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Wagga Wagga  
**NSW 2650**

TDG Ref: 15327  
1 May 2018

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

Dear Sarah,

### **Proposed Avonlie Solar Farm – Traffic Access Assessment**

TDG has reviewed the proposed access arrangements for the Avonlie Solar Farm, which is located approximately 20 kilometres south of Narrandera township. Access to the site will be provided via Sturt Highway, Sandigo Road and the unsealed road of Muntz Road. Sandigo Road connects to Sturt Highway, with Sturt Highway being controlled by Roads and Maritime Services (RMS).

An assessment of the access arrangements for the solar farm is provided below.

## **1. Existing Conditions**

### **1.1 Road Network**

Sturt Highway is a regional state highway, which generally runs in a northwest-southeast alignment in the vicinity of the site. It has one traffic lane in each direction, approximately 3.8 metres wide, and the carriageway has a sealed width of approximately 16 metres.

Sandigo Road is a local road that runs in a north-south alignment, extending from its intersection with Sturt Highway in the north to where it continues as Orara Street approximately 22 kilometres to the south. It has a sealed road width of approximately five metres in the vicinity of the site, with wide unsealed shoulders on both sides of the road, allowing for simultaneous two-way movement.

Muntz Road is also a local road, and runs in an east-west alignment. It extends from its intersection with Sandigo Road to its termination approximately 2.8 kilometres to the west. It has an unsealed road width of approximately seven metres toward the eastern end, and four to five metres further west.

### **1.2 Traffic Volumes**

Traffic volumes for Sturt Highway were obtained from the Roads and Maritime Services (RMS) traffic volume viewer. The data for Sturt Highway recorded an average daily traffic count of 2,472 vehicles per day (vpd) in 2011. Assuming a 0.05% annual growth from 2011, an average traffic volume of 2,560 vpd is approximated to be the current daily volume.

Traffic volumes for Sandigo Road were obtained from Narrandera Shire Council (Council), with the most recent traffic count carried out between December 2013 and January 2014. The



counts recorded an average daily traffic volume of 33 vpd. Assuming a 0.05% growth from 2013, an average daily traffic volume of 42 vpd is approximated to be the current daily volume.

The raw traffic data for Sandigo Road is included for reference within **Appendix A**.

Muntz Road is expected to carry an even lower amount of daily traffic than Sandigo Road.

## 2. Traffic Generation

Construction activities would typically be undertaken during standard daytime construction hours. Any construction outside of these normal working hours would only be undertaken with prior approval from relevant authorities.

There are expected to be up to three transformers delivered to the site via Restricted Access Vehicles (RAV). During delivery of the transformers, the RAVs will be escorted and be accompanied by pilot vehicles, as both Sandigo Road and Muntz Road would be restricted to one-way vehicle access for short periods while the RAVs access the roads. It is expected that this would occur outside of typical construction hours, and outside of peak hours for the surrounding road network, causing minimal delay to the existing traffic environment.

On average, approximately 18 trucks will access the site per day during the construction period. The delivery trucks will predominantly be Truck and Dog vehicles, with a number of mixer trucks and Articulated Vehicles (AV as defined within AS 2890.2:2009). The AVs will occasionally be used to transport larger plant such as the PV panels.

During the peak solar panel construction period, it is estimated that a total of 32 heavy vehicles will access the site per day, in addition to 149 passenger vehicles.

During the peak battery storage construction period, it is estimated that a total of 48 heavy vehicles and 12 passenger vehicles will access the site per day.

Accordingly, the site is expected to generate approximately 32 heavy vehicles and 149 passenger vehicles per day, or 64 heavy vehicle movements (32 inbound and 32 outbound) and 298 passenger vehicle movements per day during the peak construction period of the solar farm.

**Table 1** summarises the traffic movements generated during the peak construction period of the solar farm:

Vehicle Type	Vehicle Movements per Day (vpd)
Light Vehicle (car / 4WD / minibus)	298
Truck and Dog	24
Mixer Truck / Rigid Vehicles	24
Low loader	2
AV	14
<b>Total</b>	<b>362</b>

**Table 1: Estimated Traffic Generation During Peak Construction Periods**



### 3. Appropriateness of Access Roads

The use of these roads by larger vehicles delivering plant to the site would not be dissimilar to the existing use of the road by trucks associated with the surrounding agricultural use. Notwithstanding this, it is recommended that a pavement assessment be conducted prior to construction, in order to determine the strength of pavement along the section of Sandigo Road between Sturt Highway and Muntz Road, in order to support the proposed volume of construction traffic associated with the solar farm.

