

# ***Bookaar Solar Farm***

## Transport Impact Assessment



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## onemilegrid



ABN: 79 168 115 679

(03) 9939 8250  
1/59 Keele Street

**COLLINGWOOD, VIC 3066**

[www.onemilegrid.com.au](http://www.onemilegrid.com.au)

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<b>Prepared by</b>	Julian Stone	<b>Reviewed by</b>	Valentine Gnanakone
<b>Signature</b>		<b>Signature</b>	

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# 1 INTRODUCTION

onemilegrid has been requested by Bookaar Renewables Pty Ltd to undertake a Transport Impact Assessment for the proposed solar farm in Bookaar.

As part of this assessment the subject site has been inspected with due consideration of the development proposal, traffic data has been sourced and relevant background reports have been reviewed.

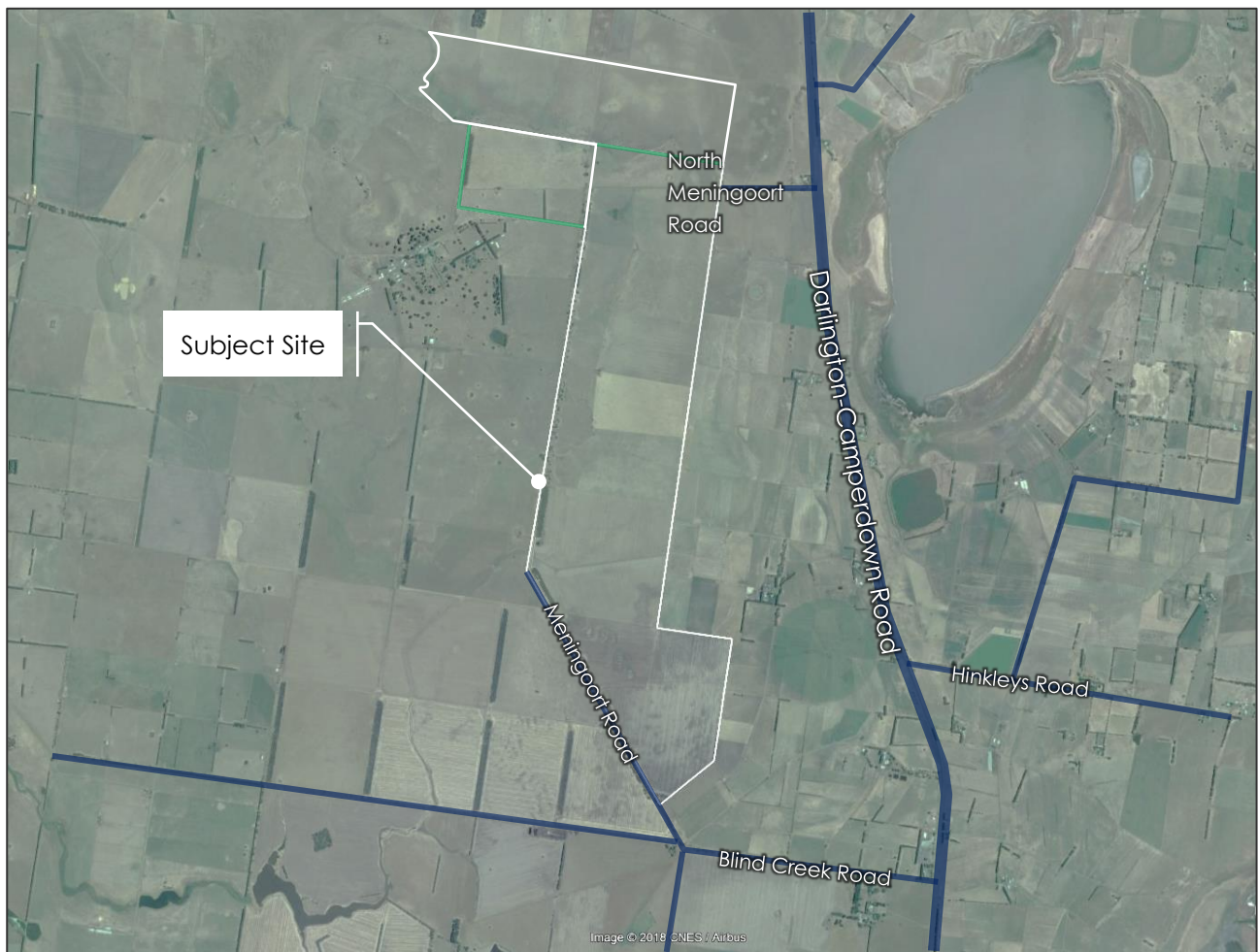
## 2 EXISTING CONDITIONS

### 2.1 Site Location

The subject site is located to the west of Darlington-Camperdown Road and Lake Bookaar. Vehicle access to the site is provided via North Meningoort Road and Blind Creek Road to the south and North Meningoort Road to the north-east.

The location of the subject site in the context of the surrounding road network is shown in Figure 1.

**Figure 1 Site Location**



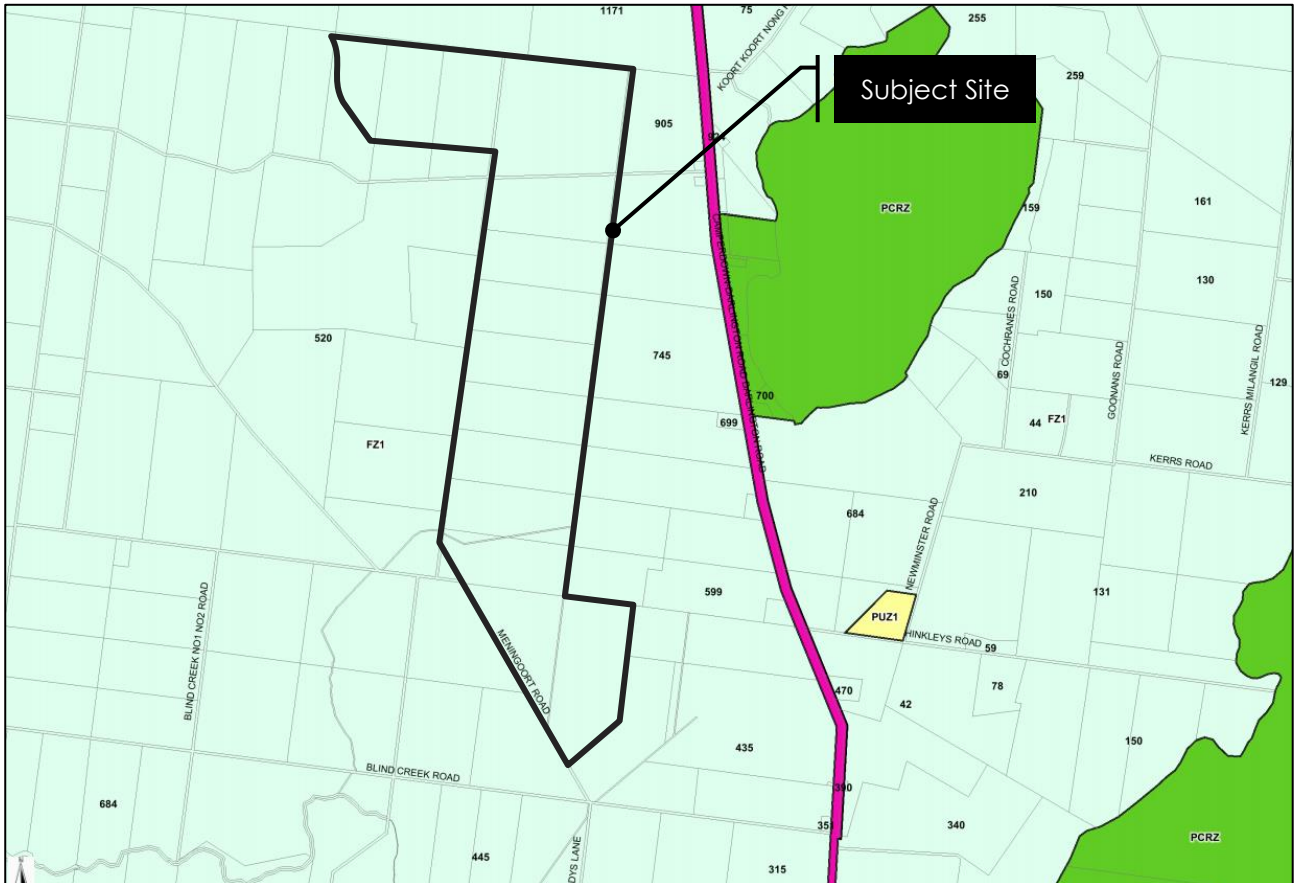
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The subject site is currently utilised as farming land, with the surrounding land also used for farming.

