Appendix I Traffic Impact Assessment

Amber

Traffic & Transportation Direction

Forest Glen Solar Farm

Traffic Impact Assessment

July 2021

Reference: 126 rep 210715 final

Forest Glen Solar Farm

Traffic Impact Assessment

Prepared for: X-Elio

Status: Final report

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1. Executive Summary

Amber Organisation Pty Ltd has been engaged by NGH Consulting Pty Ltd on behalf of X-Elio to conduct a review of the traffic implications of the Forest Glen Solar Farm and prepare a Traffic Impact Assessment.

The solar farm is proposed to have a capacity of 110MW, including an energy storage system of up to 25MWh. The site is located approximately 16km west of Dubbo and has an area of approximately 789ha. Access to the site will be provided via Delroy Road and Minore Road, which connects to the state road network via Newell Highway. Up to 200 staff are expected on-site during peak construction which will primarily be located in Dubbo, and all plant is expected to be delivered from Sydney.

Traffic generated by the solar farm can be separated into three distinct stages; construction, operation and decommissioning. The peak traffic generating potential for the solar farm is during construction which generates trips associated with staff accessing the site and the delivery of raw materials and plant. During operation the solar farm is expected to generate a minimal amount of traffic with only a small number of maintenance staff accessing the site each day. Decommission of the solar farm is anticipated to generate a similar level of traffic to the construction stage.

The solar farm construction is expected to take approximately 12 to 18 months, with the peak construction period expected to take 3 months. It is anticipated that during peak construction the site could generate up to 68 heavy and 89 light vehicle movements per day. The site is expected to generate approximately 72 vehicle movements in the peak hour during peak construction periods.

In order to determine the traffic impact generated during the construction of the solar farm an analysis of the operation of the intersection of Newell Highway with Minore Road was carried out using the SIDRA computer modelling program. Overall, the construction traffic is expected to have a minimal impact on the operation of the intersection. Accordingly, it is concluded that the road network is able to accommodate the traffic generated by the development during the construction period.

All vehicles accessing the site will utilise Minore Road and Delroy Road which both accommodate simultaneous two-way vehicle movement. Minore Road has a sealed surface whilst Delroy Road has an unsealed surface. In order to accommodate the construction traffic Delroy Road is proposed to be widened to ensure a minimum carriageway width of 6.5 metres is provided to allow simultaneous two-way vehicle movement. In addition, it is recommended a road dilapidation survey of the relevant sections of the existing road network is undertaken prior and post construction to ensure the road is monitored and maintained to continue to provides safe use by all road users.

The intersection of Minore Road and Delroy Road is currently in poor condition. It is recommended that the intersection be provided with some minor upgrades to formalise the intersection to ensure vehicle movements are undertaken in a safe manner and to accommodate the increase in traffic generated by the solar farm. A design for the intersection has been provided within the following assessment based on a B-Double design vehicle.

In order to mitigate the impacts of the development during construction a CTMP will be prepared which should include the recommendations provided within this document. Subject to the adoption of the recommendations of the following assessment, it is concluded that the proposed access arrangements for the solar farm are suitable to accommodate the expected construction vehicle types and traffic volumes during the construction, operation and decommissioning phase of the project.

2. Background

2.1 Background

Amber Organisation Pty Ltd has been engaged by NGH Consulting Pty Ltd on behalf of X-Elio to conduct a review of the traffic implications of the Forest Glen Solar Farm and prepare a Traffic Impact Assessment.

The solar farm is proposed to have a capacity of 110MW, including an energy storage system of up to 25MWh. The site is located approximately 16km west of Dubbo and has an area of approximately 789ha. Access to the site will be provided via Delroy Road and Minore Road, which connects to the state road network via Newell Highway. Staff will primarily be located in Dubbo with all plant expected to be delivered from Sydney.

Figure 1 shows the proposed layout for the site in relation to the road network and the access locations.

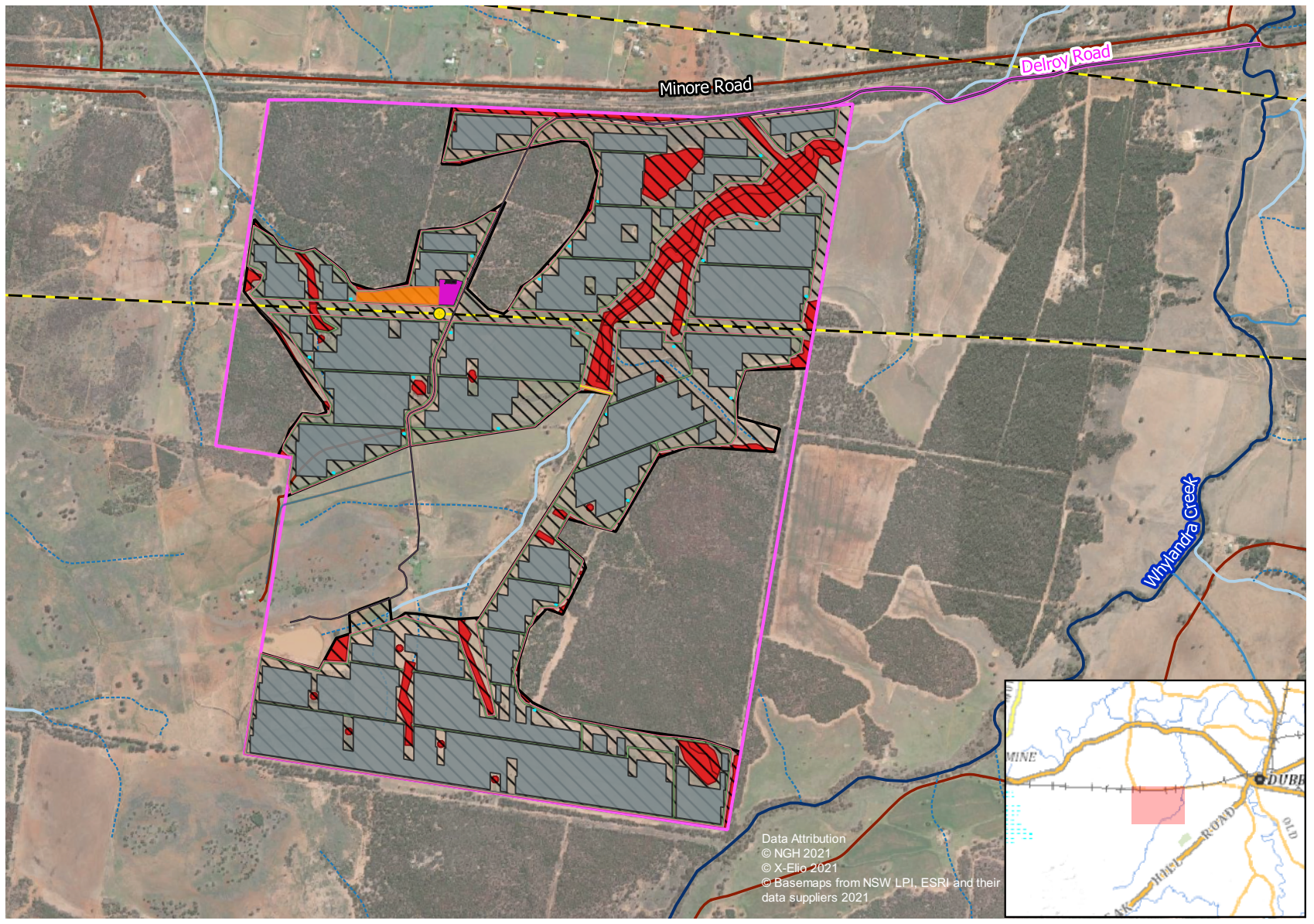
2.2 Environmental Assessment Requirements