It is also recommended that the following form part of the Construction TMP 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 proposed to be utilised by the construction vehicles associated with the solar farm are to be monitored and maintained to ensure continued safe use by all road users, and any faults attributed to construction of the PV plant required to be rectified. At the end of construction, a post-condition survey would be undertaken to ensure that the road network is left in a similar condition as per the start of construction.
- Construction of the proposal may result in increased dust on unsealed roads. During construction, water is to be used to minimise dust generation on the unsealed lanes.

The adoption of the above recommendations will assist to mitigate any impact to the road surface.

Council has noted that Sturt Highway was forced to close due to flooding on several occasions in previous years, thus a risk of flooding and road closure should be considered. It is recommended that a Flood Response Plan be prepared that will include an access contingency plan during these times.

### 4. Access Design

It is proposed to provide access to the site from Muntz Road, approximately 3.4 kilometres south-west of Sturt Highway. The proposed site access will be able to accommodate simultaneous entry and exit of the largest design vehicle expected to access the site. Based on discussions with RES Australia, the largest construction vehicle expected to access the site is expected to be an RAV.

In the event where RAVs access / egress the site, which is expected to occur outside of construction hours and the local traffic network peak hours, the RAVs are expected to be able to access / egress the site comfortably as Sandigo Road / Muntz Road and the site will be restricted to one-way vehicle flow.

### 5. Road Upgrades

#### 5.1 Sandigo Road

It is proposed to provide three passing areas along Sandigo Road, along the eastern side of the road for incoming vehicles. The proposed passing area locations are shown in Figure 2 of **Appendix B**. Details of a typical heavy vehicle passing bay are shown in Figure 3 of Appendix B. Given the relatively straight nature of Sandigo Road, offering excellent sight distance for vehicles travelling in either direction, a total of three passing bays is considered to be a satisfactory provision.



## 5.2 Muntz Road

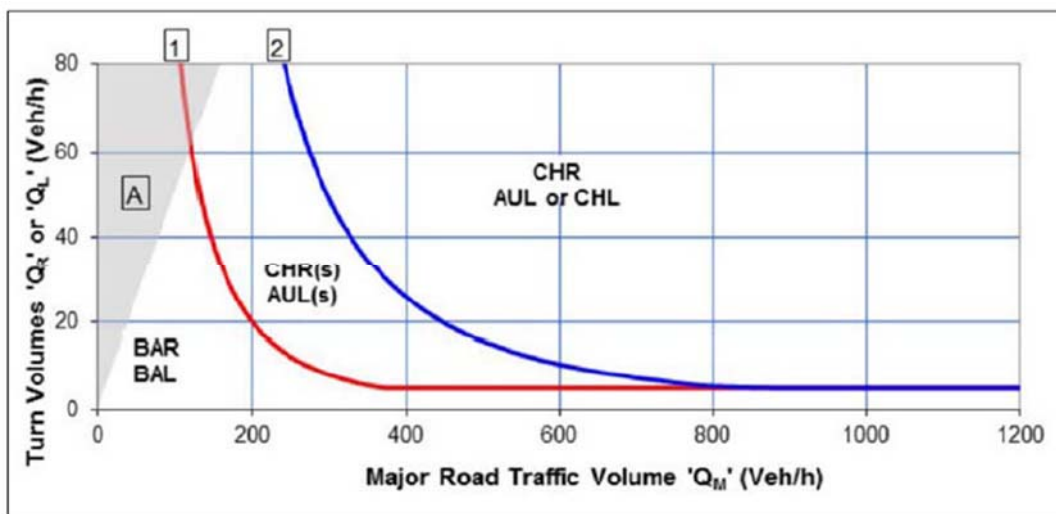
It is considered that Muntz Road in its current form is of satisfactory width to accommodate two-way vehicle flow along its easternmost section. There is an S-bend in the road approximately 820 metres west of the Sandigo Road / Muntz Road intersection, which is considered to be of insufficient width to allow for two-way vehicle flow. It is therefore recommended that this section be widened to allow for two AVs to simultaneously pass each other.

It is proposed that four passing areas along the southern side of Muntz Road be provided to the west of the S-bend, to allow for incoming vehicles to pull over and allow outgoing vehicles to pass. Details of a typical heavy vehicle passing bay are shown in Figure 3 of Appendix B. Given the relatively straight nature of Muntz Road between the S-bend and the site entrance, a total of four passing bays is considered to be a satisfactory provision.