## 2.2 Planning Zones

It is shown in Figure 2 that the site is located within a Farming Zone (FZ), for which the permitted uses are listed in Clause 35.07 of the Corangamite Planning Scheme. Furthermore, Darlington Road is identified as a Road Zone Category 1.

**Figure 2 Planning Scheme Zones**



## 2.3 Road Network

### 2.3.1 Darlington-Camperdown Road

Darlington-Camperdown Road is an arterial road extending generally north-south between Hamilton Highway in the north and Princes Highway in the south.

Darlington-Camperdown Road provides one traffic lane in each direction and has a signed speed limit of 100 km/h.

The VicRoads database for gazetted roads for Higher Mass Limits (HML) includes Darlington-Camperdown Road as an approved HML road.

A cross section of Darlington-Camperdown Road is shown in Figure 3.

**Figure 3 Darlington-Camperdown Road, looking south from Blind Creek Road**



### 2.3.2 Blind Creek Road

Blind Creek Road is a local road extending to the west from Darlington-Camperdown Road.

Blind Creek Road is paved between Darlington-Camperdown Road and Meningoort Road, further to the west the road continues with a gravel surface.

The VicRoads database for gazetted roads for Higher Mass Limits (HML) includes Blind Creek Road as a restricted access road, noting that there is a local council timber bridge load limit. There is no timber bridge located between Darlington-Camperdown Road and Meningoort Road.

A cross section of Blind Creek Road is shown in Figure 4.

**Figure 4** Blind Creek Road looking east from Meningoort Road



### 2.3.3 Meningoort Road

Meningoort Road is a local road extending to the north from Blind Creek Road. Meningoort Road has a gravel surface.

It is noted that there is a gate, with a grill pit, and a culvert under the road on the approach to the site. The culvert under the road is shown in Figure 5.

**Figure 5** Meningoort Road, looking north with the existing culvert



## 2.4 Traffic Volumes

Traffic volume information for Darlington-Camperdown Road (between Hamilton Highway and Princes Highway West) adjacent to the site was obtained via VicRoads Traffic Profile Viewer. The data indicates that Darlington-Camperdown Road carries the following approximate traffic volumes.

**Table 1** Existing Traffic Volumes

<i>Direction</i>	<i>Daily</i>	<i>AM Peak</i>	<i>PM Peak</i>
Northbound	300 vpd	17 vph	28 vph
Southbound	300 vpd	29 vph	24 vph
<b>Total</b>	<b>600 vpd</b>	<b>46 vph</b>	<b>52 vph</b>



## 3 DEVELOPMENT PROPOSAL

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### 3.1 General

The proposed Bookaar Solar Farm will generate electricity through the conversion of solar radiation to electricity using PV panels laid out across the study area in a series of modules, mounted on steel racks with piled supports. Other infrastructure within the study area will include electrical invertors, underground and/or above ground electrical cabling, telecommunications equipment, a substation, a battery, amenities and storage facilities, vehicular access and parking areas, along with security fencing and gates.

