Appendix H

Traffic impact assessment

Hillston Sun Farm

Overland Sun Farming

Hillston Sun Farm

Traffic Impact Assessment

Prepared for OVERLAND Sun Farming Pty Ltd | 29 June 2017

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Hillston Sun Farm

Final

Report J16135RP1 | Prepared for OVERLAND Sun Farming Pty Ltd | 29 June 2017

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1 Introduction

1.1 Overview

OVERLAND Sun Farming Pty Ltd (OVERLAND) proposes to develop the Hillston Sun Farm, a large-scale solar photovoltaic (PV) generation facility and associated infrastructure in the Riverina region of south-western NSW (Figure 1.1) (the project). OVERLAND proposes to develop the project on a site within the Carrathool local government area (LGA), approximately 3.5 kilometres (km) south of the township of Hillston.

The project is a State significant development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). A development application (DA) for the project is required to be submitted under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The NSW Minister for Planning, or the Minister's delegate, is the consent authority.

An environmental impact statement (EIS) is a requirement of the approval process. This Traffic Impact Assessment (TIA) forms part of the EIS. It documents the traffic impact assessment methods and results, the initiatives built into the project design to avoid and minimise associated traffic impacts, and the additional mitigation and management measures proposed to address any residual impacts not able to be avoided.

1.2 Assessment guidelines and requirements

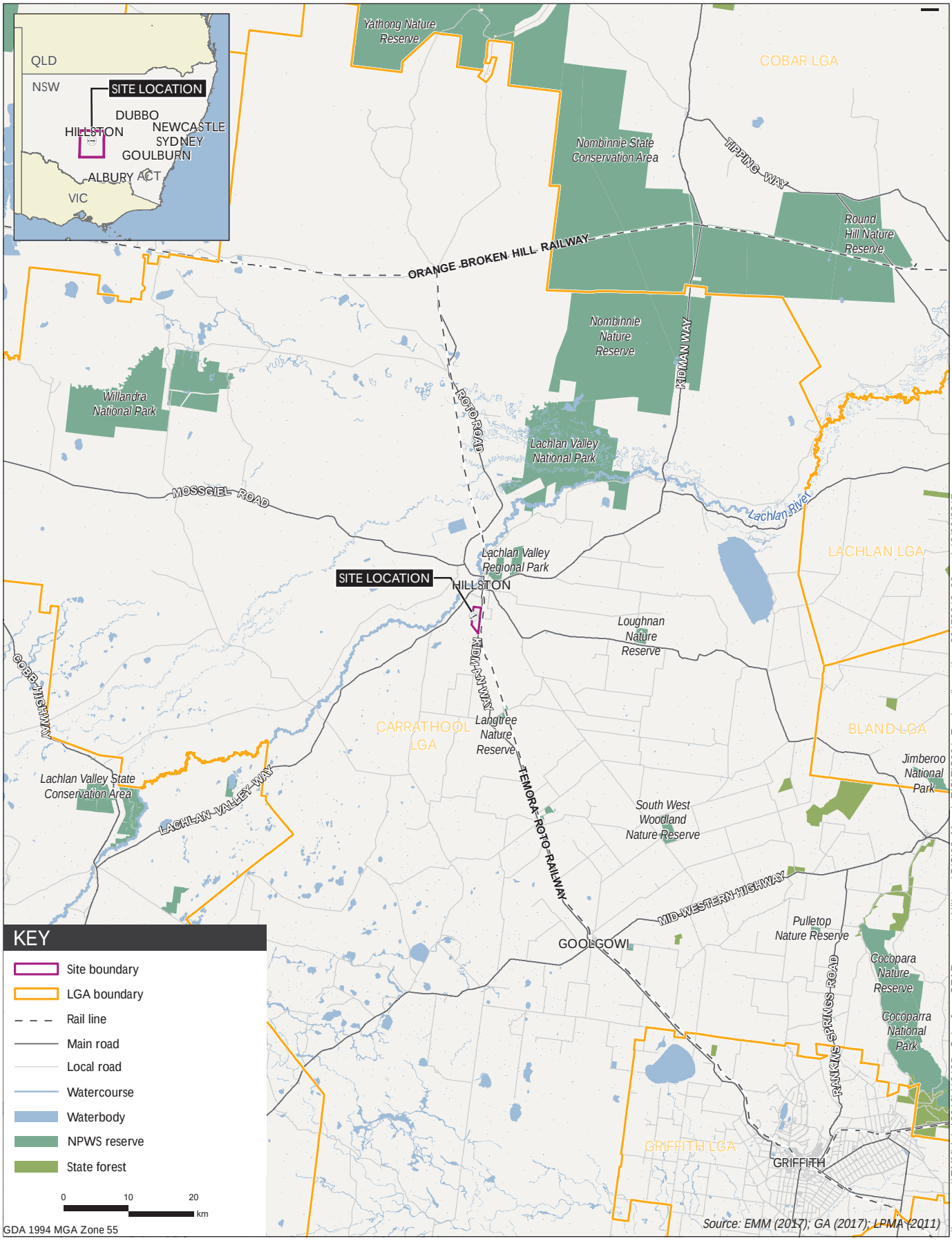
This TIA has been prepared in accordance with the relevant governmental assessment requirements, guidelines and policies, and in consultation with the relevant government agencies.

The assessment is based on the following general scope for matters to consider in a TIA which is defined by the NSW Roads and Maritime Services (RMS) *Guide to Traffic Generating Developments* (RTA 2002):

- the existing locality and surrounding land uses;
- the existing road network and intersections;
- traffic and car parking generation characteristics of the project;
- traffic and car parking impacts of the project; and
- a summary of the assessed traffic impacts and any traffic management or mitigation measures.

The TIA also addresses the requirements of the NSW Department of Planning and Environment (DPE). These were set out in the Secretary's Environmental Assessment Requirements (SEARs) for the project, issued on 14 October 2016.

The SEARs matters must be addressed in the EIS. A copy of the SEARs is attached to the EIS as Appendix A, while Table 1.1 lists the individual requirements relevant to this TIA and where they are addressed in this report.



