Attachment 1: Photographs

View towards the site from the east looking northwest nearby the Castlereagh Highway Intersection with Caledonia Street

View of the Castlereagh Highway looking west with the site located to the right of the photo

View of the site looking north from the Castlereagh Highway including the railway land immediately in the foreground

View of the site looking north from the Castlereagh Highway including scant mature roadside vegetation in the foreground

View of the site from the Crown Land Reserve and the Castlereagh Highway looking east

Old Mill Road looking east

View to the site from Old Mill Road looking east

View of the site looking south from Old Mill Road, including the Castlereagh Highway in the background

View of the site looking south east from Old Mill Road.

View of the site looking south west including the single tree within the development site adjacent to the existing dam

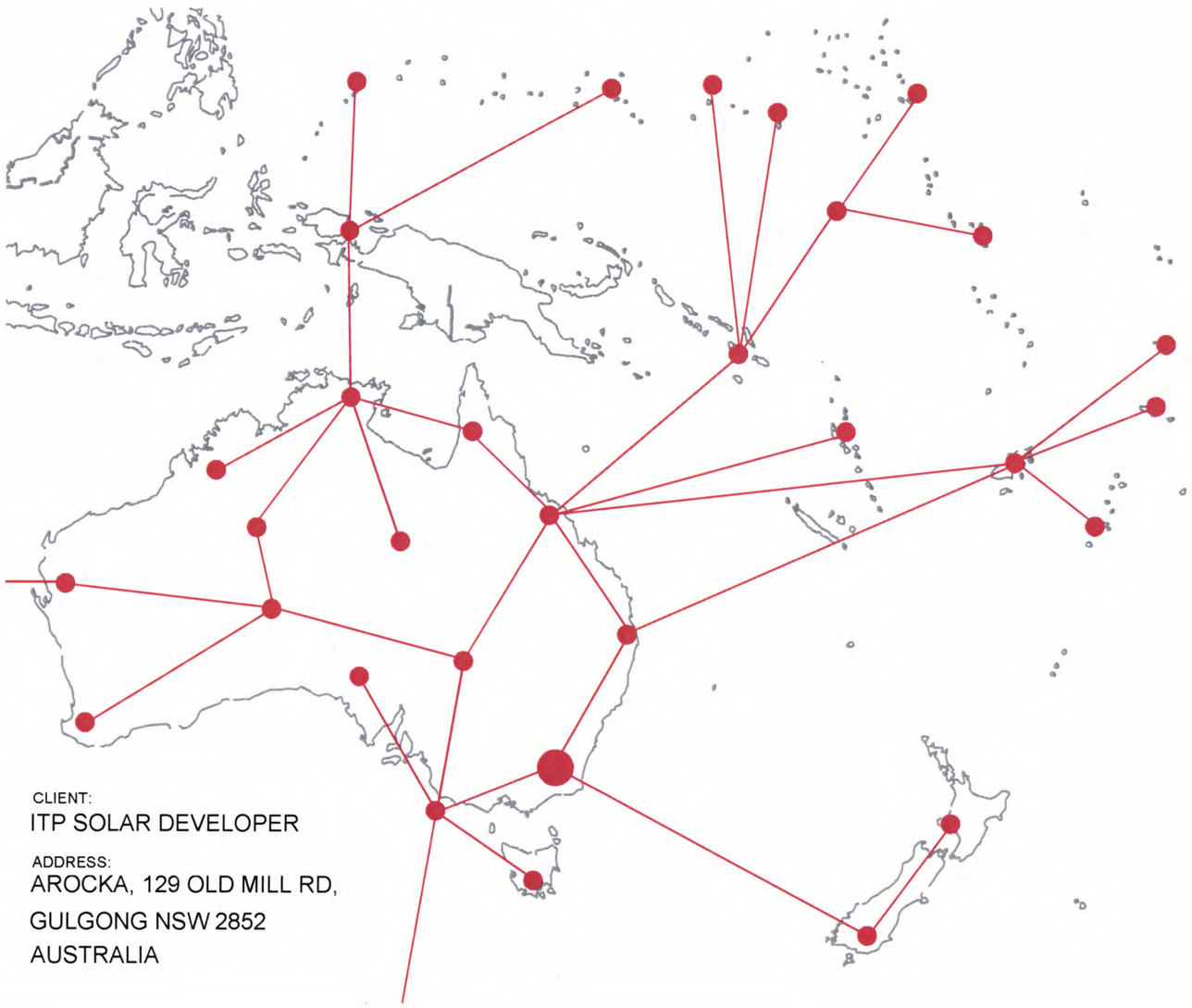
View of the existing power lines looking south from Old Mill Road