### 3.2 Key Components of Proposed Activity

The proposed Bookaar Solar Farm involves the installation of PV panels with a combined generation capacity of approximately 200 MW. The activity includes the following elements:

- Solar arrays: which would be made up of approximately 800,000 solar panels supported by a mounting system installed on approximately 100,000 piles driven or screwed into the ground;
- The panels would be installed on either:
  - + A fixed tilt system (oriented west to east); or
  - + A single axis system (orientated north to south);
- Up to 60 central inverters located throughout the development (placed together in groups of two units or singularly, each unit would likely be between 2 and 3 MW);
- Above and/or below ground onsite cabling and electrical connections;
- Onsite access tracks;
- Substation area, up to a maximum area of 125 m by 132 m by up to 4 m high which would connect the Proposal to the national electricity grid;
- The substation may also contain a telecommunication tower, similar in nature to a cellular mast;
- Adjacent to the substation would be a triangular area designated for battery storage (approximately 140 m x 110 m x by 4 m high). This area may contain lightning protection rods which would rise above the storage facility;
- Support buildings alongside the substation including communications equipment and potentially a tower;
- Drainage system aiding water movement away from the site's eastern areas that are subject to inundation;
- Perimeter fence (security fence approximately 2.5 m high);
- Vegetation screens for visual screening (if necessary); and
- Firebreaks.

The final location of the elements listed above will be micro-sited within the designated areas post consent, through a detailed design process. The main Planning Report which details these components and locations further.

In addition to the key components outlined above, there would be a temporary construction compound required to facilitate the construction and decommissioning phases of the proposed Bookaar Solar Farm. The construction compound would include:

- Temporary construction offices;
- Car and bus parking areas;
- A staff amenity block (including portable toilets, showers and a kitchen) designed to accommodate peak staff numbers during the construction period; and

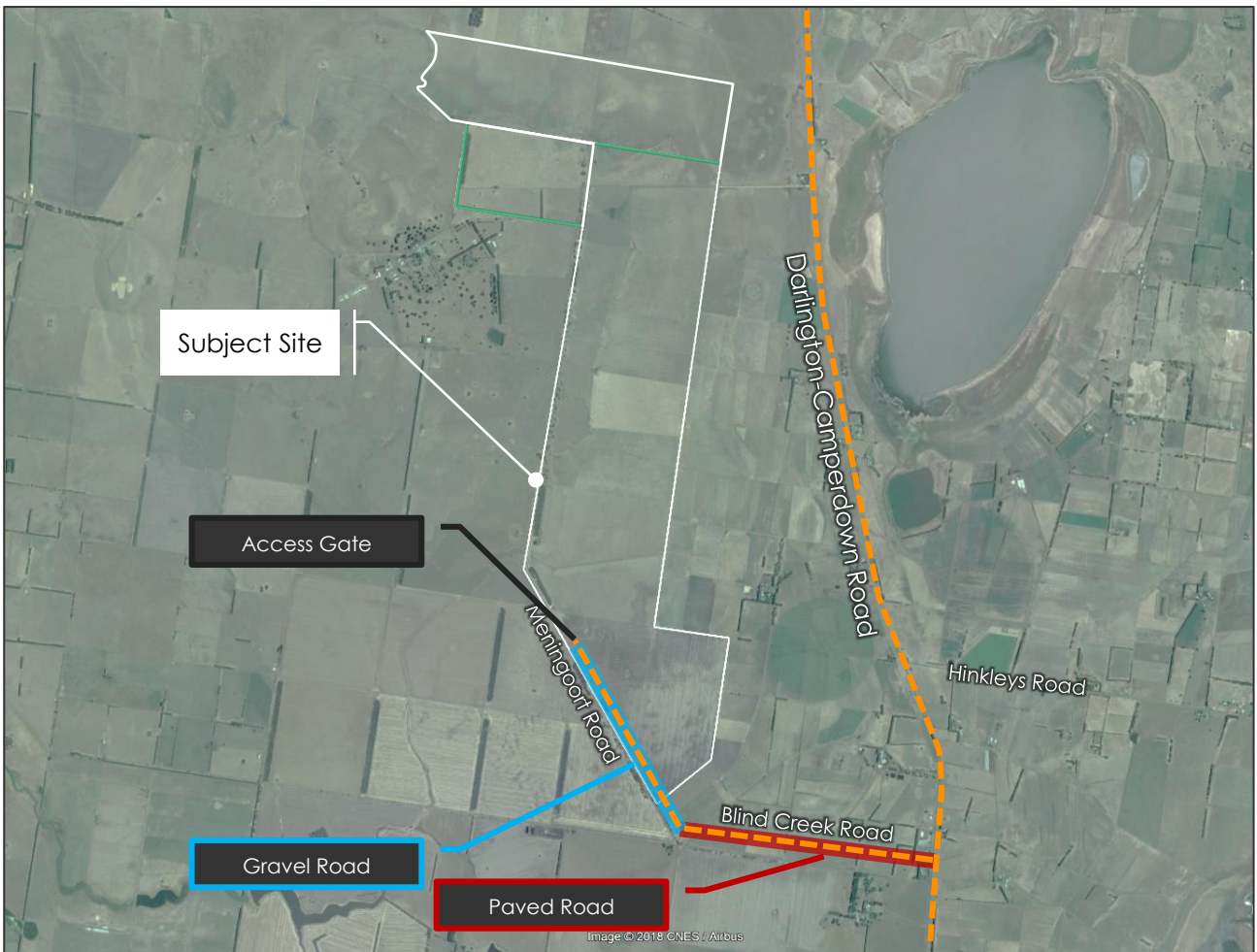
- Laydown areas.