Regional project location
Hillston Sun Farm
Traffic Impact Assessment
Figure 1.1

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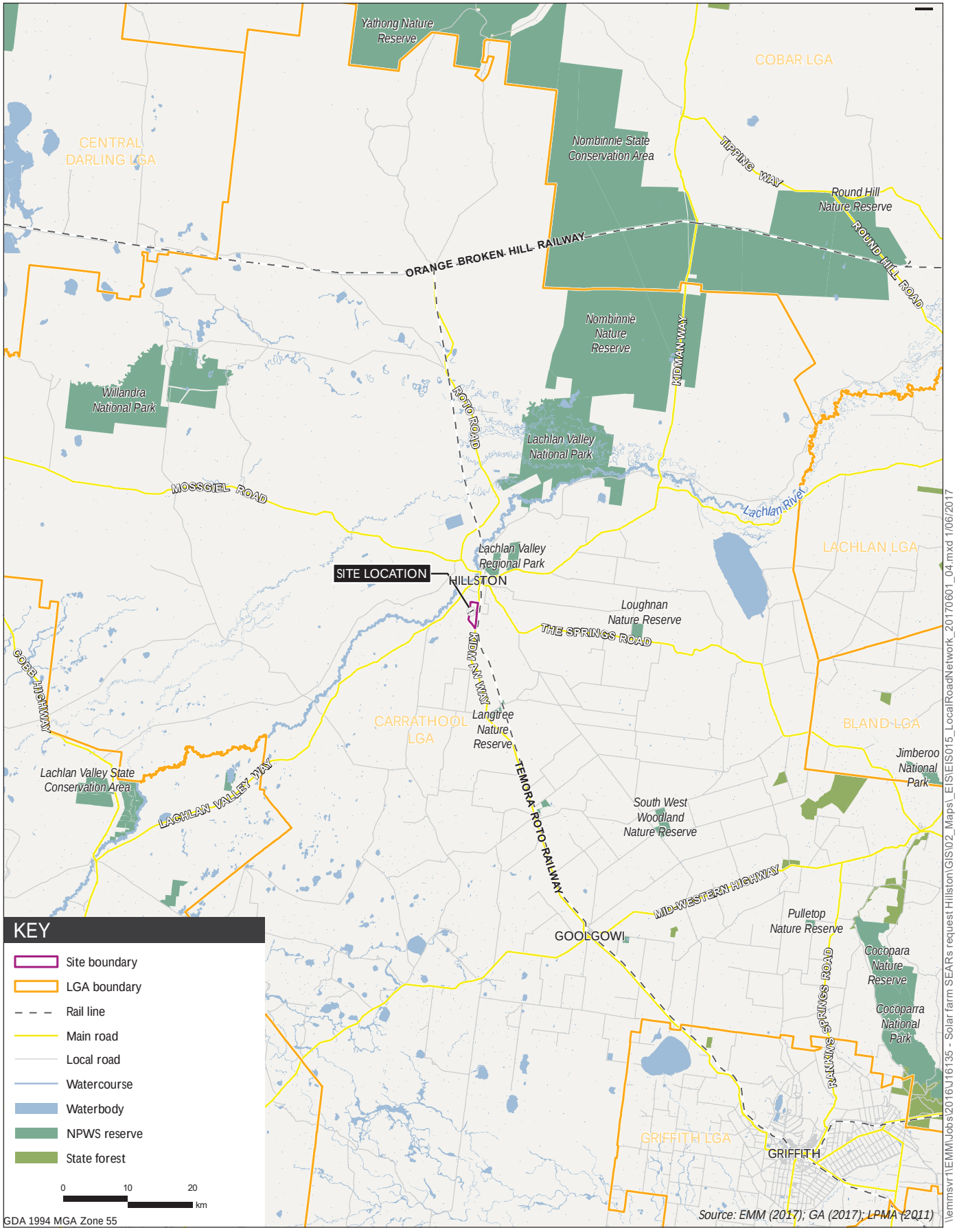
Table 1.1 Relevant matters raised in SEARs

Requirement	Section addressed
Site access routes	Sections 2.3 and 3.4
Site access point	Sections 2.2, 3.1,4.3 and 4.4
Rail safety issues	Not applicable – the project will not affect the rail corridor to the east of Kidman Way
Likely transport impacts of the development on the capacity and condition of roads	Sections 4.1 and 4.2
Measures to be implemented to mitigate impacts during construction	Section 4.5
Description of any proposed road upgrades developed in consultation with the relevant road and rail authorities (if required)	Sections 2.1, 2.4, 4.3 and 4.4

To inform preparation of the SEARs, DPE invited other government agencies to recommend matters to be addressed in the EIS. These matters were taken into account by the Secretary for DP&E when preparing the SEARs. Copies of the RMS advice to DPE were attached to the SEARs and matters relevant to the TIA are listed in Table 1.2.

Table 1.2 Government agency (RMS) traffic impact assessment recommendations

Requirement	Section addressed
Prepare a TIA which assesses the project establishment and decommissioning stages separately to the project operations stage traffic impacts	Section 3.2 and Section 4.1
Assess the transport of materials and equipment/components for the facility and ancillary infrastructure and the movement and parking of construction related vehicles, including personal vehicles, during the construction of the facility	Section 3.2 and Section 3.3
Assess the ongoing traffic generation due to the operation, maintenance and servicing of the various elements of the project	Section 3.2 and Section 4.1
Consider the development of a traffic management plan to manage the traffic during the construction period	Section 4.5
Potential rail corridor crossing issues if the site is developed on the eastern side of the Kidman Way	Not applicable – the project will not affect the rail corridor to the east of Kidman Way
Potential distraction and glare impacts from the facility for traffic using the Kidman Way	Section 4.6



Location of the Hillston Sun Farm

Hillston Sun Farm
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Figure 1.2

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2 Existing traffic conditions

2.1 Road network

The three main transport routes that connect the site and the township of Hillston, within the Carrathool LGA, to a range of other areas throughout NSW and Victoria are:

- Kidman Way (MR 80) – a state funded main road, which connects in a north south direction through the major part of western NSW, from Bourke and Cobar in the north, via Hillston, to Griffith in the south. From Griffith, other major highways connect to the Kidman Way, including the Sturt Highway and other routes through Victoria in the south, crossing the Murray River at Cobram.

- Mid Western Highway (SH 6) – a federally funded highway. It is the main route connecting from the east to the south west of NSW. It diverges from the Great Western Highway at Bathurst and connects to the Sturt Highway at Hay. The route travels west from Bathurst via Blayney, Cowra, Grenfell and West Wyalong to Hay and crosses the Kidman Way at a large roundabout outside the town of Goolgowi (approximately 55 km south of Hillston). Goolgowi is approximately mid way between Hillston and Griffith. At Hay, other routes connect to Victoria in the south, crossing the Murray River at Echuca.

- Lachlan Valley Way – connects from the east to the south west of NSW via Hillston. It diverges from the Mid Western Highway at Cowra, where the route travels west via Forbes and Lake Cargelligo to Hillston. West of Hillston, the route connects towards either Hay or Ivanhoe, via the Cobb Highway. The route combines with the Kidman Way as the main street route through the centre of Hillston.

