

APPENDIX G TRAFFIC IMPACT ASSESSMENT

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Issued via email: sarah.h@nghenvironmental.com.au

Dear Sarah

Culcairn Solar Farm – Traffic Impact Assessment

Amber has been asked to assess the traffic matters of the proposed solar farm located approximately 4.0 kilometres southwest of Culcairn, New South Wales. The solar farm is proposed to have a capacity of 350MW, and will be split between two sites that are separated by Cummings Road. Access to the sites will be provided via Weeamera Road, which connects to Benambra Road and Olympic Highway. A vehicle crossing will be established across Cummings Road to provide traffic movements between the sites. Staff will be located within the nearby regional towns. The majority of plant is expected to be delivered from the south along Olympic Highway. An assessment of the traffic impacts of the solar farm is provided below.

1. Existing Conditions

1.1 Road Network

Weeamera Road is a local road that runs in a north-south alignment between Cummings Road and Benambra Road. Between Benambra Road and the Boral Quarry site access it has a sealed width of 8.0 metres. North of the quarry access the road is unsealed and has a width of 5.5 metres, and accommodates two-way vehicle movement.

Benambra Road is also a local road under the care and management of Council. It runs in an east-west alignment between Coach Road and Cummings Road. Between Olympic Highway and Weeamera Road it has a sealed carriageway width of 8.5 metres and accommodates two-way vehicle movement. West of Weeamera Road it has an unsealed surface for approximately 3.3 kilometres before widening to have a sealed surface to its connection with Cummings Road.

Olympic Highway is a State Arterial Road under the care and management of RMS. It generally runs in a north-south alignment from its continuation as Colin Knott Drive and its connection with the Hume Highway. Within the vicinity of the site, it typically accommodates one lane of traffic in each direction and has a sealed width of approximately 9.0 metres.

The intersection of Olympic Highway with Benambra Road is priority controlled, with vehicles exiting Benambra Road required to give way to vehicles on Olympic Highway. An Auxiliary Left Turn (AUL) turning treatment is provided for vehicles turning left into Benambra Road, and widening of the southbound carriageway allows southbound vehicles to pass around vehicles waiting to turn right into



Benambra Road. An acceleration lane is also provided for vehicles turning left from Benambra Road. The intersection of Weeamera Road and Benambra Road is priority controlled.

All roads within the vicinity of the site have a speed limit of 100km/hr.

1.2 Traffic Volumes

Traffic volume data for Olympic Highway was obtained from the RMS traffic volume viewer. The closest available data was located 290 metres north of Calool Lane, where the 2011 data recorded an average daily traffic count of 2,753 vehicles per day (vpd). Council have advised that the average daily traffic for Benambra Road and Weeamera Road between Olympic Highway and the quarry site access is 42vpd, with Weeamera Road carrying 15vpd north of the access.

2. Traffic Generation

Construction activities would be undertaken during standard daytime construction hours (7:00am to 6:00pm Monday to Friday, and 7:00am to 1:00pm on Saturdays). Any construction outside of these normal working hours would only be undertaken with prior approval from relevant authorities.

Approximately 15 trucks will access the site per day during typical construction periods. The delivery trucks will predominantly be Medium and Heavy Rigid Trucks (MRV and HRV as defined within AS 2890.2:2009). Articulated Vehicles (AV as defined within AS 2890.2:2009) and B-Doubles will occasionally be used to transport larger plant such as the PV panels.

It is anticipated that during peak construction the site could generate up to 50 heavy vehicles per day and 150 light vehicles per day. Accordingly, the site is expected to generate approximately 100 heavy vehicle movements and 300 passenger vehicle movements per day during the peak construction period of the solar farm. Table 1 summarises the traffic movements generate during the peak construction period of the solar farm.

Table 1: Traffic Generation During Peak Construction Periods

Vehicle Type	Vehicle Movements per Day
Light Vehicle (car / 4WD / minibus)	300
MRV/HRV/AV/B-Double	100
Total	400

Accordingly, the site is expected to generate approximately 400 vehicle movements per day during peak periods. For the purposes of this assessment, all construction vehicles have been assessed as travelling from the north and the south along the Olympic Highway to access the site via Benambra Road and Weeamera Road. Approximately 30% of vehicles will access the site from the north and 70% from the south along Olympic Highway.