NSW Department of Planning & Environment issued Secretary's Environmental Assessment Requirements (SEARs) for the project. The required traffic and transport matters include the following:

- *An assessment of the construction, operational and decommissioning traffic impacts of the development;*
- *An assessment of the peak and average traffic generation, including over dimensional vehicles and construction worker transportation;*
- *An assessment of the likely transport impacts to the site access route (including Mitchell Highway, Newell Highway, Minore Road, Delroy Road and the adjacent Main Western Line rail corridor), site access point, any Crown land, particularly in relation to the capacity and condition of the roads, road safety and intersection performance and impacts to the rail corridor;*
- *A cumulative impact assessment of traffic from nearby developments;*
- *Provide details of measures to mitigate and / or manage potential impacts including a schedule of all required road upgrades (including resulting from heavy vehicle and over mass / over dimensional traffic haulage routes), road maintenance contributions, and any other traffic control measures, developed in consultation with the relevant road and rail authorities.*

2.3 Purpose of Document

This Traffic Impact Assessment has been prepared to assess the construction, operational and decommissioning traffic impacts, and the access arrangements of the solar farm. The assessment responds to the Secretary's Environmental Assessment Requirements and details how road impacts of the project traffic, particularly from heavy vehicle use, will be avoided or managed using road-use management strategies.



Forest Glen Solar Farm
TIA Figure 1 Forest Glen
Indicative Infrastructure Layout

Legend

- Proposal srea
- Development footprint
- Exclusion zones
- 132kV transmission line
- Public roads

Waterways

- 1
- 2
- 3
- 4

Indicative Infrastructure Layout

- Indicative Point of Grid Connection
- Array Area
- BESS
- PCU
- Substation
- O&M Building
- Fences

Site Roads and Crossings

- Existing Access Track (Delroy Road)
- Creek Crossing
- Road Relocation for Adjacent Landowner Access
- Perimeter Roads

Ref: 20-492 Forest Glen 14012021 \ TIA Figure 1 Forest Glen Indicative Infrastructure Layout
Author: kyle.m
Date created: 16.09.2021
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH

More specifically, the report addresses the following key matters:

- Details of both light and heavy vehicle traffic volumes and proposed transport routes;
- An assessment of the potential traffic impacts of the project on road network function and safety;
- An assessment of the capacity of the existing road network to accommodate the type and volume of traffic generated by the project;
- Details of measures to mitigate and / or manage potential impacts, including construction traffic control, road dilapidation surveys and measures to control soil erosion and dust generated by traffic volumes; and
- Details of access roads and how these connect to the existing road network and ongoing operational maintenance.

The traffic assessment has been undertaken in conjunction with consultation with Transport for NSW and Dubbo Regional Council.

3. Existing Conditions

3.1 Site Location

The Forest Glen Solar Farm is proposed to be located at Lot 6 DP 755102 and Lot 1 DP1198911, which is situated 16km west of Dubbo and has an area of approximately 789ha. The site is currently occupied by one dwelling within the southern portion of the site, with access provided via an existing connection with Delroy Road.

The site and the surrounding area are zoned RU1 Primary Production and are predominantly agricultural land use.

The Main Western Railway line is located north of the proposal site. However, the access route for the project does not cross the railway line.

3.2 Road Network

Vehicles accessing the site are expected to primarily use Golden Highway, and to a lesser extent Mitchell Highway, which both connect with Newell Highway within Dubbo. Vehicles will then use the local road network via Minore Road and Delroy Road to access the site.

Golden Highway, Mitchell Highway and Newell Highway are State Roads under the care and management of Transport for New South Wales (TfNSW), and are described below:

- **Golden Highway** is located in the Hunter and Orana regions and runs in an eastbound direction from Newell Highway in Dubbo towards Newcastle where it connects with New England Highway. Within the Dubbo LGA it typically has a sealed width of approximately 9.0 metres accommodating one lane of traffic in each direction, and has a speed limit of 100km/hr.
- **Mitchell Highway** extends northwest from its connection with Great Western Highway and Mid-Western Highway in Bathurst. The road runs through Dubbo and continues to the Queensland border. Within the Dubbo LGA it typically has a sealed width of approximately 9.0 metres accommodating one lane of traffic in each direction, and has a speed limit of 110km/hr.
- **Newell Highway** generally runs in a north-south alignment from West Wyalong to Tocumwal. Within the vicinity of the site, it accommodates one lane of traffic in each direction and has a sealed width of approximately 10.0 metres. It also has a posted speed limit of 60km/hr within Dubbo.