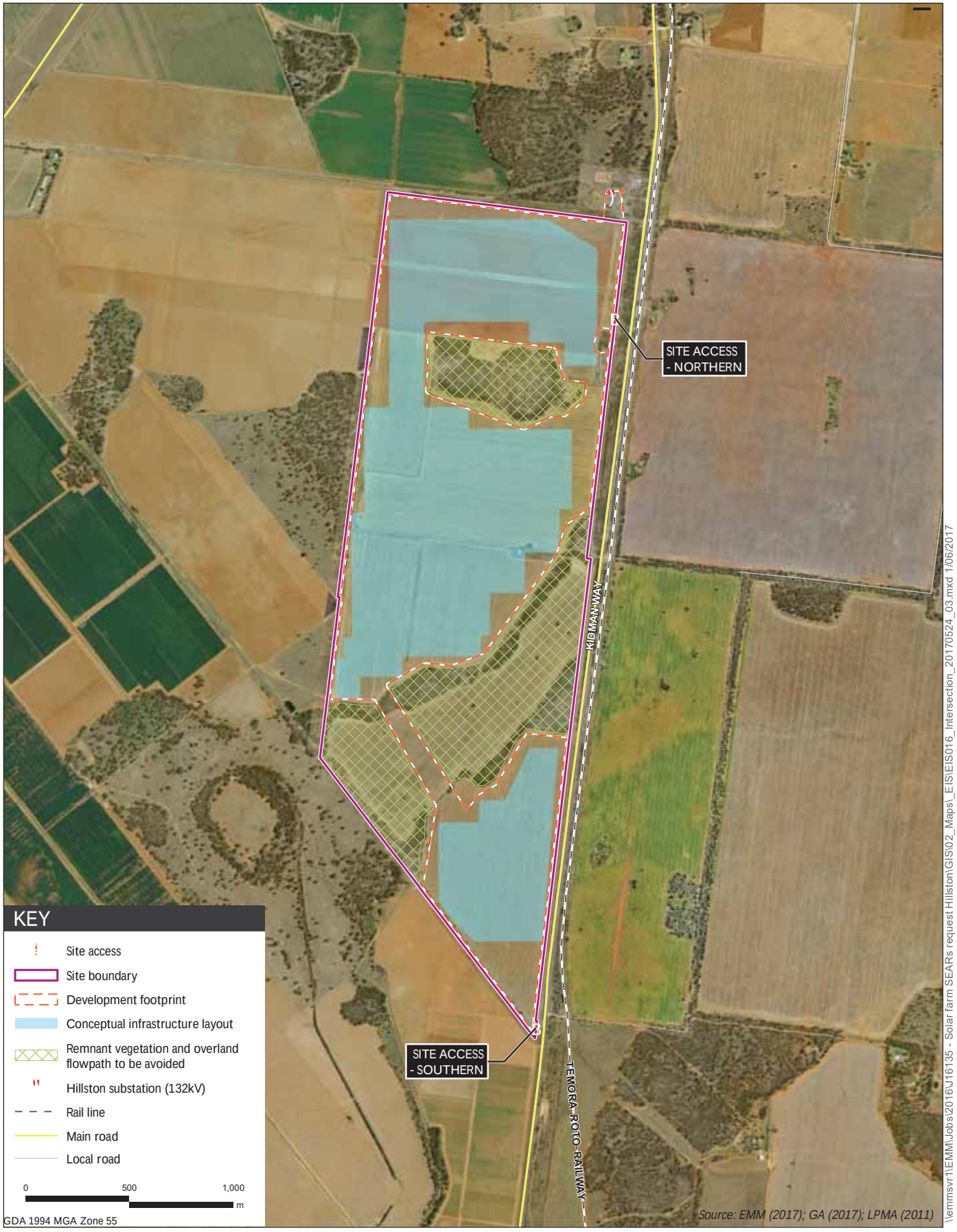
A heavy vehicle bypass route is signposted for trucks travelling north or south through Hillston via either the Kidman Way or Lachlan Valley Way. The bypass route follows the industrial area around the eastern side of the town, so that large trucks do not generally drive through the town centre of Hillston.

The proposed site access will utilise two access road intersections on the western side of the Kidman Way. Two major site access driveways are proposed, one each for the northern and southern parts of the site, which are shown in Figure 2.1. The proposed site access driveways will require some gravel shoulder widening within the road reserves, which will improve the sight distance visibility for turning traffic and facilitate safe turning movements by large trucks on and off the Kidman Way.

The speed limit on Kidman Way is generally 100 km/hr near the site frontage, which commences approximately 3.5 km south of Hillston. Lower speed limits (50 km/hr on most sections) apply to the Kidman Way route through the town centre of Hillston including the heavy vehicle bypass route.

Along Kidman Way, both the centre line and edge lines of the road are generally marked and overtaking is permitted on most rural sections of the road between Hillston and Griffith due to the generally straight and level alignment of the route.

Only the most important intersections on the Kidman Way have additional turning lanes or other traffic capacity or safety improvements. A large four way roundabout has been constructed where the route crosses the Mid Western Highway outside the town of Goolgowi (Figure 2.2). At the major road intersections on the Kidman Way to the north between the site and Hillston, at Smith Road and Rankins Springs Road there are two basic T-intersections with no additional turning lanes.



Proposed intersection locations
Hillston Sun Farm
Traffic Impact Assessment
Figure 2.1

Due to the generally low daily traffic volumes using the Kidman Way (see Section 2.2), the left and right turning traffic movements at intersections rarely conflict with either northbound or southbound through traffic movements and the peak hourly traffic volumes at intersections do not generally meet the Austroads Warrants for additional turning lanes.

2.2 Traffic volumes and capacity standards

Baseline daily traffic volumes for the main project access routes have been determined from published RMS daily traffic surveys, for the years where the data is available between 2006 and 2012. To establish a baseline year 2017 daily traffic volume, +1% annual (linear) traffic growth has been added to the most recent annual survey. Traffic volumes are presented in Table 2.1.

Table 2.1 Historic and projected daily vehicle volumes

Road	Historic daily traffic volumes			2017 projected daily traffic volume[1]	Average proportion of heavy vehicles
	2006	2010	2012		
High Street (Kidman Way) at Hillston	2,409	N/A	N/A	2,674	N/A
Kidman Way, north of the site (near Hillston)	568	N/A	N/A	630	22%
Kidman Way, 20 km south of Hillston	441	518	N/A	554	26%
Kidman Way, south of Goolgowi	826	801	N/A	857	15%
Mid Western Highway, east of Goolgowi	334	378	N/A	404	44%
Mid Western Highway, west of Goolgowi	417	426	385	404	35%

Note: + 1% annual (linear) traffic growth is used, which gives a growth factor x 1.05 from the 2012 volumes, x 1.07 from the 2010 volume or x 1.11 from the 2006 volumes.

Road width design standards for low volume (generally rural) roads are defined by the Austroads *Guide to Road Design* (Austroads 2010) and are based on daily traffic volumes. The current design standards which are applicable to major roads in the Hillston area are presented in Table 2.2.

Table 2.2 Daily traffic volumes and corresponding design standards

Daily traffic volume	Austroads (2010) design standard	Applicable roads	Meets design standard?
150–500	Austroads requires a 6–7 m wide seal (7 m wide if more than 15% heavy vehicles)	Mid Western Highway east and west of Goolgowi	Yes
500–1,000	Austroads requires a 7–8 m wide seal	Kidman Way (all rural sections) between Hillston and Griffith	Yes
1,000–3,000	Austroads requires a minimum 9 m wide seal	Kidman Way, urban sections through the town of Hillston	Yes

The major roads which are proposed to be used for the project access have acceptable rural road cross sections which meet the Austroads (2010) road design standard for the daily traffic volumes which are using each road currently, as shown in Table 2.1.

In most cases the existing rural road standard provides a reasonable margin of spare traffic capacity for the existing traffic and can accommodate some daily traffic increases, without requiring any increase to the design standard of the route. An urban road cross section is provided for the Kidman Way route through the town centre of Hillston.