During operation the solar farm is expected to generate a maximum of 10 light vehicle movements per day. These vehicles are expected to access the two sites via Cummings Road.

3. Access Route Assessment

The *Unsealed Roads Manual: Guidelines to Good Practice*, dated March 2009, notes that the average traffic for gravel roads usually varies between 20 and 200 vehicles per day. The document also notes that roads may warrant paving when maintenance costs increase to unacceptable levels, in wet climates, or when economic or social benefits are evident.



Weeamera Road north of the quarry access is estimated to currently accommodate 15 vehicle movements per day, which would increase to 415 vehicle movements per day during peak construction periods (an increase of 400 vehicle movements generated by construction traffic). Therefore, the traffic volumes would exceed the recommended loading for gravel roads.

In order to accommodate the traffic volumes generated by the development it is recommended that Weeamera Road north of the quarry access be upgraded to have a light spray seal and a width of 6.0 metres. The light spray seal is expected to be able to accommodate the level of traffic generated by the construction traffic and will also act to reduce the dust impact to the nearby dwellings. The increased carriageway width will also allow two trucks to pass.

Weeamera Road south of the quarry access, and Benambra Road between Olympic Highway and Weeamera Road, both have sealed widths of 8.0 metres, which accommodates simultaneous two-way vehicle movement. Further, both roads are rated to accommodate B-Double trucks. Therefore, this section of the access route is currently able to accommodate the sized vehicles that are proposed as part of the construction of the solar farm.

A Construction Traffic Management Plan (CTMP) will be prepared prior to construction of the site. It is recommended that the following form part of the CTMP to minimise the impact of construction traffic along the unsealed roads:

- Prior to construction, a pre-condition survey of the relevant sections of the existing road network be undertaken, in consultation with Council. During construction the sections of the road network utilised by the proposal are to be monitored and maintained to ensure continued safe use by all road users, and any faults attributed to construction of the solar farm would be rectified. At the end of construction, a post-condition survey would be undertaken to ensure the road network is left in the consistent condition as at the start of construction.
- Neighbours of the solar farm be consulted and notified regarding the timing of major deliveries which may require additional traffic control and disrupt access.

Given the expected traffic along Weeamera Road and Benambra Road during construction, it is concluded that the surface of the roads, with the inclusion of the proposed upgrades to Weeamera Road, is suitable to accommodate the future traffic volumes. In addition, the adoption of the above recommendations will assist to mitigate any impact to the road surface and adjacent properties.

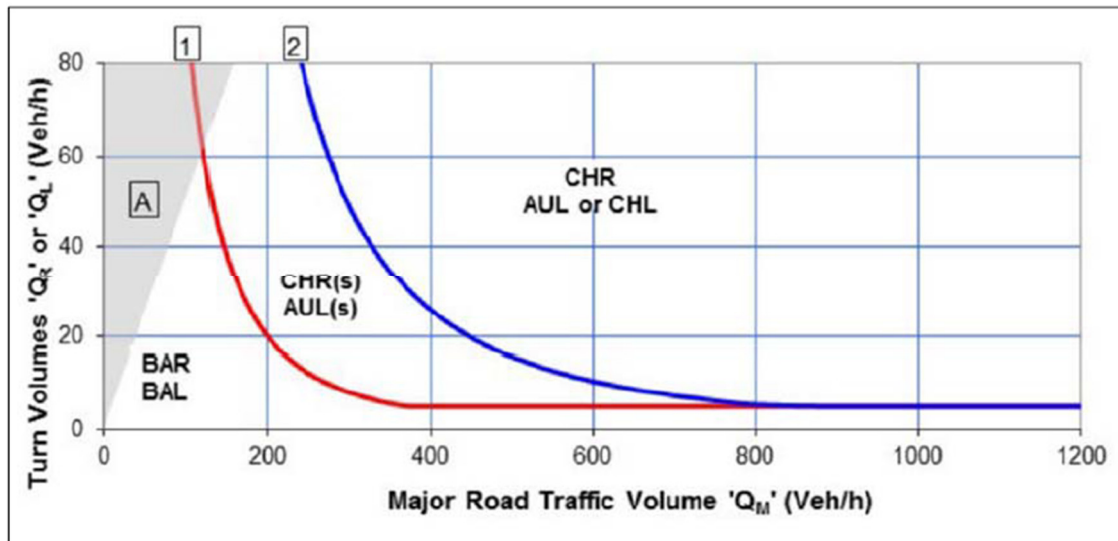
It is noted that the proposed access route has been determined in consultation with Council and RMS. Alternative access routes have been reviewed, including the use of Cummings Road to access the site. However, given the angle of the intersection of Cummings Road with Olympic Highway the use of Benambra Road was concluded to provide a safer access route.