Minore Road is a municipal local road that extends west from Newell Highway to its connection with Narromine Street. It has a sealed carriageway width of approximately 12.0 metres within Dubbo which narrows to 7.0 metres towards the site. It accommodates one lane of traffic in each direction and has a speed limit of 80km/hr west of the urban area.

Delroy Road is also a local road that extends west from Minore Road for 3.6km to its connection with the site access. It has an unsealed carriageway width of approximately 5.5 metres and accommodates two-way vehicle access.

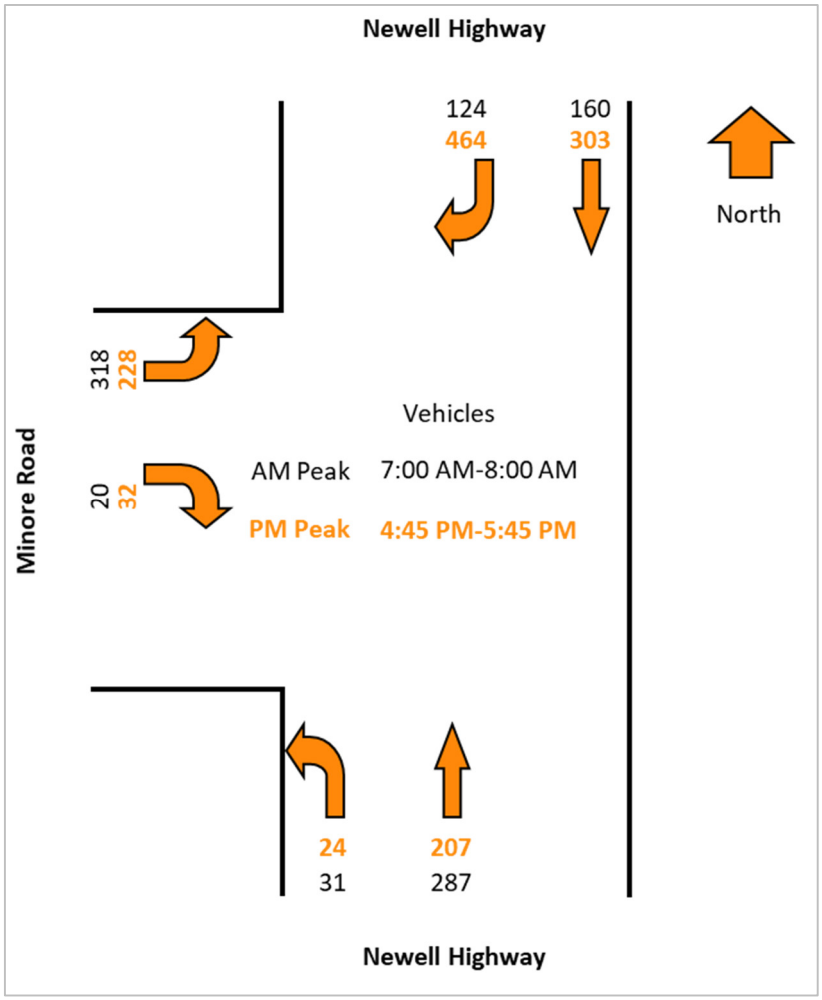
The intersection of Newell Highway with Minore Road is priority controlled with a Give Way sign provided for vehicles exiting Minore Road. Turning movements from Newell Highway are

supported by a right turn lane and vehicles turning left are provided with basic left turn treatment. The intersection of Minore Road and Delroy Road is priority controlled.

3.3 Traffic Volumes

Amber commissioned a turning movement count survey at the intersection of Newell Highway and Minore Road in order to determine the existing traffic conditions at the intersection. The survey was undertaken on Tuesday 8 December 2020 from 6:00am to 8:00am and from 4:30pm to 6:30pm. The peak hour survey results are illustrated below in Figure 2.

Figure 2: Turning Movement Count Peak Hour Survey Results



The survey results indicate the morning peak hour occurred from 7:00am and the afternoon peak occurred from 4:45pm. The intersection accommodates a total of 940 and 1,258 vehicles per hour during the morning and evening peak hours, respectively.

Traffic volume data for Newell Highway was obtained from the TfNSW traffic volume viewer. The closest available data was located 370 metres east of Yuille Court, where the 2009 data recorded an average daily traffic count of 5,178 vehicles per day (vpd). The traffic count data also indicates that 19% of all traffic are heavy vehicles. Applying a growth rate of 1.5% to the 2009 data suggests Newell Highway currently accommodates in the order of 6,099vpd.

Traffic count data for Minore Road has been provided by Dubbo Regional Council and is outlined below:

- Minore Road west of St Andrews Drive (February 2016): 2,825vpd - 1% heavy vehicles;
- Minore Road west of Champagne Drive (February 2016): 950vpd;
- Minore Road east of St Andrews Drive (September 2007): 3,300vpd;

Council has suggested a growth rate of 1.0-1.5% for Minore Road. Therefore, Minore Road is estimated to currently accommodate approximately 4,184vpd.

Given Delroy Road services 7 residential property it is estimated that it currently accommodates in the order of 70 vehicle movements per day.