2.3 Warrants for intersection improvements

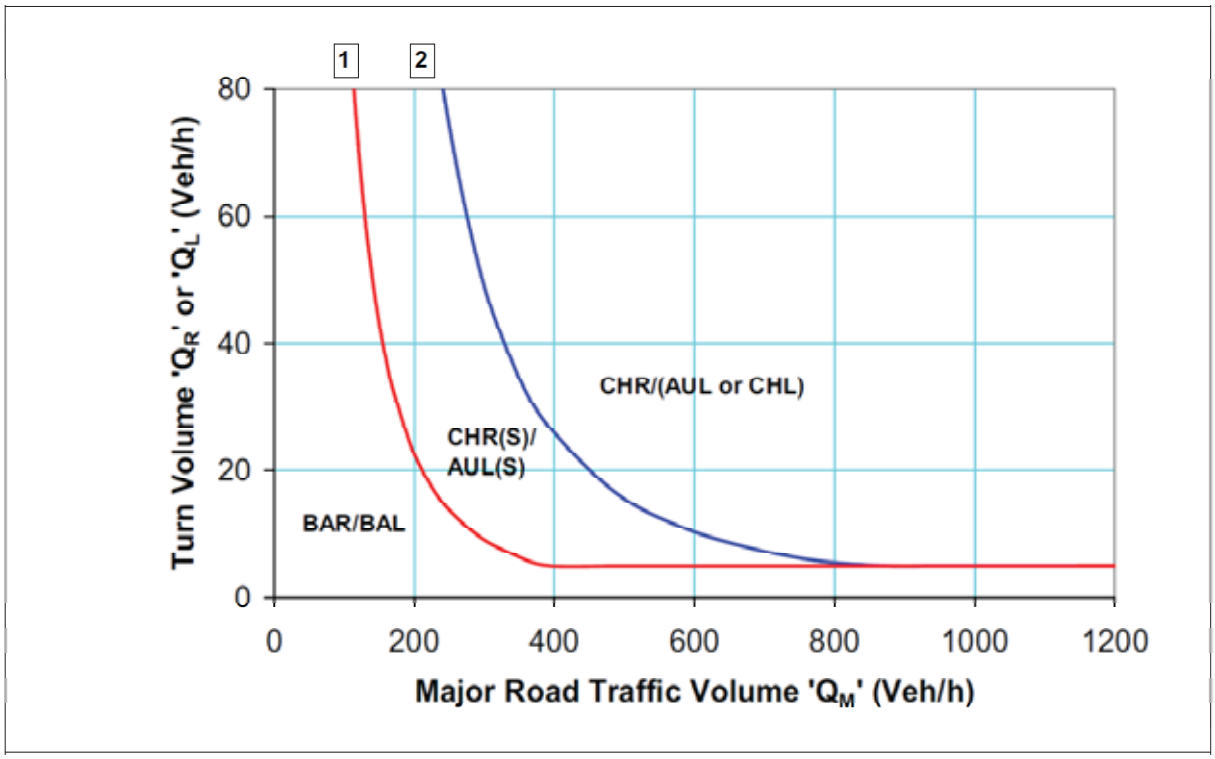
Rural intersection operations are assessed from the combination of the peak hourly through and turning traffic movements which are occurring at each intersection. This determines the need for additional intersection turning lanes in accordance with the current Austroads design standards which are shown in Appendix A and the Austroads Warrant design charts which are shown in Figure 2.2.

There are separate design charts for roads with either 100 km/hr or higher design speeds or design speeds lower than 100 km/hr. The design speed for all intersections on the Kidman Way in the locality of the site is 100 km/hr. For this design speed, additional left or right turn traffic lanes are only required, where the major road peak hourly traffic volume exceeds 120 vehicles per hour and the minor road traffic also exceeds the level shown on the Warrant Chart in Figure 2.2.

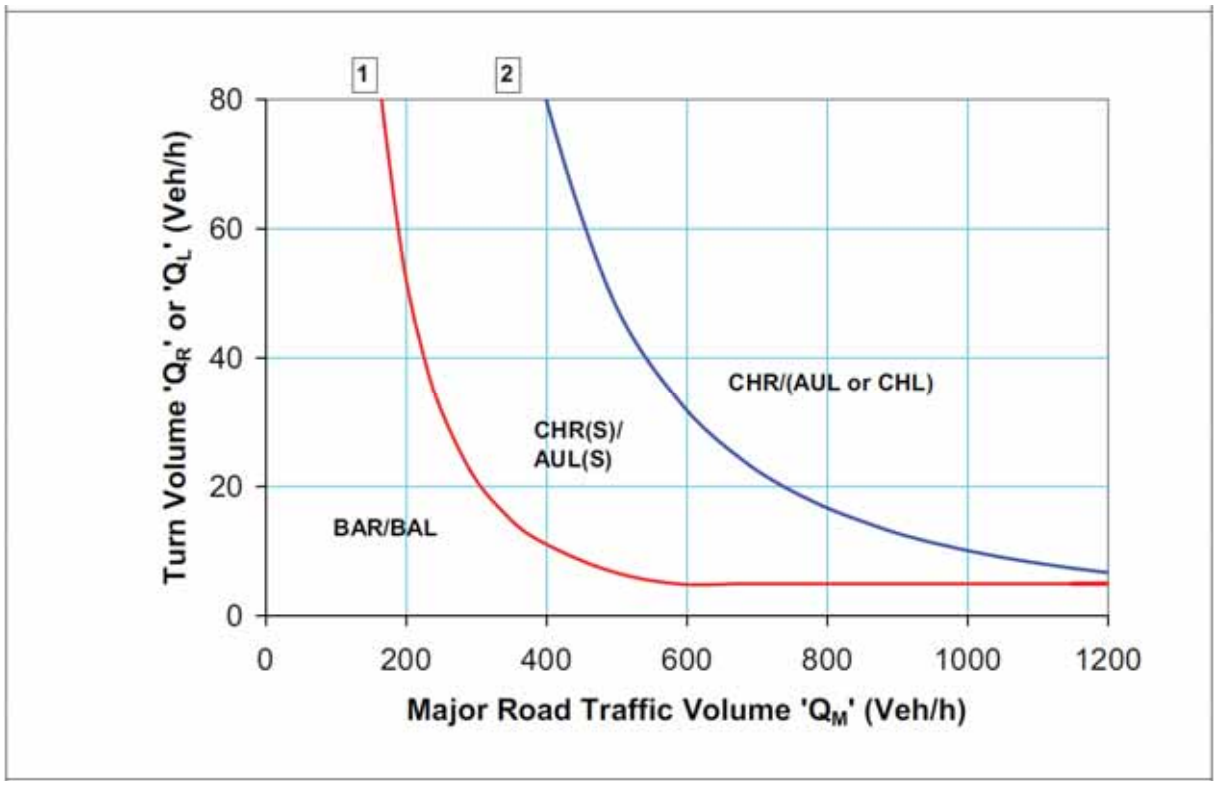
The current year 2017 baseline daily traffic volumes for Kidman Way north and south of the site (see Table 2.1) have been calculated to be between 554 and 630 daily vehicles, which corresponds to approximately 60 vehicles per hour during the peak hourly traffic periods.

The existing intersections on the Kidman Way near the site are therefore acceptable without additional left or right turn traffic lanes, as the major road peak hourly traffic volume is less than 120 vehicles at all locations, south of the urban area at Hillston.

A detailed assessment of the future effects of project-generated traffic at the site access and other relevant intersections, during the project construction and operations periods, is provided in Section 4.2.



Warrant Chart for additional turn lanes for traffic volumes for design speeds 100 km/hr or greater.



Warrant Chart for additional turn lanes for traffic volumes for design speeds lower than 100 km/hr.

Figure 2.2 Austroads warrant design charts for rural intersection turn lanes

2.4 Public transport

The railway line which passes along the eastern side of the Kidman Way near the site connects Griffith and Hillston. The railway line, which was completed in 1926, originally continued further to the north beyond Hillston to Roto, where it met the line to Broken Hill. However the railway line is no longer operational north of Hillston. Passenger train services to Hillston ceased in 1974 and the line is now used for goods traffic only.

Public transport in the Hillston area is primarily school buses which are operated by McCormack Bus Lines. These services primarily operate in the Hillston urban area, but including some services operating to the south via the Kidman Way between Hillston, Merriwagga and Goolgowi.

2.5 Traffic safety

Traffic safety conditions in the vicinity of the proposed site access intersections on the Kidman Way south of Hillston are considered to be acceptable, with excellent intersection visibility in both directions along the major road (as shown in Photographs 2.1 to 2.4).

The general traffic safety conditions on the Kidman Way route between Hillston and Goolgowi have been reviewed for the most recent five year accident history (for the years 2011 to 2015 inclusive) using the Transport for NSW (TfNSW) interactive accident history database.

Over this five year period, for the Carrathool LGA as a whole, there were 78 recorded traffic accidents of which seven accidents (or 9% of all accidents recorded) resulted in fatalities. In the overall NSW State accident statistics for the same period, less than 1% of all recorded traffic accidents resulted in fatalities.