## 6. Intersection Design

### 6.1 Sturt Highway / Sandigo Road

*Austrads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings* specifies the turning treatments required at intersections. In particular, Figure 2.26, 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 *Austrads Guide to Traffic Management Part 6*

During the construction phase of the solar farm, when traffic generation will be at its peak, Sandigo Road is expected to accommodate a total of approximately 362 additional vehicle movements per day. Assuming 10% of all daily trips occur during peak periods, Sturt Highway and Sandigo Road are assumed to accommodate approximately 256 and 42 vehicle movements during the peak hour, respectively.

It is assumed that all vehicles associated with the site will turn to / from Sturt Highway to the left and right in a 50:50 ratio, with a 50:50 inbound / outbound split. Therefore, the turning volumes  $Q_L$  and  $Q_R$  can both be approximated as being 11 vehicles per hour.

As such, the intersection would require Basic Right Turn (BAR) and Basic Left Turn (BAL) turning treatments.



Figure 7 in **Appendix C** shows the proposed intersection design, which is based on an AV as the design vehicle. The swept path assessment, created using the software package 'AutoTurn', is shown in Figures 8 and 9 within Appendix C. Accordingly, the proposed intersection turning treatments have been appropriately designed and in accordance with the Austroads dimensional requirements.

## 6.2 Sandigo Road / Muntz Road

The intersection of Sandigo Road / Muntz Road is expected to accommodate approximately 42 vehicle movements per hour. The movement of vehicles travelling along the access route to / from the site will be via the one-lane section of Sandigo Road. It is proposed to widen Muntz Road on the southern side to allow for inbound AVs to turn onto Muntz Road from Sandigo Road while an AV waits on Muntz Road, as shown in Figure 10 within **Appendix D**.

The swept path assessment, created using the software package 'AutoTurn', is shown in Figure 11 within Appendix C, and demonstrates that an AV can turn from Sandigo Road onto Muntz Road while an AV eastbound on Muntz Road awaits at the proposed stop line.

Accordingly, the proposed intersection has been appropriately designed to cater for the largest design vehicle.

## 7. Conclusion

TDG has assessed the access arrangements of Avonlie Solar Farm between the site access and Sturt Highway. The assessment determined the following:

- It is recommended that the intersection of Sturt Highway and Sandigo Road be upgraded to allow for Basic Right Turn (BAR) and Basic Left Turn (BAL) turning treatments.
- It is recommended that heavy vehicle passing bays be provided along the eastern side of Sandigo Road and the southern side of Muntz Road to allow for the safe passing of heavy vehicles.
- It is recommended that the S-bend along Muntz Road between Sandigo Road and the site entrance be widened to allow for two-way simultaneous AVs to pass.
- The designs provided within Appendix C and D will ensure the associated intersections along the access route will operate in a safe manner and will be able to accommodate the maximum design vehicle expected to access the site.

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 phase.



If you have any queries, please feel free to contact us.

Yours sincerely  
**Traffic Design Group Ltd**

**Desmond Ang**  
**Traffic Engineer**

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enc:      Appendix A – Traffic Volume Data  
            Appendix B – Heavy Vehicle Passing Bay Location and Details  
            Appendix C – Sturt Highway / Sandigo Road Intersection Design  
            Appendix D – Sandigo Road / Muntz Road Intersection Design

## Appendix A

### Traffic Volume Data

## MetroCount Traffic Executive Adjusted Flow

### AADT-70 -- English (ENA)

#### Datasets:

**Site:** [7] Sandigo Rd  
**Direction:** 1 - North bound, A hit first. **Lane:** 0  
**Survey Duration:** 0:00 Tuesday, 10 December 2013 => 14:48 Monday, 6 January 2014  
**Zone:**  
**File:** Sandigo Rd 6Jan2014.EC0 (Plus)  
**Identifier:** R05102D7 MC56-L5 [MC55] (c)Microcom 19Oct04  
**Algorithm:** Factory default (v3.21 - 15322)  
**Data type:** Axle sensors - Paired (Class/Speed/Count)

#### Profile:

**Filter time:** 0:00 Tuesday, 10 December 2013 => 14:48 Monday, 6 January 2014  
**Included classes:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12  
**Speed range:** 10 - 160 km/h.  
**Direction:** North, East, South, West (bound)  
**Separation:** All - (Headway)  
**Name:** Default Profile  
**Scheme:** Vehicle classification (AustRoads94)  
**Units:** Metric (meter, kilometer, m/s, km/h, kg, tonne)  
**In profile:** Vehicles = 894 / 895 (99.89%)