3.4 Public Transport Services

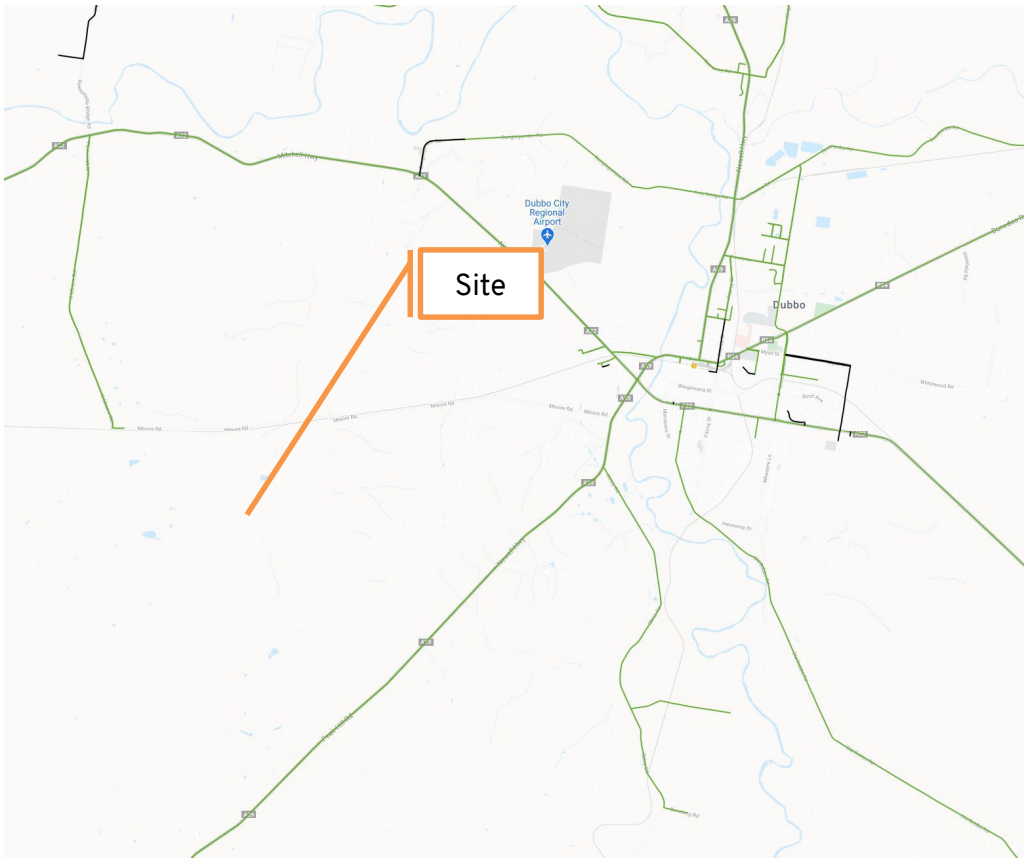
School bus services are operated within the vicinity of the site and are summarised below:

- Dubbo Bus Lines operate along Minore Road between Newell Highway and Champagne Drive; and
- Ogden's Coaches operate along Minore Road with buses expected along the section used by the project between 7:40am-8:00am and 4:10pm-4:30pm.

3.5 Restricted Vehicle Access

The state road network within the vicinity of the site is rated to accommodate B-Double movements which is illustrated within Figure 3. The green lines indicate B-Double routes while the black lines represent approved routes with travel conditions.

Figure 3: TfNSW Restricted Access Vehicle Map



4. Traffic Assessment

4.1 Traffic Generation

4.1.1 Construction

The solar farm construction is expected to take approximately 12 to 18 months, with the peak construction period expected to take 3 months. Construction activities would be undertaken during standard daytime construction hours, as follows:

- Monday to Friday: 7am – 6pm
- Saturday: 8am – 1pm
- No work on Sundays or public holidays.

Any construction outside of these normal working hours would only be undertaken with prior approval from relevant authorities.

A maximum of 200 staff will be on-site during peak construction periods. It is understood that shuttle buses will be provided that can accommodate the majority of staff, with the remaining staff to access the site using private vehicles.

Approximately 34 trucks will access the site per day during peak 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 be used to transport larger plant such as the PV panels.

It is also noted that Restricted Access Vehicle / Oversized Vehicles will also be required for the delivery of larger plant to the site such as the sub-station transformer.

It is anticipated that during peak construction the site could generate up to 68 heavy and 89 light vehicle movements per day. Table 1 summarises the traffic movements generated during the construction period of the solar farm.

Table 1: Traffic Generation During Peak Construction Periods

Vehicle Type	Average Vehicle Movements per Day		Peak Vehicle Movements per Day	
	Daily (vpd)	Peak Hour (vph)	Daily (vpd)	Peak Hour (vph)
Light Vehicle (car / 4WD)	30	5	80	50
Shuttle Bus	48	8	9	5
MRV/HRV	18	3	20	5
AV	18	3	24	6
B-Double	18	3	24	6
Total	**132**	**22**	**157**	**72**

Accordingly, the site is expected to generate approximately 72 vehicle movements in the peak hour during peak construction periods.

4.1.2 Operational Traffic

During operation the solar farm is expected to generate a minimal level of traffic associated with maintenance and operation services. The solar farm is expected to generate up to 8 vehicle movements per day which would result in a negligible change to the traffic environment.

4.1.3 Decommissioning Traffic

At the end of the operational life of the project all above ground infrastructure will be dismantled and removed from the project site. Internal roads, if not required for ongoing farming purposes or fire access, would be removed and the site reinstated as close as possible to its original state.

Traffic generation during decommissioning would be similar to traffic generation during the average construction period. A comprehensive Construction Traffic Management Plan would be prepared prior to the decommissioning phase in conjunction with the relevant road authorities. This would aim to ensure adequate road safety and road network operations are maintained.

4.2 Traffic Distribution

Traffic accessing the site will do so via Newell Highway and then Minore Road, before entering the site via Delroy Road. The following provides a breakdown of the access distribution for each of the vehicle classifications outlined within Table 1:

- Light Vehicles: It is anticipated that most staff will be local within Dubbo, with all staff travelling to/from the north.
- Shuttle Bus: It has been assumed that all shuttle buses will travel to/from the north.
- MRV/HRV: These vehicles will predominantly be water trucks and vehicles transporting materials such as concrete and fencing supplies which will be sourced within the surrounding area. The Applicant has advised that the majority of movements will be to/from the north.
- AV/B-Double: Plant will be transported via Sydney and will utilise Golden Highway to access Newell Highway, then Minore Road.

Accordingly, the majority of vehicle movements are expected to access the site via Newell Highway from the north. However, it is noted that there may be the occasional vehicle that accesses the site from the south.