There were a total of nine recorded traffic accidents on the Kidman Way between Hillston and Goolgowi over the five year period. This is a relatively low total number of accidents, when considering the 50 km route length between Hillston and Goolgowi. Of the nine recorded accidents, three (33 percent) resulted in fatalities. This is a high proportion of fatal accidents in comparison to either the LGA or NSW State averages.

The majority of the road pavement along the Kidman Way between Hillston and Goolgowi has a sealed width of between 7 m to 8 m and the road centre line and edge lines are generally clearly marked along the entire route. The route design meets the relevant Austroads 2010 road design standard for the current daily traffic volumes and there would appear to be no inherent traffic safety deficiencies for the route. Driver behaviour, and the delays in persons receiving medical treatment after road accidents due to the remoteness of the location are probably significant contributory factors in the above average proportion of fatal traffic accidents which have occurred since 2011 on this section of the Kidman Way.

Along the frontage of the site, which extends from between 3.5 km to 7 km south of Hillston, there were no recorded traffic accidents during the five year period from 2011 to 2015.

3 Traffic and parking demands for the proposal

3.1 Site access

Two existing site access roads would be used for the project, identified in Figure 2.1. Visibility on the Kidman Way at the existing site access roads is shown in Photographs 3.1, 3.2, 3.3 and 3.4.

The sight distances for approaching traffic along the Kidman Way at both intersections are very good. The road is straight and level in both directions and drivers can clearly see for at least 500 m both north and south of each intersection location.

Photograph 3.1 Visibility on Kidman Way near northern site access looking north

Photograph 3.2 Visibility on the Kidman Way near northern site access looking south

Photograph 3.3 Visibility on the Kidman Way near southern site access looking north

Photograph 3.4 Visibility on the Kidman Way near southern site access looking south

3.2 Construction and other traffic generating activities

Construction of the project will take approximately 12 months. Construction activities will be undertaken during the standard daytime construction hours of:

- 7 am–6 pm Monday to Friday; and
- 8 am–1 pm Saturday.

In general, no construction activities will occur on Sundays or public holidays. Exceptions to these hours may be required on limited occasions. The local council and surrounding landholders will be notified of any exceptions.

When operational, the project will produce electricity for contribution to the grid network. The PV solar panels will operate during daylight hours, seven days per week, 365 days per year. The operational lifespan of the project may be in the order of 30 years, depending on the nature of solar PV technology and energy markets. An operational workforce of between two to five full-time equivalents (FTE) will be required for the project once construction had been completed. This workforce would undertake ongoing routine maintenance of the site and the associated project infrastructure.

The future decommissioning of the site, when it occurs, will require the full removal of all installed infrastructure from the site. This would entail similar workforce requirements and daily traffic movements by both car and truck traffic as would previously have occurred during the project construction stage.

3.3 Site access and circulation

Vehicular access to the site will occur via two proposed intersections on Kidman Way, serving the northern and southern parts of the site. Each access will involve:

- construction of a site access road from the Kidman Way;
- asphalt surfacing for approximately 50 m of the new site access road; and
- improved intersection visibility and gravel shoulder widening design corresponding to Austroads type BAR/BAL intersection standard on the Kidman Way on the approaches to and departures from the intersections.

The above intersection requirements have been discussed with RMS and agreed in principle. The RMS and Carathool Shire Council will be consulted further in relation to the detailed design requirements for each access road intersection prior to construction.

All weather gravel surfaces will be provided for the internal site access roads which will have a minimum width of either 4 or 6 m and have appropriate passing places provided. The indicative locations of the internal access roads are illustrated in the detailed site layout plan.

During construction, a suitable number of parking spaces will be available within the temporary construction compound. The indicative locations of the parking spaces are also illustrated in the detailed site layout plan.

The site will be fenced off by a chain mesh fence, which will be approximately 1.8–2.4 m high. Fencing will restrict public access to the site.

3.4 Traffic generation

The following generated daily traffic movements and corresponding vehicle types have been calculated for the average construction, peak construction and operations stage activities for the project (Table 3.1). Truck traffic movements will typically be semi-trailer type truckloads for all deliveries of plant and equipment to the site:

- Average construction – this period would typically be the site establishment stage and final commissioning. There will be on average 16 daily truck deliveries to the site and 30 light vehicle visits, corresponding to 92 daily traffic movements in total.
- Peak construction – this period would typically occur during the early and mid stages of construction including earthworks and delivery activities, there will be on average 28 daily truck deliveries to the site and 45 light vehicle visits, corresponding to 146 daily traffic movements in total.
- Typical operation – there will be on average two daily truck deliveries to the site and four light vehicle visits, corresponding to 12 daily traffic movements in total.
- Decommissioning – this assumes there will be full removal of all the installed plant and equipment from the site. This would entail similar workforce requirements and daily traffic movements by both car and truck traffic as would previously have occurred during the project construction stage.

The site daily traffic volumes for the project are presented in Table 3.1, including the estimated peak hourly traffic volumes for each stage of the project.

Table 3.1 Additional daily and hourly traffic volumes generated by the project

Project phase	Average construction		Peak construction		Operation	
	Daily	Peak hour	Daily	Peak hour	Daily	Peak hour
Workforce (car) traffic movements	60	16	90	24	8	2
Delivery (truck) traffic movements	32	8	56	12	4	1
Total site traffic movements	**92**	**24**	**146**	**36**	**12**	**3**

The daily traffic will be greatest during the peak construction stage, with approximately 146 daily vehicle trips, and up to 36 peak hourly vehicle movements (24 light vehicle trips and 12 truck trips) during both the morning and afternoon peak hourly traffic periods.

During the average stages of project construction there will be approximately 92 daily vehicle trips, with up to 24 peak hourly vehicles (16 employee vehicle trips and eight truck trips) during the morning and afternoon peak hourly traffic periods.

During operation there will be much lower daily traffic movements, which are estimated at up to 12 daily vehicle trips, with up to three peak hourly vehicles (two light vehicle trips and one truck trip) during the morning and afternoon peak hourly traffic periods.

During project decommissioning, the project generated daily and peak hourly traffic movements have not been specifically calculated and assessed as these movements have been assumed to be similar, in principle, to the daily and peak hourly site generated car and truck traffic movements generated during the construction stage.

3.5 Traffic distribution

The proposed transport routes for the project light vehicle (workforce car or shuttle bus) traffic and heavy vehicle (truck) traffic are primarily as follows:

For the workforce traffic:

- 40% of the workforce will be based locally travelling to and from the Hillston area via the Kidman Way north of the site; and
- 60% of the workforce will be based in Griffith or other areas, travelling via the Kidman Way south of the site and other routes potentially via the Mid Western Highway, which connects to the Kidman Way at Goolgowi.

For truck traffic:

- 80% of truck deliveries will be travelling to and from the south from locations and equipment suppliers in southern NSW and Victoria travelling via the Kidman Way (south) via Griffith or via the Mid Western Highway and other routes east and west of Goolgowi; and
- 20% of truck deliveries will be travelling to and from the north from locations and equipment suppliers in the local Hillston area and other routes north and east of Hillston.

The major proportions of the project generated car and truck traffic (60% and 80% respectively) will be travelling to and from the south via the Kidman Way to Griffith or the Mid Western Highway and other routes east and west of Goolgowi. The project car traffic would mainly be travelling to and from the direction of Griffith which is the major population centre in the region.

Significant proportions of the project truck traffic would also be travelling from areas further to the south in Victoria including from Melbourne where deliveries of key imported items for the project such as PV solar panels would be sourced from.