4. Intersection Assessment

4.1 Olympic Highway / Benambra Road

Austrorads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings specifies the turning treatments required at intersections. Figure 2.26 of the guide, shown below in Figure 1, specifies the required turn treatments on the major road at unsignalised intersections, and is provided below for a design speed of greater than or equal to 100km/hr.

Figure 1: Figure 2.26 of Austroads Guide to Traffic Management Part 6



During the construction phase of the solar farm, when traffic generated will be at its peak, Benambra Road will accommodate approximately 442vpd, with the existing base level of traffic of 42vpd and the site traffic of 400vpd. Olympic Highway is expected to accommodate approximately 2,981vpd based on the 2011 traffic volume count and applying a 1% growth factor.

The turning volumes for the assessment have been calculated assuming 10% of these trips are generated during peak periods and traffic travelling to/from Benambra Road is distributed with 30% of vehicles travelling north and 70% of vehicles travelling south. Therefore, the Major Road Traffic Volume is 298vph and the Turning Volumes are 13vph and 31vph for the right and left turns. Based on these volumes, the intersection would require Channelised Right Turn (CHR) and Auxiliary Left Turn (AUL) turning treatments.

The intersection is currently provided with an AUL turning treatment and widening of the southbound carriageway allows southbound vehicles to pass around vehicles waiting to turn right into Benambra Road. Therefore, the left-turn treatment meets the requirement of the Austroads Guide. The right turn treatment is considered to be suitable to accommodate the increase in traffic generated during the construction of the solar farm given the short duration of peak construction (approximately 7 months), and the existing treatment effectively acts as a CHR allowing southbound vehicles to pass a right-turning vehicle. Therefore, no upgrades are required at the intersection as part of the solar farm project.

4.2 Benambra Road / Weeamera Road

A swept path assessment has been undertaken for the Benambra Road / Weeamera Road intersection using the AutoTurn software package, which is presented in Appendix A. The swept paths have been based on AVs, which represents the worst-case scenario for two trucks meeting at the intersection in opposite directions. The assessment demonstrates simultaneous two-way movement is provided at the intersection.

5. Access Design

5.1 Southern Site Access

Access to the site is proposed at the south-eastern boundary of the site via Weeamera Road. The access design and a swept path assessment showing access to the site by an AV is shown within Appendix A. Accordingly, the access is able to accommodate the worst-case design vehicle expected