The peak hour for the solar farm will occur at the start and end of the day when staff are transported to/from the site. During the morning peak all vehicle movements will be towards the site and in the evening peak all vehicle movements will be away from the site. Heavy vehicle movements will be distributed throughout the day and will be split evenly between inbound and outbound movements.

4.3 Traffic Assessment

In order to determine the traffic impact generated during the construction of the solar farm an analysis of the operation of the intersection of Newell Highway with Minore Road was carried out using the SIDRA computer modelling program. The concepts of intersection capacity and level of service, as defined in the guidelines published by the RTA (2002), are discussed in Appendix A

together with criteria for their assessment. The assessment of the level of service for sign-controlled intersections is based on the average delay (seconds/vehicle) of the critical movement.

The turning movement count surveys which have previously been discussed in Section 2.3 have been used to determine the existing operating conditions at the intersection. The assessment has been undertaken for the peak hour for construction traffic which is expected to occur between 6:00am and 7:00am when staff arrive on-site and from 5:30pm to 6:30pm when staff depart the site.

The traffic volumes used for the assessment are provided within Appendix B and the results of the analysis summarised below.

Table 2: SIDRA Analysis Results Summary – AM Peak

Movement		Existing Conditions			Peak Construction Conditions		
		Average Delay (sec)	95% Queue (m)	Level of Service	Average Delay (sec)	95% Queue (m)	Level of Service
Newell Highway Northern Leg	Through	0.0	0.0	A	0.0	0.0	A
	Right Turn	6.2	2.5	A	6.3	4.5	A
Minore Road	Right	9.4	0.2	A	10.2	1.7	B
	Left	5.9	0.7	A	5.9	5.0	A
Newell Highway Southern Leg	Through	0.0	0.0	A	0.0	0.0	A
	Left	5.6	0.0	A	5.6	0.0	A

The SIDRA analysis for the AM peak indicates the following:

- The right turn lane from Newell Highway has sufficient length to continue to accommodate the queue length generated during the morning peak hour;
- The delay at the intersection increases from 3.3 seconds to 3.7; and
- The intersection is expected to continue to operate with a good level of service.

Table 3: SIDRA Analysis Results Summary – PM Peak

Movement		Existing Conditions			Peak Construction Conditions		
		Average Delay (sec)	95% Queue (m)	Level of Service	Average Delay (sec)	95% Queue (m)	Level of Service
Newell Highway Northern Leg	Through	0.0	0.0	A	0.0	0.0	A
	Right Turn	7.0	12.4	A	7.0	12.4	A
Minore Road	Right	16.8	2.1	C	16.9	2.4	C
	Left	6.0	6.2	A	6.1	8.4	A
Newell Highway Southern Leg	Through	0.0	0.0	A	0.0	0.0	A
	Left	5.6	0.0	A	5.6	0.0	A

The SIDRA analysis for the PM peak indicates the following:

- The right turn lane from Newell Highway has sufficient length to continue to accommodate the queue length generated during the morning peak hour;

- The delay at the intersection increases from 4.2 seconds to 4.3;
- The right turn lane from Minore Road experiences a Level of Service C during both the existing and future conditions, with the delay expected to increase by only 0.1 seconds; and
- The intersection is generally expected to continue to operate with a good level of service.

Outside of the morning and evening peak hour of the solar farm the traffic generation is expected to be minimal (less than 5 vehicles per hour) and would be well within the typical daily variation in traffic at the intersection. As such, the construction traffic can readily be accommodated on the road network at these times.

Overall, the construction traffic is expected to have a minimal impact on the operation of the intersection. Accordingly, it is concluded that the road network is able to accommodate the traffic generated by the development during the construction period.

4.4 Cumulative Impacts

It is noted that the following major projects are located in the surrounding area:

- Wellington North Solar Farm – Determination
- Suntop Solar Farm Stage 2 – Prepare EIS
- Uungula Wind Farm – Determination
- Maryvale Solar Farm – Determination
- Dunedoo Solar Farm – Determination
- Gilgandra Solar Farm – Determination
- Dubbo Quarry Continuation Project – Assessment
- Mumbil Solar Farm – Prepare EIS
- Bunrrendong Wind Farm – Prepare EIS

The surrounding major projects have the potential to generate a number of staff vehicle movements during the peak periods associated with construction, and a number of staff for the projects are expected to be located in Dubbo. The traffic associated with the projects will be spread on the surrounding road network and will be utilise Newell Highway, Mitchell Highway, and Golden Highway.

The traffic assessment provided within this report demonstrates that the local road network is expected to continue to operate with a good level of service with ample spare capacity. As such, the combined increase in traffic generated by the site and these projects is expected to have a minimal cumulative impact on the road network. Further, it is noted that the peak traffic generated by these projects during construction occurs before 7am and after 6pm which is outside of the peak times of the road network.

It is recommended that any delivery of large plant be coordinated with the other solar and wind farm projects to ensure the vehicle movements do not conflict.

Appendix I Traffic Impact Assessment

5. Route Assessment

5.1 Access Route

Sydney has been identified as the location where the solar farm plant will be imported. The proposed construction traffic access route from Sydney to the site is proposed to be via Castlereagh Highway, Golden Highway and Newell Highway. The state roads are designated for B-Double vehicles as outlined within the TfNSW Restricted Access Vehicle Map provided within Figure 2. Accordingly, the access route is able to accommodate the loads and type of vehicle movement to be generated during construction of the solar farm.

It is also noted that some oversize and overmass vehicles will be required to deliver larger plant to the site such as the sub-station transformer. The vehicles are subject to specific road permits that will be applied for by the contractor once the dimensions of the load and the specific delivery vehicle are known.

5.2 Local Road Network

All vehicles accessing the site will utilise Minore Road and Delroy Road which both accommodate simultaneous two-way vehicle movement. Minore Road has a sealed surface whilst Delroy Road has an unsealed surface. It is noted that both roads are not classified within the TfNSW Restricted Access Vehicle Map and as such, approval of the use of the roads by larger vehicles is required as part of any future Construction Traffic Management Plan.