Caledonia Street and Rouse Street intersection to Old Mill Road, looking west

View of the site looking west from Caledonia Street

AVISFORD MINI SUSTAINABLE ENERGY PARK

GLG2A - **DEVELOPMENT APPLICATION**



CLIENT:
ITP SOLAR DEVELOPER

ADDRESS:
AROCKA, 129 OLD MILL RD,
GULGONG NSW 2852
AUSTRALIA

SHEET LIST

SHEET NUMBER	SHEET TITLE
G-010	MAIN TITLE SHEET
G-040	LOCATION PLAN
G-210	GENERAL ARRANGMENT
C-130	SITE ELEVATION
C-530	TYPICAL FENCING DETAIL
C-631	ACCESS ROAD DETAILS
C-730	LANDSCAPE PLAN
E-341	TYPICAL ARRAY DETAIL
E-430	TYPICAL INVERTER STATION DETAIL

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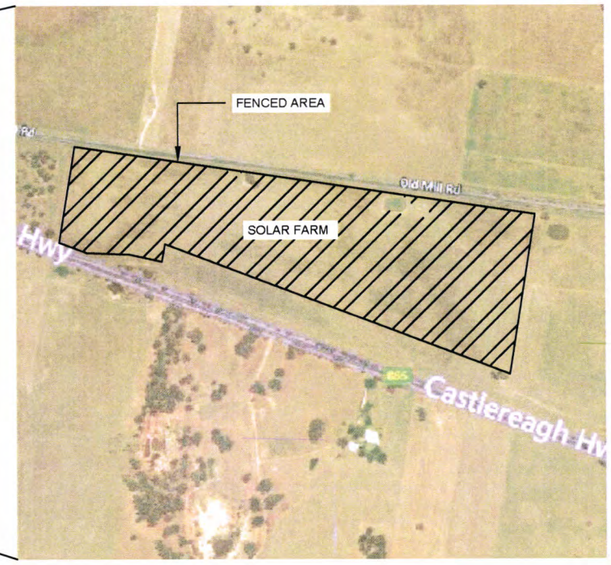
IT Power (Australia)