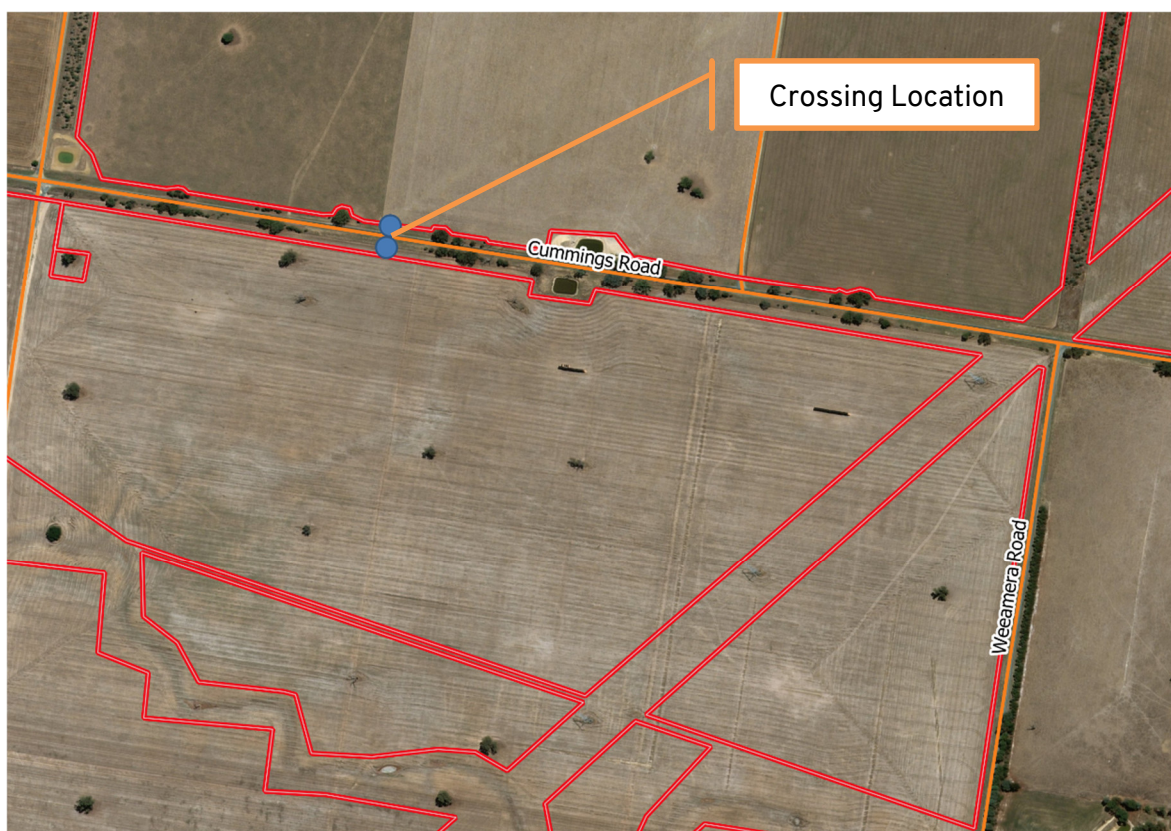
to access the site. The swept path assessment also demonstrates that Weeamera Road will need to be widened in the proximity of the railway crossing to allow simultaneous two-way movement.

Clear sight distances are provided along Weeamera Road in both directions for vehicles exiting the site.

5.2 Northern Site Access

Access to the northern site will be provided across Cummings Road from the southern site. Trucks accessing the northern site will enter the southern site via the Weeamera Road access, then utilise internal roads to reach Cummings Road. A direct crossing across Cummings Road will be provided that will accommodate two-way truck movements. The location of the crossing is shown withing Figure 2 below.

Figure 2: Cummings Road Crossing Location



The crossovers are proposed to be designed in accordance with Council's standard drawing for a typical rural driveway. Accordingly, the access will be able to accommodate the largest design vehicle.

The Safe Intersection Sight Distance (SISD) required at intersections is specified within the *Austrroads Guide to Road Design - Part 4A: Unsignalised Intersections*. The sight distance requirement for a 100km/hr design speed is 248 metres. The sight distance available at the crossing greatly exceeds the Austrroads requirements given the straight and flat alignment of Cummings Road.

In order to minimise the impact of the crossing to vehicles travelling along Cummings Road it is recommended that a variable message sign be provided on Cummings Road for vehicles travelling in both directions. The signs will be activated when a vehicle is crossing between the two sites and will provide a warning indicating vehicles are crossing ahead. The operation of the sign and the proposed arrangement should be included within any future CTMP.



5.3 Operation Access

Access to the site during typical operations will be provided via the Cummings Road crossing driveways. The driveways are proposed to be designed in accordance with Council's standard drawings for a typical rural driveway and will readily accommodate the light vehicles that will access the site.

6. Conclusions

Amber has assessed the traffic impacts of the solar farm located approximately 4.0 kilometres southwest of Culcairn, New South Wales. Access to the site is to be provided to/from Weeamera Road, via Olympic Highway and Benambra Road. The above assessment determined the following:

- The site will generate up to 400 vehicle movements per day during peak construction times, including 100 truck movements;
- The road network is able to accommodate the traffic generated by the development during the construction and operational period;
- Weeamera Road north of the Boral Quarry site access will be widened to 6.0 metres and be provided with a light spray seal in order to accommodate simultaneous two-way movement and limit the impact of dust to nearby dwellings;
- In order to mitigate the impacts of the development during construction a CTMP will be prepared which should include the following recommendations:
 - Prior to construction, a pre-condition survey of the relevant sections of the existing road network be undertaken, in consultation with Council. During construction the sections of the road network utilised by the proposal are to be monitored and maintained to ensure continued safe use by all road users, and any faults attributed to construction of the solar farm would be rectified. At the end of construction, a post-condition survey would be undertaken to ensure the road network is left in the consistent condition as at the start of construction.
 - Neighbours of the solar farm be consulted and notified regarding the timing of major deliveries which may require additional traffic control and disrupt access.
 - In order to minimise the impact to vehicles travelling along Cummings Road, it is recommended that a variable message sign be provided on Cummings Road. The signs will be activated when a vehicle is crossing between the two sites and will provide a warning to vehicles on Cummings Road indicating vehicles are crossing ahead.
- The access to the southern site from Weeamera Road is able to accommodate 19.0 metre articulated vehicles, with some widening required in the proximity of the railway crossing to allow for simultaneous two-way truck movement;
- The access to the northern site across Cummings Road will be based on Council's standard drawings for a typical rural driveway.

Accordingly, based on the assessment and recommendations above, it is considered that the proposed access arrangements for the solar farm are suitable to accommodate the expected construction vehicle types and traffic volumes during the construction and operation phase of the project.

If you have any questions please feel free to contact the undersigned.



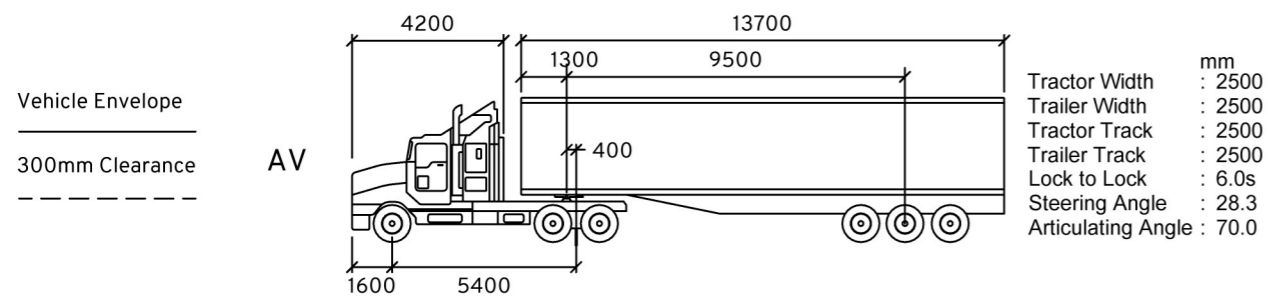
Yours sincerely
Amber Organisation

Michael Willson
Director

Attach: Appendix A – Swept Path Assessment
 Appendix B – Access Design

Appendix A

Swept Path Assessment



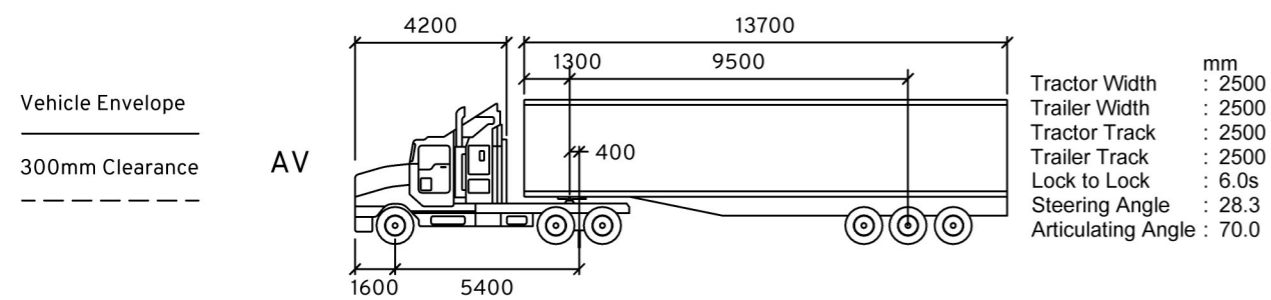
Culcairn Solar Farm
Southern Access Design
Swept Path Assessment

DRAWN: MW
DATE: 25/03/2019
SCALE: 1:500 @ A3
DWG NO: 012-S1A



Appendix B

Access Design



Culcairn Solar Farm
 Southern Access Design
 Swept Path Assessment

DRAWN: MW
 DATE: 25/03/2019
 SCALE: 1:750 @ A3
 DWG NO: 012-S1A