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.

Delroy Road is estimated to currently accommodate 10 vehicle movements per day. The traffic volumes along Delroy Road would increase to 167 vehicle movements per day during peak construction periods and 142 vehicle movements per day during typical construction periods. Therefore, the traffic volumes along Delroy Road would be less than the recommended loading for gravel roads during peak construction periods.

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 is proposed to 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;
- Delroy Road be widened to ensure a minimum carriageway width of 6.5 metres is provided to allow simultaneous two-way vehicle movement;

- Dwellings are located adjacent to Delroy Road along the access route. It is recommended that dust suppression measures be implemented within the vicinity of the dwelling to limit the impact to residents; and
- Neighbours of the solar farm be consulted and notified regarding the timing of major deliveries which may require additional traffic control and disrupt access.

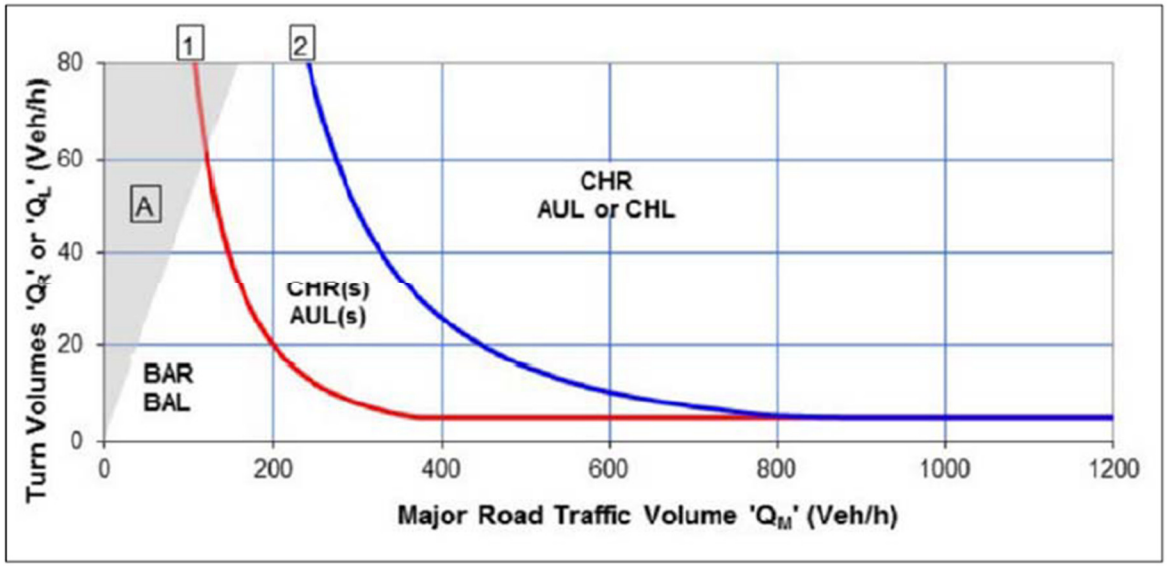
Given the expected traffic along Delroy Road during construction, it is concluded that the surface of the road is suitable to accommodate the future traffic volumes. Further, it is concluded that Minore Road and Delroy Road are suitable to accommodate the traffic generated by the solar farm.

6. Intersection Assessment

6.1 Newell Highway / Minore Road

Austroads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings specifies the turning treatments required at intersections. Figure 2.26 of the guide specifies the required turn treatments on the major road at unsignalised intersections, and is provided below in Figure 3 for a design speed of less than 70km/hr.

Figure 4: Figure 2.26 of Austroads Guide to Traffic Management Part 6



The peak hour turning volumes will predominantly be generated by staff accessing the site in the morning which occurs from 6:00am to 7:00am. Table 4 identifies the required turning treatments based on the expected traffic volumes at the intersection outlined within Appendix B.

Table 4: Turning Volumes for Turn Treatment Calculations

Turning Treatment	Traffic Volume (vph)		Requirement
	Turn Volume	Major Road	
Right Turn	102	322	CHR
Left Turn	8	135	BAL

The intersection is already provided with an Channelised Right Turn Lane (CHR) and a Basic Left Turn (BAL) turn treatment. Therefore, the existing turn facilities meet the requirements of the Austroads Guideline. Accordingly, the intersection of Newell Highway and Minore Road is expected to be able to accommodate the traffic generated by the solar farm in a safe manner.

6.2 Minore Road / Delroy Road

The intersection of Minore Road and Delroy Road is currently in poor condition. It is recommended that the intersection be provided with some minor upgrades to formalise the intersection to ensure vehicle movements are undertaken in a safe manner and to accommodate the increase in traffic generated by the solar farm. The proposed upgrades are shown within Appendix C and includes:

- Provide a minimum carriageway width of 6.5 metres for Delroy Road;
- Sealing the first part of Delroy Road to allow vehicles to safely exit Minore Road;
- Providing Give Way signage and linemarking for vehicles exiting Delroy Road.

A swept path assessment has been undertaken for the Minore Road / Delroy Road intersection using the AutoTurn software package which is presented in Appendix D. The swept path assessment has been based on a B-Double which represents the worst-case vehicle expected to access the site (excluding OSOM vehicles) and demonstrates simultaneous two-way movement is provided at the intersection.

Accordingly, the intersection of Minore Road and Delroy Road is expected to be able to readily accommodate the development traffic in a safe manner subject to the adoption of the recommended upgrades.

6.3 Site Access

Access to the site is essentially provided via a continuation of Delroy Road. As such, the site access is able to accommodate the expected vehicles generated by the solar farm and no upgrades are required to the access.

7. Construction Management Plan

A Construction Traffic Management Plan (CTMP) will be prepared prior to construction commencing by the appointed contractor. The CTMP will provide additional information regarding the traffic volumes and distribution of construction vehicles that is not available at this time, including:

- Road transport volumes, distribution and vehicle types broken down into:
  - Hours and days of construction.
  - Schedule for phasing/staging of the project.
- The origin, destination and routes for:
  - Employee and contractor light traffic.
  - Heavy vehicle traffic.
  - Oversize and overmass traffic.