Day	Hits	RawVol	DayFac	MonFac	AdjVol	Date
0	1	44.000	1.000	1.000	44.000	- Tuesday, 10 December 2013
1	1	49.000	1.000	1.000	49.000	- Wednesday, 11 December 2013
2	1	49.000	1.000	1.000	49.000	- Thursday, 12 December 2013
3	1	55.000	1.000	1.000	55.000	- Friday, 13 December 2013
<b>4</b>	<b>1</b>	<b>18.000</b>	<b>1.000</b>	<b>1.000</b>	<b>18.000</b>	<b>- Saturday, 14 December 2013</b>
<b>5</b>	<b>1</b>	<b>14.000</b>	<b>1.000</b>	<b>1.000</b>	<b>14.000</b>	<b>- Sunday, 15 December 2013</b>
6	1	48.000	1.000	1.000	48.000	- Monday, 16 December 2013
7	1	48.000	1.000	1.000	48.000	- Tuesday, 17 December 2013
8	1	46.000	1.000	1.000	46.000	- Wednesday, 18 December 2013
9	1	28.000	1.000	1.000	28.000	- Thursday, 19 December 2013
10	1	29.000	1.000	1.000	29.000	- Friday, 20 December 2013
<b>11</b>	<b>1</b>	<b>14.000</b>	<b>1.000</b>	<b>1.000</b>	<b>14.000</b>	<b>- Saturday, 21 December 2013</b>
<b>12</b>	<b>1</b>	<b>19.000</b>	<b>1.000</b>	<b>1.000</b>	<b>19.000</b>	<b>- Sunday, 22 December 2013</b>
13	1	26.000	1.000	1.000	26.000	- Monday, 23 December 2013
14	1	34.000	1.000	1.000	34.000	- Tuesday, 24 December 2013
15	1	23.000	1.000	1.000	23.000	- Wednesday, 25 December 2013
16	1	15.000	1.000	1.000	15.000	- Thursday, 26 December 2013
17	1	30.000	1.000	1.000	30.000	- Friday, 27 December 2013
<b>18</b>	<b>1</b>	<b>27.000</b>	<b>1.000</b>	<b>1.000</b>	<b>27.000</b>	<b>- Saturday, 28 December 2013</b>
<b>19</b>	<b>1</b>	<b>21.000</b>	<b>1.000</b>	<b>1.000</b>	<b>21.000</b>	<b>- Sunday, 29 December 2013</b>
20	1	44.000	1.000	1.000	44.000	- Monday, 30 December 2013
21	1	51.000	1.000	1.000	51.000	- Tuesday, 31 December 2013
22	1	41.000	1.000	1.000	41.000	- Wednesday, 1 January 2014
23	1	32.000	1.000	1.000	32.000	- Thursday, 2 January 2014
24	1	32.000	1.000	1.000	32.000	- Friday, 3 January 2014
<b>25</b>	<b>1</b>	<b>19.000</b>	<b>1.000</b>	<b>1.000</b>	<b>19.000</b>	<b>- Saturday, 4 January 2014</b>
<b>26</b>	<b>1</b>	<b>22.000</b>	<b>1.000</b>	<b>1.000</b>	<b>22.000</b>	<b>- Sunday, 5 January 2014</b>
27	----	-----	-----	-----	-----	- Monday, 6 January 2014