The daily traffic distributions for the proposed project car and truck traffic are shown on the map of proposed access routes (traffic distribution) in Figure 3.1.

3.6 Car parking

Parking for the project construction and operations workforces will be provided on-site in gravel surfaced parking areas with appropriate dimensions to accommodate the number and size of vehicles.

3.7 Other transport

It is anticipated that the use of shuttle buses (estimated 15 seat capacity) could be used for approximately 50% of the project construction workforce transport arrangements, including for a proportion of the workforce travel from both Griffith and Hillston, which are the two urban areas of highest population concentration in the region. Therefore, the workforce traffic generation assumptions used in this TIA have considered this in traffic generation estimates.

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Traffic distribution
Hillston Sun Farm
Traffic Impact Assessment
Figure 3.1

4 Impact assessment

4.1 Traffic volumes on the road network

The existing daily traffic volumes (projected baseline volumes for the year 2017) for Kidman Way and the Mid Western Highway, and the existing adequacy of the road design standards for these roads is discussed in Section 2.3.

The current daily traffic capacities for these roads, according the current Austroads 2010 Road Design Guide standards for rural roads, are:

- Kidman Way, south of the Hillston urban area 500–1,000 daily vehicles; and
- Mid Western Highway, east and west of Goolgowi 150–500 daily vehicles.

The daily traffic capacity for the High Street section of the Kidman Way through the town centre of Hillston is determined by other urban road capacity standards, which generally allow significantly higher daily traffic volumes, depending on the number of lanes on the road.

The additional daily traffic volumes generated by the project during the average construction, peak construction and operations stages are assessed for the relevant sections of the affected travel routes (the Kidman Way and the Mid Western Highway) in the following sections.

4.1.1 Average construction traffic

Table 4.1 summarises the project baseline traffic conditions within the local road network and the predicted future daily traffic during the average construction phase of the project.

Table 4.1 Future daily traffic assessment for project average construction traffic

RMS traffic count location	Projected baseline daily traffic volume (year 2017)	Peak daily traffic from the project [1]	Future total daily traffic	Percent traffic increase	Austroads rural daily traffic volume standard
High Street (Kidman Way) at Hillston	2,674	24	2,698	1%	Not Applicable
Kidman Way, north of the site (near Hillston)	630	32	662	5%	500–1,000
Kidman Way, 20 km south of Hillston	554	60	614	11%	500–1,000
Kidman Way, south of Goolgowi	857	32	889	4%	500–1,000
Mid Western Highway, east of Goolgowi	404	14	418	3%	150–500
Mid Western Highway, west of Goolgowi	404	14	418	3%	150–500

Note: 1. This assumes truck traffic uses other routes which bypass the Hillston town centre.

The results in Table 4.1 show that the highest proportional daily traffic increases from the project will be on the Kidman Way south of the site towards Merriwagga and Goolgowi, where there will be a temporary daily traffic increase of approximately +11% during average construction, compared to the calculated year 2017 baseline traffic conditions.

At the other assessed locations on the Kidman Way, north and south of the site, including towards Griffith and through Hillston, there will be much lower (+1% to +5%) daily traffic volume increases.

On the Mid Western Highway, east and west of Goolgowi, in the directions of either Hay or Rankin Springs, the predicted daily traffic increases will be marginal at +3%.

At all of the assessed traffic locations in Table 4.1, the project generated daily traffic increases will not generally be noticeable for the future traffic using the road and will comply with the future traffic capacity for the route according to the Austroads 2010 rural road design and capacity standards.

These traffic increases will not have a significant effect on the future traffic capacity, levels of service or traffic safety for the existing traffic which is using these roads.

4.1.2 Peak construction traffic

Table 4.2 summarises the project baseline traffic conditions within the local road network and the predicted future daily traffic during the peak construction phase of the project.

Table 4.2 Future daily traffic assessment for project peak construction traffic

RMS traffic count location	Projected baseline daily traffic volume (year 2017)	Peak daily traffic from the project [1]	Future total daily traffic	Percent traffic increase	Austroads rural daily traffic volume standard
High Street (Kidman Way) at Hillston	2,674	36	2,710	1%	Not Applicable
Kidman Way, north of the site (near Hillston)	630	48	678	8%	500–1,000
Kidman Way, 20 km south of Hillston	554	98	652	18%	500–1,000
Kidman Way, south of Goolgowi	857	52	909	6%	500–1,000
Mid Western Highway, east of Goolgowi	404	21	425	5%	150–500
Mid Western Highway, west of Goolgowi	404	25	429	6%	150–500

Note: 1. This assumes truck traffic uses other routes which bypass the Hillston town centre.

The results in Table 4.2 show that the highest proportional daily traffic increases from the project will be on the Kidman Way on the section south of the site towards Merriwagga and Goolgowi, where there will be approximately +18% daily traffic volume increases during the peak of construction compared to the calculated year 2017 baseline traffic conditions.

At the other assessed locations on the Kidman Way, north and south of the site, including towards Griffith and through Hillston, there will be much lower (+1% to +8%) daily traffic volume increases.

On the Mid Western Highway, east and west of Goolgowi, in the directions travelling towards either Hay or Rankine Springs, the predicted daily traffic increases will be marginal at +5% to +6%.

At all of the assessed traffic locations in Table 4.2, the project generated daily traffic increases will be minor or moderate and the future daily traffic volumes will be within the Austroads recommended daily traffic volume standards for each route.

These traffic increases will have no significant effect on the future traffic capacity, levels of service or traffic safety for the existing traffic which is using these roads.

4.1.3 Operational traffic

Table 4.3 summarises the project baseline traffic conditions within the local road network and the predicted future daily traffic during the operational phase of the project.

Table 4.3 Future daily traffic assessment for project operations traffic

RMS traffic count location	Projected baseline daily traffic volume (year 2017)	Peak daily traffic from the project [1]	Future total daily traffic	Percent traffic increase	Austroads rural daily traffic volume standard
High Street (Kidman Way) at Hillston	2,674	3	2,679	0.1%	Not Applicable
Kidman Way, north of the site (near Hillston)	630	4	634	0.6%	500–1,000
Kidman Way, 20 km south of Hillston	554	8	562	1.4%	500–1,000
Kidman Way, south of Goolgowi	857	4	861	0.5%	500–1,000
Mid Western Highway, east of Goolgowi	404	2	406	0.5%	150–500
Mid Western Highway, west of Goolgowi	404	2	406	0.5%	150–500

Note: 1. This assumes truck traffic uses other routes which bypass the Hillston town centre.

The results in Table 4.3 show on all the traffic routes considered, including the Kidman Way and the Mid Western Highway the project operations daily traffic increases will be marginal at between +0.1% to +1.4% at all locations.

These daily traffic increases will not be noticeable and will have no effects on the future traffic operations, level of service or traffic safety for the future traffic using these routes.

4.2 Summary of the effect of future project traffic increases

On Kidman Way, the existing road cross section has generally been improved during the past decade and has a consistent road cross section sealed width of 7-8 m over the route between Hillston and Griffith, which is appropriate for daily traffic volumes of between 500-1,000 daily vehicle movements. This road cross section is adequate to accommodate the proposed future route daily traffic volumes including the peak construction stage traffic for the project, which would be up to 909 daily vehicle movements, as summarised in Table 4.2.

On Mid Western Highway, the existing road cross section has also generally been improved during the past decade and most sections have a sealed width of approximately 7 m which is appropriate for a daily traffic volume of between 150-500 daily vehicle movements. This road cross section is adequate to accommodate the assessed future route daily traffic volumes at the peak construction stage for the project, which would be up to 429 daily vehicle movements, as summarised in Table 4.2.

