landholders. As the northern array area is immediately adjacent to the rail corridor, the security of fencing along the rail corridor is essential to prevent unauthorised entry. <u>Recommended Condition</u>	Boundary fences within the northern array area adjacent to the rail corridor will be installed and remain installed during construction and operation of the facility in accordance with JHR's engineering standards. Any requirement for work access to the rail corridor would only be undertaken following assessment and endorsement by JHR for the proposed access and would be undertaken in accordance with the relevant JHR rules and procedures. During consultation with JHR, it was confirmed that all land within Lot 2 of DP 982376 is classified as rail land and therefore forms part	The proponent is required to submit an application to access the rail corridor for installing the boundary fences to John Holland Rail (TfNSW's agent of CRN) for its endorsement and for TfNSW's approval.	None required. Response provided by UPC as part of RTS acknowledged that any requirement for work access to the rail corridor would only be undertaken following assessment and endorsement by JHR for the proposed access and would be undertaken in accordance with the relevant JHR rules and procedures.

ID	TfNSW comment	UPC response	TfNSW recommended consent condition	UPC response
	The boundary fences along the rail corridor should be installed and remain installed during construction and operation of the facility in accordance with JHR's engineering standards which is available at http://jhrcrn.com.au/media/2071/crn-cp-511-v1-1.pdf. The Proponent must submit an application to access the rail corridor in order to install the boundary fences to JHR for its endorsement and for TfNSW's approval / approval with conditions. Please refer the Proponent to JHR website http://www.jhrcrn.com.au/what-wedo/ property-services/third-party-work-enquiries/. The Proponent must obtain approval for a track possession in order to install the boundary fences.	of the rail corridor. A copy of this consultation is provided in Appendix B A new mitigation measure has been proposed.		
TfNSW_8	Access to the rail corridor and Work Access & Possessions <u>Issue</u> As mentioned above, the development would require work access to the rail corridor. <u>Recommended Condition</u> Approval to work, access and track possession of the railway corridor or part thereof (or air space) must be assessed and endorsed by JHR prior to the actual proposed access in accordance with JHR's Network Rules and Procedures and the JHR Possession Manual. This information can be found at http://jhrcrn.com.au/what-we-	As outlined above, any requirement for work access to the rail corridor would only be undertaken following assessment and endorsement by JHR for the proposed access and would be undertaken in accordance with the relevant JHR rules and procedures. A new mitigation measure has been proposed.	Approval to work, access and track possession of the railway corridor or part thereof (or air space) must be assessed and endorsed by John Holland Rail (TfNSW's agent of CRN) prior to the actual proposed access in accordance with the relevant JHR's rules and procedures. Once assessed and endorsed, JHR will submit the approval sought by the proponent for TfNSW's approval/approval with conditions or no approval.	None required. Response provided by UPC as part of RTS acknowledged that any requirement for work access to the rail corridor would only be undertaken following assessment and endorsement by JHR for the proposed access and would be undertaken in accordance with the relevant JHR rules and procedures.

ID	TfNSW comment	UPC response	TfNSW recommended consent condition	UPC response
	do/network-operationsaccess/network-access-planning-performance/ Once assessed and endorsed, JHR will submit the approval sought by the Proponent for TfNSW's approval / approval with conditions or no approval.			
TfNSW_10	Derailment protection and other potential impacts of adjacent development on railway <u>Issue</u> The Guideline provides information regarding the potential risks from a possible derailment in the context of design of buildings and structure. <u>Recommended Condition</u> The Proponent must provide JHR with a risk assessment addressing the potential risks of the derailment including considerations of the characteristics of the site, the type of structure to be erected and track speed and whether this represents a risk to the integrity of the structure and demonstrating compliance with JHR Engineering Standards being CRN CS 320, which then references AS 5100 which is available at http://www.jhrcrn.com.au/what-wedo/engineering-standards/civil-standards/.	The rail corridor adjacent to the site boundary in the vicinity of the norther array area is 25 m in width, and project infrastructure will be setback from the site boundary by a further 10 m, therefore it is not considered that there is any significant derailment risk for structures proposed on land adjacent to the rail corridor in the northern array area. The solar PV plant will be built by a tier 1 reputable contractor, with all engineering designs meeting the relevant Australian standards and appropriate insurances will be put in place prior to the commencement of construction works. UPC will have to demonstrate to the satisfaction of its financiers that all relevant project risks have been taken into account prior to securing finance for the construction phase. No further mitigation measures are proposed.	The proponent is required to provide John Holland Rail (TfNSW's agent of CRN), prior to the commencement of construction activities, a risk assessment addressing the potential risks of the derailment including considerations of the characteristics of the site, the type of structure to be erected and track speed and whether this represents a risk to the integrity of the structure and demonstrating compliance with the relevant engineering standards.	As noted previously, the rail corridor adjacent to the site boundary in the vicinity of the northern array area is 25 m in width, and project infrastructure will be setback from the site boundary by a further 10 m, therefore it is not considered that there is any significant derailment risk for structures proposed on land adjacent to the rail corridor in the northern array area. As part of further consultation with John Holland Rail, UPC will confirm what level of risk assessment is required as no significant risks have been identified.

ID	TfNSW comment	UPC response	TfNSW recommended consent condition	UPC response
TfNSW_11	Access to the Land <u>Issue</u> It is noted that there are several access points to each array via local roads. The Minister for Planning is requested to ensure that access to the rail corridor is strictly prohibited unless otherwise permitted in writing. In the meantime, the EIS states that the locations of emergency access points will be determined during detailed design. <u>Recommended Condition</u> The Proponent must consult with JHR and TfNSW in respect of the prospective locations of emergency access points to consider any potential impacts on the operations of the current and future rail operations.	Access to the rail corridor is not anticipated as being required and would only be undertaken in accordance with the written permission of TfNSW. As outlined in the EIS, in addition to the identified primary site access points, emergency access points may be required and will be identified as part the project's ERP, which will be prepared post-approval. UPC or the appointed lead EPC contractor(s) for the construction phase will consult with JHR and TfNSW in relation to locations of emergency access points during preparation of the ERP. A mitigation measure has been revised.	The proponent is required to consult with TfNSW and its agent of the CRN (John Holland Rail) in relation to locations of emergency access points during preparation of the Emergency Response Plan (ERP).	None required. Response provided by UPC as part of RTS acknowledged that UPC or the appointed lead EPC contractor(s) for the construction phase will consult with JHR and TfNSW in relation to locations of emergency access points during preparation of the ERP.