**Total days = 27, Coverage = 7.40%**

ADT = 32.519, SD = 13.016

AADT = 32.519, SD = 13.016

**Weekdays = 19, Coverage = 5.21%**

AWDT = 38.105, SD = 11.244

AAWDT = 38.105, SD = 11.244

**Weekend days = 8, Coverage = 2.19%**

AWET = 19.250, SD = 4.268

AAWET = 19.250, SD = 4.268

**ADT and adjustment factor by month**

**Jan** - Vol = 146.000, Days = 5, ADT = 29.200, Adjust = 1.11365, 1/Adjust = 0.89795

**Feb**

**Mar**

**Apr**

**May**

**Jun**

**Jul**

**Aug**

**Sep**

**Oct**

**Nov**

**Dec** - Vol = 732.000, Days = 22, ADT = 33.273, Adjust = 0.97733, 1/Adjust = 1.02319

**ADT and adjustment factor by day of week**

**Mon** - Vol = 118.000, Days = 3, ADT = 39.333, Adjust = 0.82674, 1/Adjust = 1.20957

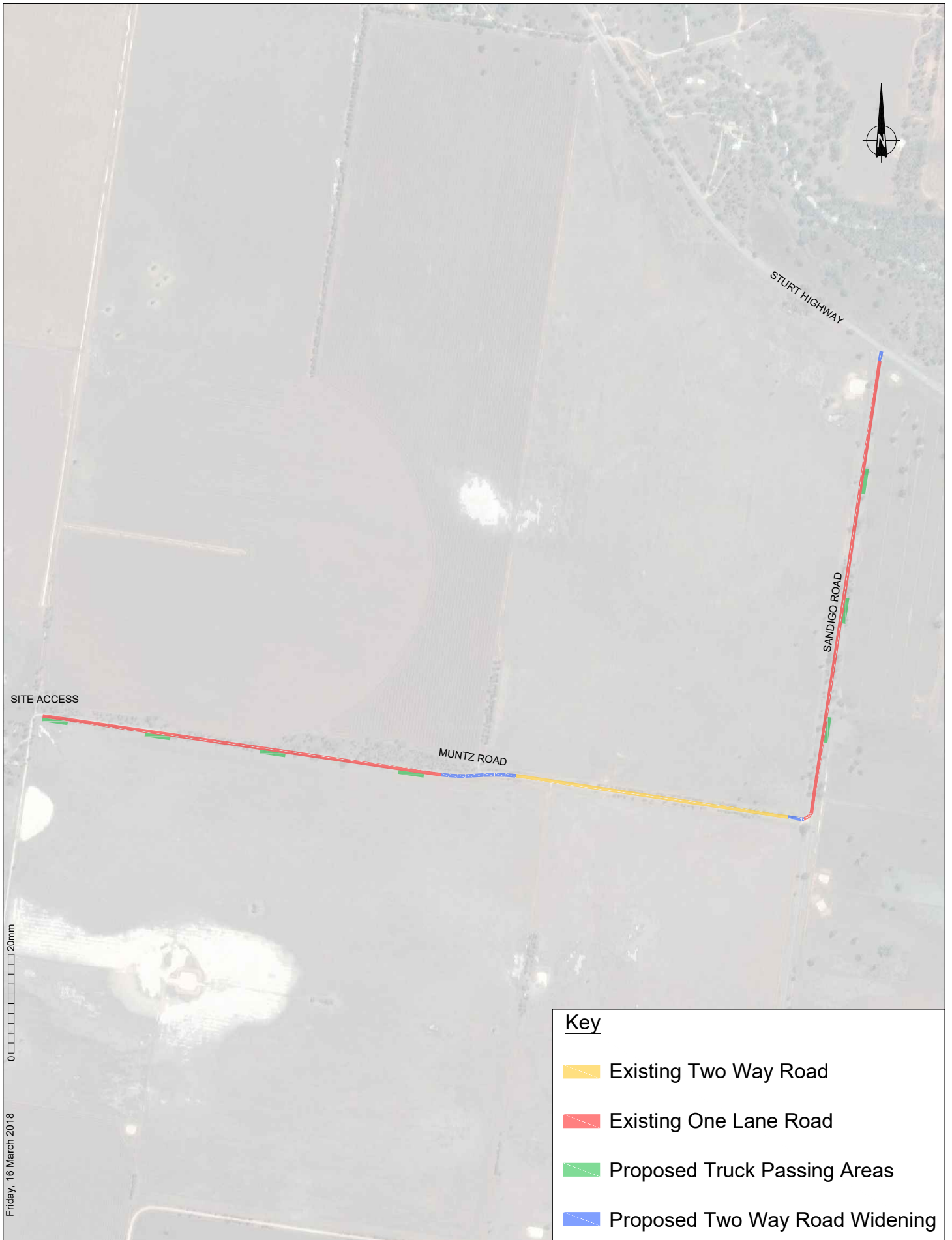
**Tue** - Vol = 177.000, Days = 4, ADT = 44.250, Adjust = 0.73488, 1/Adjust =

1.36076  
**Wed** - Vol = 159.000, Days = 4, ADT = 39.750, Adjust = 0.81808, 1/Adjust =  
1.22238  
**Thu** - Vol = 124.000, Days = 4, ADT = 31.000, Adjust = 1.04898, 1/Adjust =  
0.95330  
**Fri** - Vol = 146.000, Days = 4, ADT = 36.500, Adjust = 0.89092, 1/Adjust =  
1.12244  
**Sat** - Vol = 78.000, Days = 4, ADT = 19.500, Adjust = 1.66762, 1/Adjust =  
0.59966  
**Sun** - Vol = 76.000, Days = 4, ADT = 19.000, Adjust = 1.71150, 1/Adjust =  
0.58428