4.3 Traffic impact at intersections

The existing peak hourly volumes of northbound or southbound through traffic using the Kidman Way at the locations of the two proposed site access intersections are not anticipated to increase significantly as a result of the project. These traffic volumes will remain at approximately 60 vehicle movements per hour (two-way traffic) for the duration of the project construction.

The potential need for additional turning lanes at the two proposed site access intersections has been assessed by reference to the 100 km/hr Austroads intersection design warrant chart in Figure 2.2 and the Austroads intersection road design guide extracts, which are included as Appendix A.

At each of the two proposed site access intersections, it has been assumed that 80% of the future project construction traffic could potentially use each intersection, during the respective peak construction periods for the work on the northern and southern parts of the site.

From the forecast future project traffic volumes in Table 3.1, for each stage of construction and the corresponding project operations, the maximum peak hourly turning traffic volumes which could be using either site access intersection, using the 80% site traffic ratio, are summarised in Table 4.4, for the morning and afternoon peak hour traffic periods.

Table 4.4 Future forecast turning traffic volumes using either site access from Kidman Way

Stage	Peak hour	Hourly traffic entering the site		Hourly traffic leaving the site	
Site Activity	**Time of day**	**From the north**	**From the south**	**To the north**	**To the south**
Average construction	Morning peak hour	5	10	1	4
	Afternoon peak hour	1	4	5	10
Peak construction	Morning peak hour	9	13	3	5
	Afternoon peak hour	3	5	9	13
Operation	Morning peak hour	1	1	0	1
	Afternoon peak hour	0	1	1	1

During the busiest period for the future site traffic (the peak construction stage) the summary of the site access traffic volumes in Table 4.4, shows the maximum future site entry turning traffic volume from either the north of the south will be 13 vehicles. This volume when combined with the major road traffic flow using Kidman Way (60 hourly vehicles) would only require the minimum (Type BAR/BAL) intersection left or right turn safety treatments, according to the 100 km/hr Austroads intersection warrant chart, which is in Figure 2.2.

This intersection traffic assessment, using the forecast major road and minor road traffic volumes for each leg of the intersection, shows that only the minimum (Type BAR/BAL) intersection left or right turn safety treatment is required at the Kidman Way major road approaches to the two proposed site access road intersections.

4.4 Site access road traffic impact

The predicted maximum project daily traffic usage on each site access road (up to 80% of the future total predicted site traffic) during each stage of the project construction and operations, will be approximately:

- 74 daily vehicle trips, during average construction;
- 116 daily vehicle trips, during peak construction; and
- a maximum of 10 daily vehicle trips during operation.

For these daily traffic volumes, a single lane width, unsealed rural road is acceptable. However, sealing of the initial length of approximately 50 m of each site access road, with a minimum sealed width of 6.5 m, is proposed to facilitate the turning trips by large vehicles to and from the Kidman Way and to minimise the potential tracking of dirt and debris onto public roads by the site construction vehicles.

4.5 Traffic management

The proposed site access intersection treatments would be incorporated into a Construction Traffic Management Plan, which will utilise Austroads and RMS guidelines for the major road intersection operations and worksite traffic control throughout the project construction period.

Details of the relevant standard road designs (Austroads, 2010) for additional intersection widening (type BAR/BAL shoulder widening) are included in the relevant extracts from the Austroads Road Design Guide in Appendix A.

Generally during the construction period the largest vehicles which are anticipated to be visiting the site for construction deliveries on a regular basis will be 19 m long semi trailers. Temporary traffic control arrangements may be required at the site access during the peak stages of construction traffic activity on days when deliveries by oversize vehicles may be required.

The project proponent would be required to lodge a Section 138 Certificate (Work on Public Lands) for Carrathool Shire Council and/or RMS approval before any future road work for the proposed intersection improvement is carried out.

4.6 Driver distraction from glare

The potential for low angled reflected sunlight to cause a distraction to drivers travelling either northbound or southbound along the Kidman Way was considered. Due to the anti-reflective properties of the PV solar panels, they are not expected to cause a distraction to motorists on Kidman Way. Visual impacts of the project are addressed in the EIS and accompanying visual impact assessment.

5 Summary and conclusions

The traffic impacts from the proposed Hillston Sun Farm have been assessed and the key findings are as follows:

- Access will be from the Kidman Way via two proposed access road intersections located near the northern and southern ends of the site frontage which extends from approximately 3.5 km south of Hillston to 7.0 km south of Hillston. Each site access road would be partially sealed and upgraded to connect to the Kidman Way, including additional vegetation clearing and shoulder widening at the Kidman Way to accommodate the swept paths of the largest trucks which are proposed to visit the site.

- The existing daily traffic volumes using the Kidman Way, Mid Western Highway and High Street through Hillston have been reviewed and +1% annual traffic growth adjustments used to determine projected year 2017 baseline daily traffic volumes from the published RMS daily traffic volume surveys during the period 2006 to 2012. The year 2017 baseline traffic volumes satisfy the current Austroads (2010) design standards for daily traffic volumes for the typical design standard and sealed width of each of these roads.

- The Kidman Way is both straight and level at the two proposed site access intersection locations. The available intersection sight distances provide for very good traffic safety and the sight distance is more than adequate for the road speed limit which is 100 km/hr.

- The predicted additional daily traffic usage of the surrounding roads at the peak stage of project construction will be approximately 146 daily vehicle trips, reducing to approximately 92 daily vehicle trips during the earlier and later (average) stages of project construction and a maximum of 12 daily vehicle trips during operation.

- Additional traffic generated by the project will not cause the future daily traffic volumes on either the Kidman Way, Mid Western Highway or High Street route through the centre of Hillston, to increase above the relevant Austroads daily traffic volume design levels that would trigger road widening improvements.

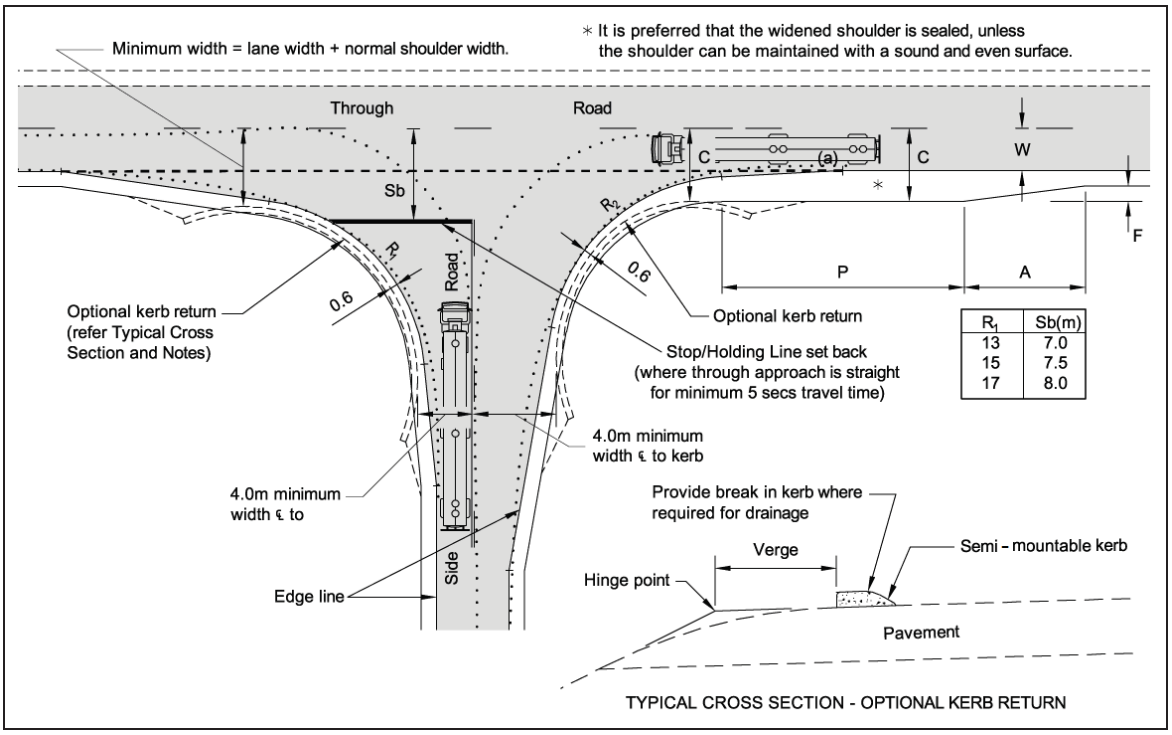
- Similarly, the additional peak hourly project access traffic would not affect the Austroads intersection warrant design requirements for additional turning lanes at rural intersections and additional intersection turning lanes would not be required. Only the minimum type BAR/BAL right and left turn sealed shoulder widening would be required for the northbound and the southbound traffic approaches to each intersection on the Kidman Way.