The following provides recommended measures that should be adopted within the CTMP to minimise the impact of construction traffic along the road network:

- Neighbours of the solar farm be consulted and notified regarding the timing of major deliveries which may require additional traffic control and disrupt access.
- Loading and unloading is proposed to occur within the work area. No street or roads will be used for material storage at any time.
- Delivery of larger plant to occur outside of school bus service times and peak traffic times to prevent larger vehicles interacting with the school bus and congestion issues.
- All vehicles will enter and exit the site in a forward direction.
- Management of vehicular access to and from the site is essential in order to maintain the safety of the general public as well as the labour force. The following code is to be implemented as a measure to maintain safety within the site:
  - Utilisation of only the designated transport routes.
  - Construction vehicle movements are to abide by finalised schedules as agreed by the relevant authorities.
- Implementation of a proactive erosion and sediment control plan for on-site roads, hardstands and laydown areas.
- All permits for working within the road reserve must be received from the relevant authority prior to works commencing.
- A map of the primary haulage routes highlighting critical locations.
- An induction process for vehicle operators and regular toolbox meetings.
- A complaint resolution and disciplinary procedure.
- Local climatic conditions that may impact road safety of employees throughout all project phases (e.g. fog, wet and significant dry, dusty weather).

The above recommendations will ensure the construction traffic will create a minimal impact to the capacity and safety of the surrounding road network.

8. Conclusion

Amber has assessed the traffic impacts of the solar farm located approximately 16km west of Dubbo, New South Wales. Access to the site will be provided via Delroy Road and Minore Road, which connects to the state road network via Newell Highway. Staff will primarily be located in Dubbo with all plant expected to be delivered from Sydney.The above assessment determined the following:

- The site will generate up to 157 vehicle movements per day during peak construction times, including 68 truck movements;
- The road network is able to accommodate the traffic generated by the development during the construction, operation and decommissioning stages. Further, the cumulative impact of the site traffic with nearby developments is expected to be minimal;
- The traffic volumes along Delroy Road during peak construction are expected to be less than the recommended loading for gravel roads and as such, the road is proposed to remain unsealed, with regular dilapidation surveys required to ensure it continues to operate in a suitable manner;
- The design provided within Appendix C for the intersection of Delroy Road and Minore Road will ensure the intersection will operate in a safe manner; and
- In order to mitigate the impacts of the development during construction a CTMP will be prepared which should include the recommendations provided within this document.

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

Amber Organisation

Appendix A

Guidelines for Assessing Intersection Performance

The *RTA Guide to Traffic Generating Developments* (October 2002, Issue 2.2), details the assessment of intersections. The assessment of the level of service of an intersection is based on the evaluation of the following Measures of Effectiveness:

- Average delay (seconds/veh) (all forms of control)
- Delay to critical movement (seconds/veh) (all forms of control)
- Degree of saturation (traffic signals and roundabouts)
- Cycle length (traffic signals)

SIDRA was used to calculate the relevant intersection parameters. The SIDRA software is an advanced lane-based micro-analytical tool for design and evaluation of individual intersections and networks of intersections including modelling of separate movement classes (light vehicles, heavy vehicles, buses, cyclists, large trucks, light rail / trams and so on). It provides estimates of capacity, level of service and a wide range of performance measures, including; delay, queue length and stops for vehicles and pedestrians, as well as fuel consumption, pollution emissions and operating costs.

It can be used to analyse signalised intersections (fixed-time / pretimed and actuated), signalised and unsignalised pedestrian crossings, roundabouts (unsignalised), roundabouts with metering signals, fully-signalised roundabouts, two-way stop sign and give-way / yield sign control, all-way stop sign control, single point interchanges (signalised), freeway diamond interchanges (signalised, roundabout, sign control), diverging diamond interchanges and other alternative intersections and interchanges. It can also be used for uninterrupted traffic flow conditions and merge analysis.

The best indicator of the level of service at an intersection is the average delay experienced by vehicles at that intersection. For traffic signals, the average delay over all movements should be taken. For roundabouts and priority control intersections (with Stop and Give Way signs or operating under the T-junction rule) the critical movement for level of service assessment should be that with the highest average delay.

With traffic signals, delays per approach tend to be equalised, subject to any over-riding requirements of signal co-ordination as well as to variations within individual movements. With roundabouts and priority - control intersections, the critical criterion for assessment is the movement with the highest delay per vehicle. With this type of control the volume balance might be such that some movements suffer high levels of delay while other movements have minimal delay. An overall average delay for the intersection of 25 seconds might not be satisfactory if the average delay on one movement is 60 seconds.

The average delay for level of service E should be no more than 70 seconds. The accepted maximum practical cycle length for traffic signals under saturated conditions is 120 - 140 seconds. Under these conditions 120 seconds is near maximum for two and three phase intersections and 140 seconds near maximum for more complex phase designs. Drivers and pedestrians expect cycle lengths of these magnitudes and their inherent delays in peak hours. A cycle length of 140 seconds for an intersection which is almost saturated has an average vehicle delay of about 70 seconds, although this can vary. If the average vehicle delay is more than 70 seconds, the intersection is assumed to be at Level of Service F.

Table 5 sets out average delays for different levels of service. There is no consistent correlation between definitions of levels of service for road links as defined elsewhere in this section, and the ranges set out in Table 5. In assigning a level of service, the average delay to the motoring public needs to be considered, keeping in mind the location of the intersection. For example, drivers in

inner urban areas of Sydney have a higher tolerance of delay than drivers in country areas. Table 5 provides a recommended baseline for assessment.