## **Appendix B**

### **Heavy Vehicle Passing Bay Location and Details**



Key

-  Existing Two Way Road
-  Existing One Lane Road
-  Proposed Truck Passing Areas
-  Proposed Two Way Road Widening

Avonlie Solar Farm  
Proposed Road Network Upgrades



2

SCALE: NTS



APPROXIMATE ROAD WIDENING

25.0m

3.2m

30.0m

25.0m

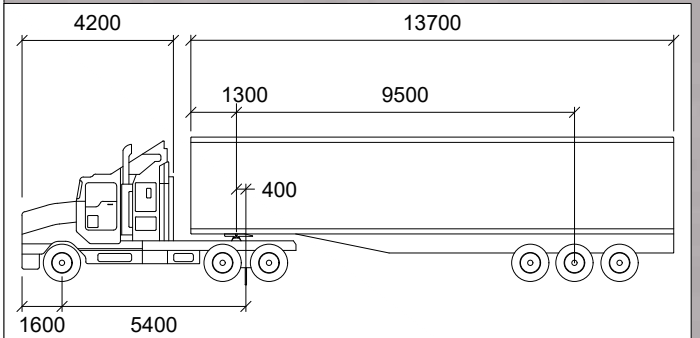
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REV	DATE	DRN	CHK	DESCRIPTION
00	16/03/18	TJG		

**Avonlie Solar Farm - Access Design**  
 Sandigo Road / Muntz Road Intersection  
 Proposed Intersection Layout Plan

DRAWN: TJG	---	---
DATE: 16/03/18	STATUS: ---	
SCALE: 1:500 @ A3		
DWG NO:15327-0S1A		





**AV**

Tractor Width	: 2500	Lock to Lock Time	: 6.0
Trailer Width	: 2500	Steering Angle	: 28.3
Tractor Track	: 2500	Articulating Angle	: 70.0
Trailer Track	: 2500		

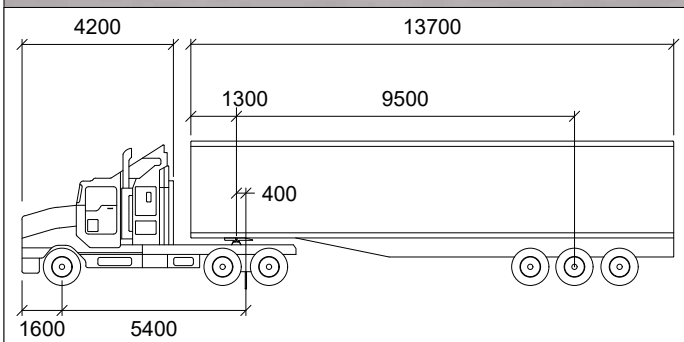
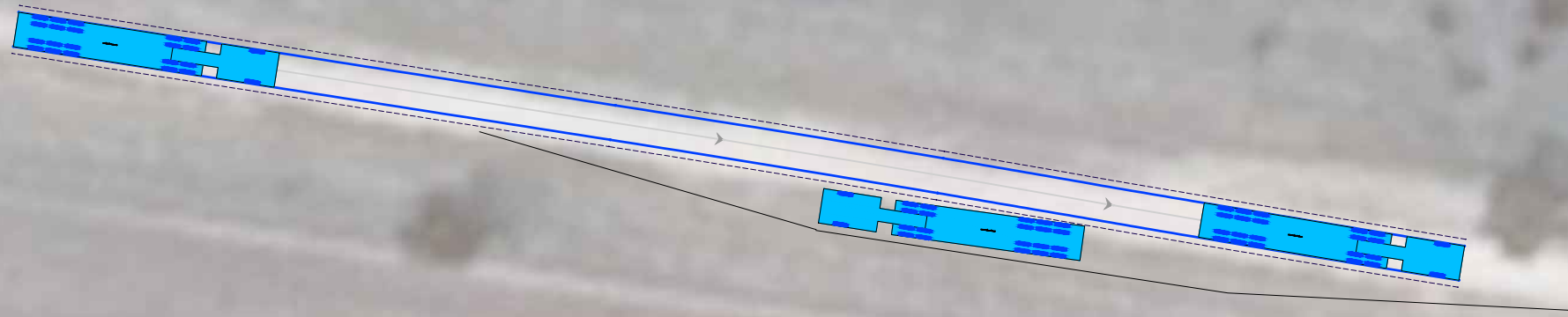
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REV	DATE	DRN	CHK	DESCRIPTION
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**Avonlie Solar Farm - Access Design**  
 Muntz Road - Typical Passing Bay  
 Swept Path Assessment - AV Passing (1)