- The internal site access roads and car parking will be constructed to serve the project's construction access and car parking needs. Internal roads will generally be all weather gravel surfaced roads, either 4 m or 6m wide. Car parking for the project construction and operations workforces will be provided in appropriate gravel surfaced car parking areas with appropriate dimensions to accommodate the required number of vehicles.

- A Construction Traffic Management Plan will be prepared in consultation with the RMS and in accordance with the RMS Traffic Control at Worksites Manual.

Appendix A

Design standards for intersection turning lanes



R_1	Sb(m)
13	7.0
15	7.5
17	8.0

Notes:

1. R1 and R2 are determined by the swept path of the design vehicle.
2. The dimensions of the treatment are defined thus:

W = Nominal through lane width (m) (including widening for curves).

C = On straights – 6.0 m minimum.

On curves – 6.0 m plus curve widening (based on widening for the design turning vehicle plus widening for the design through vehicle).

A = $\frac{0.5VF}{3.6}$

V = Design speed of major road approach (km/h).

F = Formation/carriageway widening (m).

P = Minimum length of parallel widened shoulder (Table 8.1).

Source: QDMR (2006).

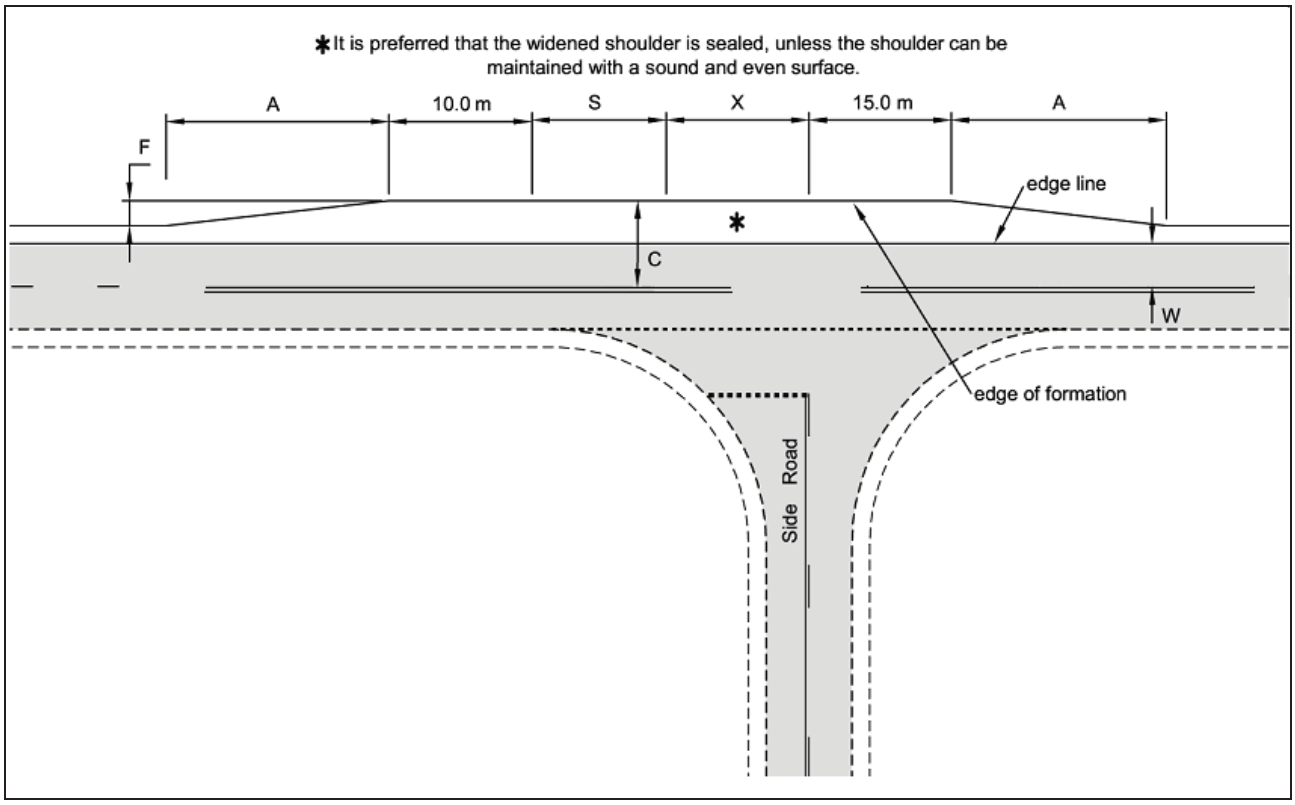
Figure 8.2: Rural basic left-turn treatment (BAL)

Table 8.1: Minimum length of widened parallel shoulder

Design speed of major road approach (km/h)	Minimum length of parallel widened shoulder P (m)
50	0
60	5
70	10
80	15
90	20
100	25
110	35
120	45

Note: Adjust the length for grade using the 'correction to grade' factor in Table 5.3

Source: QDMR (2006).



Notes:

1. This treatment applies to the right turn from a major road to a minor road.
2. The dimensions of the treatment are defined thus:

W = Nominal through lane width (m) (including widening for curves). Width to be continuous through the intersection.

C = On straights – 6.5 m minimum

7.0 m minimum for Type 1 & Type 2 road trains

On curves – widths as above + curve widening (based on widening for the design turning vehicle plus widening for the design through vehicle).

A = $\frac{0.5VF}{3.6}$

Increase length A on tighter curves (e.g. those with a side friction demand greater than the maximum desirable). Where the design through vehicle is larger than or equal to a 19 m semi-trailer the minimum speed used to calculate A is 80 km/h.

V = Design speed of major road approach (km/h).

F = Formation/carriageway widening (m).

S = Storage length to cater for one design turning vehicle (m) (minimum length 12.5 m).

X = Distance based on design vehicle turning path, typically 10–15 m.

Source: QDMR (2006).

Figure 7.5: Basic right (BAR) turn treatment on a two-lane rural road

7.5.2 Rural Channelised T-junction – Short Lane Type CHR(S)

The CHR(S) turn treatment shown in Figure 7.6 is a more desirable treatment than the BAR treatment because it provides greater protection for vehicles waiting to turn right from the centre of the road. This treatment is suitable where there are low to moderate through and turning volumes. For higher volume sites, a full-length CHR turn treatment (Figure 7.7) is preferred.

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