All land required for the temporary construction compound, if not used as part of the array area, would be restored to its current condition.

### 3.3 Access

During the construction/installation and the future operation of the site, it is proposed to achieve vehicle access via Blind Creek Road and Meningoort Road, to the south of the site, via Darlington-Camperdown Road. The approximate gateway and vehicle access route is shown in Figure 6. It is noted that the access route between Darlington-Camperdown Road includes a section of paved road and a section of gravel road.

**Figure 6 Proposed Access Route**



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### **3.4 Construction / Installation**

The construction stage is expected to take place over a 12-month period and will require up to 150 staff. Construction will take place over normal hours and will not include Sunday or public holidays.

Across the construction period, it is expected that deliveries will be required from a combination of vehicles from vans through to semi-trailers, as well as a small number of larger sized vehicles. In total across a typical day it is projected that 16 trucks will travel to the site.

### **3.5 Operation**

During operation the site has minimal requirements for staff due to the largely automated operation of the site. As a maximum during potential change over of equipment phases, it is expected that between 10 – 12 staff will be required.

## 4 INTERSECTION REVIEW

Vehicles arriving to the site will be required to negotiate intersections on their route to the subject site. A review of the likely intersections follows.

**Figure 7 Intersection Review**



### Hamilton Highway / Darlington – Camperdown Road

This intersection is located to the north of the site and is arranged as a standard T-intersection with Hamilton Highway afforded priority. Road widening is provided to allow for right turning movements from the west and left turn movements from the east to occur without impeding through traffic. A view of the intersection is provided in Figure 8.

**Figure 8** Hamilton Highway / Darlington – Camperdown Road



Darlington – Camperdown Road looking north



Hamilton Highway looking east

### Blind Creek Road / Meningoort Road

This intersection is located in the vicinity of the site and is generally arranged as a cross intersection with Sandys Lane forming the southern leg of the intersection. The intersection is entirely of gravel construction with Blind Creek Road afforded priority.

A view of the intersection is provided in Figure 9.