DRAWN: TJG	---	---
DATE: 16/03/18	STATUS: ---	
SCALE: 1:750 @ A3		
DWG NO:15327-0S1A		





AV

Tractor Width	: 2500	Lock to Lock Time	: 6.0
Trailer Width	: 2500	Steering Angle	: 28.3
Tractor Track	: 2500	Articulating Angle	: 70.0
Trailer Track	: 2500		

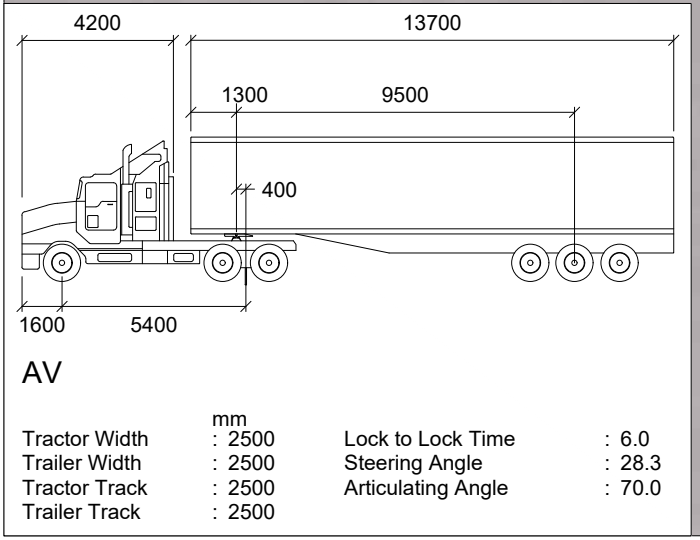
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Avonlie Solar Farm - Access Design  
 Muntz Road - Typical Passing Bay  
 Swept Path Assessment - AV Passing (2)

DRAWN: TJG	---	---
DATE: 16/03/18	STATUS: ---	
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DWG NO: 15327-0S1A		





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**Avonlie Solar Farm - Access Design**  
 Muntz Road - Typical Passing Bay  
 Swept Path Assessment - AV Passing (3)

DRAWN: TJG	---	---
DATE: 16/03/18	STATUS: ---	
SCALE: 1:750 @ A3		
DWG NO: 15327-0S1A		







## Appendix C

### Sturt Highway / Sandigo Road Intersection Design



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The following design details have been taken from *Austrroads Guide to Road Design Part 4A*:

Rural Basic Right-turn Treatment (BAR) Section 7.5.1.

- 1: Design speed of 110km/h.
- 2: 3.7m Lane widths have been used.
- 3: Taper lengths calculate to 46m.
- 4: Formation/carriageway widening is 3.0m.
- 5: Storage length is 22.5m for one 19m design vehicle.

Rural Left-turn Treatment (BAL) Section 8.2.1.

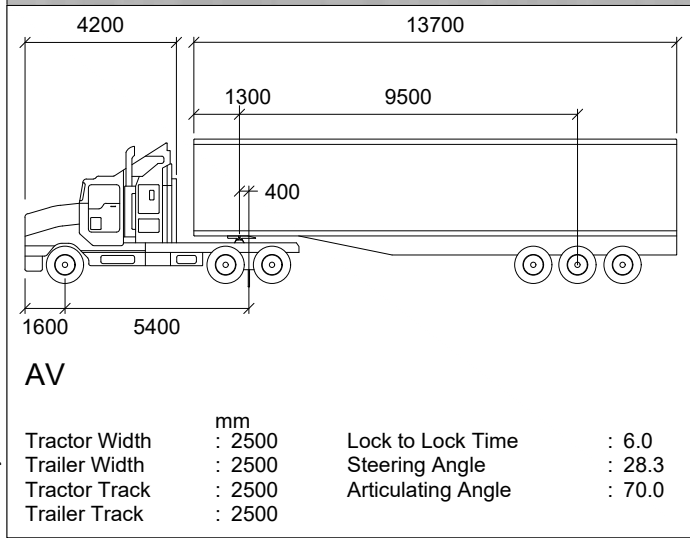
- 1: Design speed of 110km/h.
- 2: Lane widths of 3.6m have been used.
- 3: Taper length (rounded up) calculates to 12.5m.
- 4: Formation/carriageway widening is 0.8m (3.8m used for calculation).
- 5: Minimum length of parallel widened shoulder used from Table 8.1 is 35m