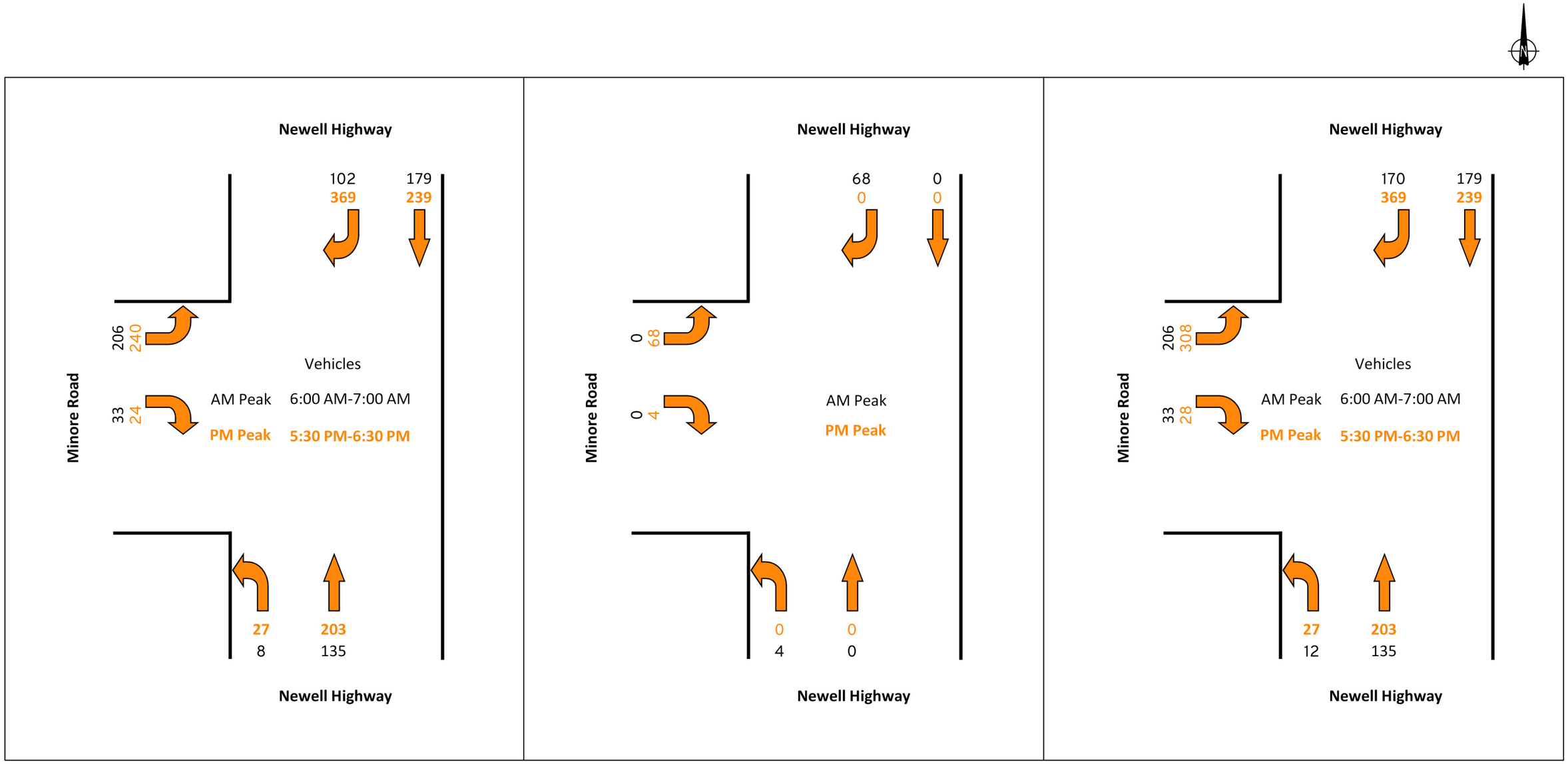
Table 5: Level of Service Criteria for Intersections

Level of Service	Average Delay per Vehicle (sec/veh)	Traffic Signals, Roundabouts	Give Way and Stop Signs
A	Less than 14	Good operation	Good operation
B	15 – 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 – 42	Satisfactory	Satisfactory, but accident study required
D	43 – 56	Operating near capacity	Near capacity and accident study required
E	57 - 70	At capacity Signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, require other control mode

The figures in Table 5 are intended as a guide only. Any particular assessment should take into account site-specific factors including maximum queue lengths (and their effect on lane blocking), the influence of nearby intersections and the sensitivity of the location to delays. In many situations, a comparison of the current and future average delay provides a better appreciation of the impact of a proposal, and not simply the change in the level of service.

Appendix B

Traffic Volumes



Existing Traffic Volumes

Peak Construction Site Traffic

Future Traffic Volumes

Forest Glen Solar Farm

Newell Highway / Minore Road Intersection

Traffic Volumes

DRAWN: MW
DATE: 12/12/2020
SCALE: NTS @ A3
DWG NO: 126-S01A

Amber

B

Appendix C

Intersection Design

Forest Glen Solar Farm

Minore Road / Delroy Road Intersection

Intersection Design

DRAWN: MW
DATE: 16/11/2020
SCALE: 1:300 @ A3
DWG NO: 126-S01A

Amber

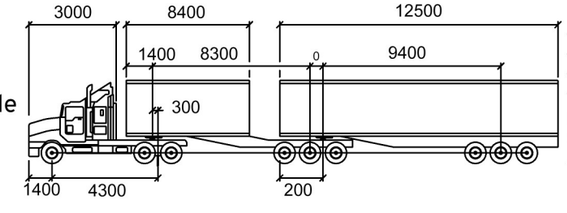
Appendix D

Swept Path Assessment

Vehicle Envelope

300mm Clearance

B-Double



	mm
Tractor Width	: 2500
Trailer Width	: 2500
Tractor Track	: 2500
Trailer Track	: 2500
Lock to Lock	: 6.0s
Steering Angle	: 22.2
Articulating Angle	: 70.0

Forest Glen Solar Farm

Minore Road / Delroy Road Intersection

Swept Path Assessment

DRAWN: MW
DATE: 16/11/2020
SCALE: 1:400 @ A3
DWG NO: 126-S01A

Amber 2