**Figure 9** Blind Creek Road / Meningoort Road



Blind Creek Road / Meningoort Road intersection looking east



Blind Creek Road / Meningoort Road intersection looking north

### Darlington – Camperdown Road / Blind Creek Road

This intersection is located to the east of the site and will be the main access for all vehicles from the arterial road network. It is arranged as a standard T-intersection with Darlington – Camperdown Road afforded priority. No road widening is provided on Darlington – Camperdown Road. A view of the intersection is provided in Figure 10.

**Figure 10 Darlington – Camperdown Road / Blind Creek Road**



Blind Creek Road looking east



Darlington – Camperdown Road looking north

### Darlington – Camperdown Road / Princes Highway

This intersection is located to the south of the site and is arranged as a standard T-intersection with Princes Highway afforded priority. Road widening is provided to allow for right turning movements from the west and left turn movements from the east to occur without impeding through traffic. Designated auxiliary right and left turn lanes are provided.

In addition to the intersection, a railway crossing is provided to the north of the intersection. A view of the intersection is provided in Figure 11.

**Figure 11 Darlington – Camperdown Road / Princes Highway**



Princes Highway looking east



Darlington – Camperdown Road looking north

## 5 TRAFFIC CONSIDERATIONS

### 5.1 Traffic Generation

The traffic generated by the proposed development of the site for a solar farm will be generated during the construction / installation phase and then the future operation phase. Based on previous solar farm projects, it is advised that the construction phase will occur over a 12 month period and the operational phase is set for 29 years.

During each of the abovementioned phases, it is projected that the traffic movements detailed in Table 2 will be generated. The traffic movements projected are based on the developer's experience with previous solar farms.

**Table 2 Anticipated Traffic Movements**

Phase	Component	Anticipated Vehicle Movements	Resultant Movements
Construction Phase	Deliveries	Average of 16 daily truck vehicle movements (includes all sizes)	32 truck movements (1 in and 1 out)
	Staff	Based on maximum 150 staff with 50% driver ratio*	150 passenger vehicle movements (1 in and 1 out)
	Total		182 movements
Operational Phase	Staff	Up to 12 staff arriving and departing in morning and departing in the evening	24 standard vehicle movements (1 in and 1 out)
	Visitors	3 visitors / deliveries across the day	6 standard vehicle movements (1 in and 1 out)
	Total		30 vehicle movements

\* On any given construction day staff will be required to car pool should the number of total movements look to exceed 150 total movements without car pooling.

The loading and delivery movements to the site will be made via multiple vehicles ranging in size between 19m semi-trailers and cars. It is noted that there are five extra large loading vehicles required for transporting the primary transformer, the modular substation and the battery (dependent on its final configuration).

General vehicle traffic will likely be concentrated during staff arrivals and departures during the AM and PM peaks, respectively. Construction traffic, deliveries and equipment, will be largely distributed across the day.

### 5.2 Traffic Distribution

All traffic movements to and from the site will use Meningoort Road, Blind Creek Road and Darlington-Camperdown Road. From Darlington-Camperdown Road, the vehicle movements will be distributed to the north (via Hamilton Highway) and to the south (via Princes Highway). It is expected that heavy vehicle movements will be evenly distributed to the north and south.

The proposed access route is shown in Figure 6.

## 5.3 Construction Phase Traffic Impact

### 5.3.1 Local Street Impact

It is noted that Darlington-Camperdown Road is gazetted as an approved Higher Mass Limit (HML) road however Blind Creek Road is restricted locally due to a timber bridge. The timber bridge is located to the west of Meningoort Road and will therefore not impact on the proposed vehicle movements to the subject site.

During the construction stage of the proposed development, it is anticipated that the site will generate up to 182 daily vehicle movements (equivalent of 32 truck movements and 150 light vehicle movements).