REV	DATE	DRN	CHK	DESCRIPTION
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**Avonlie Solar Farm - Access Design**  
**Sturt Highway / Sandigo Road Intersection**  
**Proposed Intersection Layout Plan**

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DATE: 16/03/18	STATUS: ---	
SCALE: 1:750 @ A3		
DWG NO: 15327-0S1A		





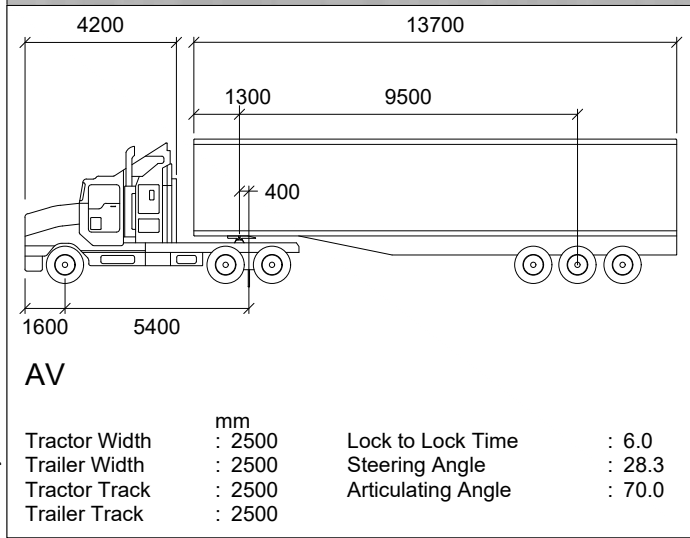
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**Avonlie Solar Farm - Access Design**  
**Sturt Highway / Sandigo Road Intersection**  
**Swept Path Assessment - AV Right Turn In / Left Turn Out**

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DWG NO:15327-0S1A		





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**Avonlie Solar Farm - Access Design**  
**Sturt Highway / Sandigo Road Intersection**  
**Swept Path Assessment - AV Left Turn In / Right Turn Out**

DRAWN: TJG	---	---
DATE: 16/03/18	STATUS: ---	
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DWG NO: 15327-0S1A		





## **Appendix D**

### **Sandigo Road / Muntz Road Intersection Design**



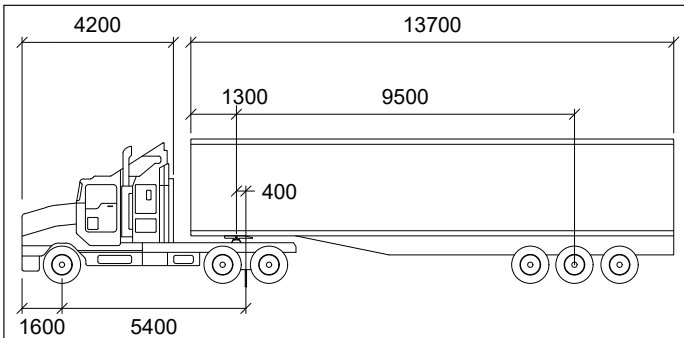
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REV	DATE	DRN	CHK	DESCRIPTION
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**Avonlie Solar Farm - Access Design**  
**Sandigo Road / Muntz Road Intersection**  
**Proposed Intersection Layout Plan**

DRAWN: TJG	---	---
DATE: 16/03/18	STATUS: ---	
SCALE: 1:750 @ A3		
DWG NO:15327-0S1A		





**AV**

Tractor Width	: 2500	Lock to Lock Time	: 6.0
Trailer Width	: 2500	Steering Angle	: 28.3
Tractor Track	: 2500	Articulating Angle	: 70.0
Trailer Track	: 2500		



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REV	DATE	DRN	CHK	DESCRIPTION
00	16/03/18	TJG		

**Avonlie Solar Farm - Access Design**  
 Sturt Highway / Sandigo Road Intersection  
 Swept Path Assessment - AV Left Turn Out / Right Turn In

DRAWN: TJG	---	---
DATE: 16/03/18	STATUS: ---	
SCALE: 1:500 @ A3		
DWG NO: 15327-0S1A		