Limited guidance on the capacity of unsealed rural roads or two-way rural roads with an approximate 4m wide seal and gravelled shoulders is available, noting that the roadway surface treatments do not typically figure in the theoretical calculations of roadway capacity. The Infrastructure Design Manual (IDM) recommends that for rural access and rural collector streets, target traffic volumes should be within 51-150 vehicles per day for roads with a 4 metre seal and gravel shoulders and 150+ vehicles per day for roads with a 6.2 metre seal. Noting the lack of an upper volume limit on the 6.2 metre sealed road, identified target volumes within the IDM are likely dictated by the balance of cost of ongoing maintenance required for higher trafficked unsealed road surfaces and associated safety issues rather than an identified physical road capacity.

It is acknowledged that the increase of traffic volumes on Meningoort Road and Blind Creek Road will result in increased frequency of vehicles relying on the gravel shoulder to pass one another, which may result in a requirement for additional maintenance to counter the wear on gravel shoulders, and in the case of Meningoort Road the full surface of the road.

The upgrade of Meningoort Road to a sealed pavement is not considered warranted, given that daily traffic movements are only marginally expected to exceed 150 vehicles per day. Rather, it is suggested that following the completion of the construction phase, that the layout of both Blind Creek Road and Meningoort Road be reviewed and returned to its existing condition.

### 5.3.2 Arterial Road / Intersection Impact

The existing traffic volumes for Darlington-Camperdown Road, as sourced from VicRoads, identified daily traffic volumes of 600 vehicles. It is anticipated that the daily traffic generation for up to 182 movements during the construction phase of the development will not adversely impact on the existing operation of Darlington-Camperdown Road.

To assist with the operation of the intersection between Darlington-Camperdown Road and Blind Creek Road, it is recommended that local gravel shoulders be constructed on Darlington-Camperdown Road to provide for a potential passing area of turning vehicles. The gravel shoulders are to be designed in accordance with a basic right turn treatment for a rural road, as per Austroads Guide to Road Design: Part 4 – Intersections and Crossings General. A concept layout for the proposed intersection treatment is shown in Figure 12.



**Figure 12 Proposed Intersection Treatment**



### 5.3.3 Transformer, Substation and Battery Delivery

It has been advised that the construction of the site will require the delivery of a transformer using an OD H – Loader and a modular substation using a OD L – Loader, as well as up to three deliveries of battery components using a OD L – Loader.

The OD vehicles required to transport these facilities will exceed VicRoads maximum Gross Combination Mass Limits for heavy vehicles and will require specific permit approval and the preparation of a specific detailed traffic management plan.

## 5.4 Operational Phase Traffic Impact

During the operational phase of the solar farm, the development is projected to generate traffic movements associated with 12 staff vehicles arriving and departing the site. This level of traffic generation is considered to have a negligible impact on the surrounding road network.

## 5.5 Overall Traffic Engineering Review

As part of the above assessment, the level of traffic generated by the project during the construction is likely to require some improvements to the Blind Creek Road intersection to ensure that vehicles can safely turn without impacting on through traffic. With regard to the main route into the site, due to the level of traffic generated and the desire to largely maintain existing conditions without disturbing the environment, the existing road profile is recommended to be retained. That said, on-going monitoring and maintenance is recommended to ensure that the road is maintained as safe.

## 6 PARKING CONSIDERATIONS

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The development of the site is to include on-site parking to meet the demands of staff during the construction stage and operational stage. It is expected that the parking facilities will be temporary during the construction stage and then formalised for the ongoing operational stage.

On-site parking is to be provided with area available for one parking space per staff member. During the construction stage this equates to approximately 150 spaces and during the operational stage this equates to 15 spaces.

It is expected that the on-site parking will be accessed via the access gate location nominated in Figure 6.

## 7 CONCLUSIONS

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Based on the foregoing assessment, it is concluded as follows:-

- It is proposed to use the site for the purposes of a solar farm;
- During the construction phase, the level of traffic generated is not expected to have an impact on the operation of the road network;
- It is recommended that gravel shoulders are provided at the intersection of Darlington-Camperdown Road and Blind Creek Road;
- During operation it is not expected that there will be any traffic impacts on the surrounding road network;
- Car parking will be provided across the site as required.