1 - LOCATION MAP

SCALE: 1:100,000



2 - LOCATION MAP

SCALE: 1:10,000

DEVELOPMENT APPLICATION

NO	STAGE	DATE
1	ISSUE FOR DA APPROVAL	13/06/19
2	####	########
3	####	####
4	####	####
5	####	####
6	####	####

NOTES

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AUSTRALIA

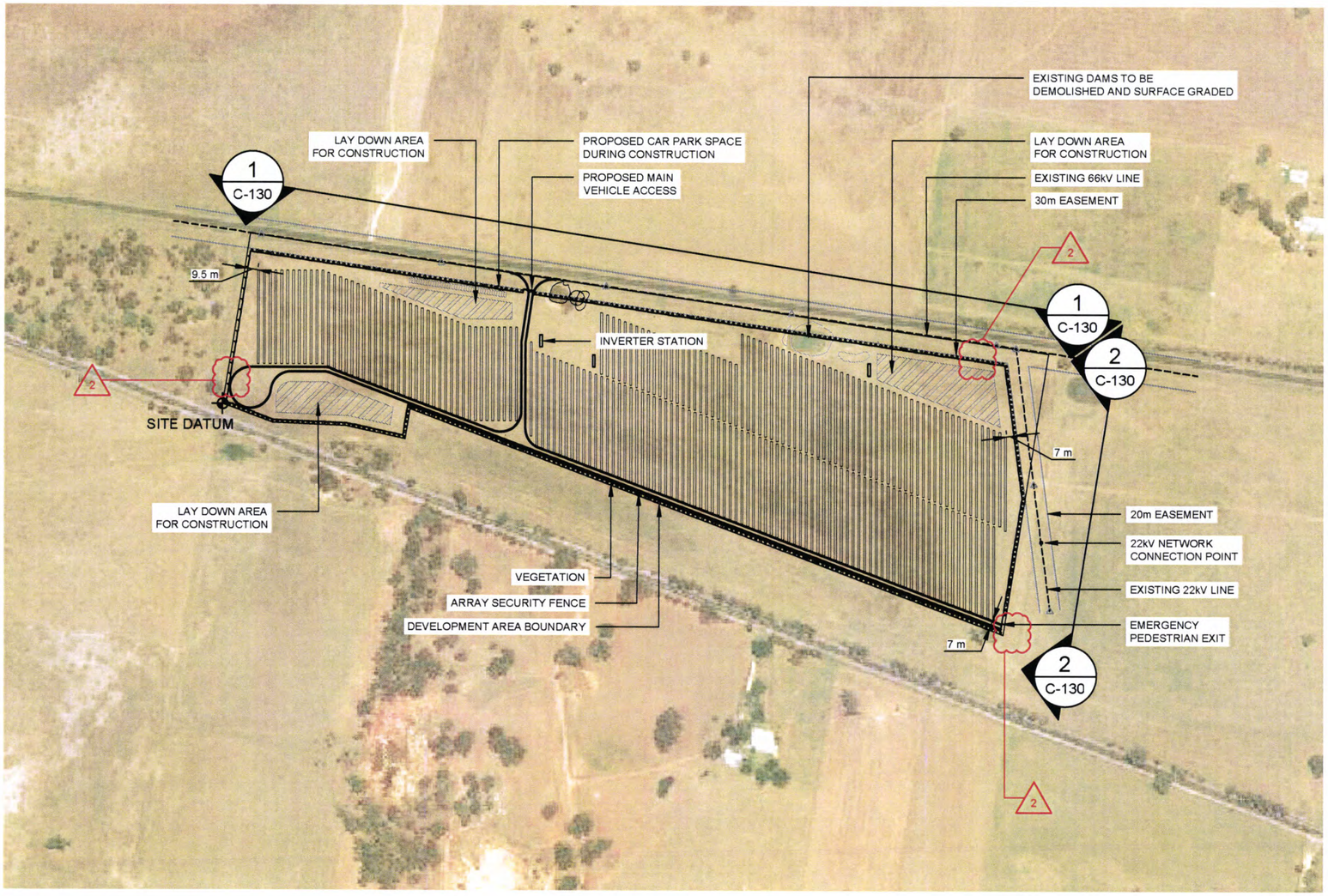
DRAWN	WJ
CHECKED	LF, KB
APPROVED	LF, KB

DO NOT SCALE.
ALL MEASUREMENTS IN MM UNLESS OTHERWISE STATED

DRAWING	**LOCATION PLAN**

PROJECT	AVISFORD MINI SUSTAINABLE ENERGY PARK
	ITP SOLAR DEVELOPER
CLIENT	AROCKA, 129 OLD MILL RD,
ADDRESS	GULGONG NSW 2852, AUSTRALIA
DRAWING NO	**GLG2A-G-040**

SCALE	AS NOTED
SHEET SIZE	A3
ORIG. DATE	22/5/19
REV. DATE	11/10/19
REV NO	1



SITE INFORMATION

LOT / DP	460-464 / 755434
ADDRESS	AROCKA, 129 OLD MILL RD, GULGONG NSW 2852
LGA	MID-WESTERN REGIONAL COUNCIL
LAT / LONG	-32.35545, 149.5118
ELEVATION	450m
LOT AREA	15.9 Ha
FENCED AREA	14.3 Ha
DNSP	ESSENTIAL ENERGY

PROJECT INFORMATION

DC CAPACITY	6.0 MW
AC CAPACITY	5.0 MW
DC/AC RATIO	1.20
INVERTERS	2 x 2.5 MW AC
MOUNTING	SINGLE AXIS TRACKER
MODULE CAPACITY	385W - 72 CELL MONO (1500V)
STRING CONFIGURATION	28 MODULES PER STRING
TRACKER	3 STRINGS, 88m
NO. TRACKERS	170 X 88m TRACKERS (84 MODULES) 24 X 60m TRACKERS (56 MODULES)
TRACKER SPACING (N-S)	1 m
ARRAY PITCH	5.7 m
SPECIFIC YIELD	2043 kWh/kWp/annum
ANNUAL GENERATION	12.7 GWh
CONNECTION VOLTAGE	22 kV
CONNECTION FEEDER	GGG22
CONNECTION SUBSTATION	BERYL
SECURITY FENCE SETBACK	3m FROM DEVELOPMENT AREA BOUNDARY
ARRAY SETBACK	7m FROM SECURITY FENCE
ACCESS ROAD WIDTH	5m

1 / - GENERAL ARRANGEMENT

SCALE: 1:5000

DEVELOPMENT APPLICATION

NO.	STAGE	DATE
1	ISSUE FOR DA APPROVAL	13/06/19
2	UPDATED EMERGENCY EXIT	11/10/19
3	####	####
4	####	####
5	####	####
6	####	####

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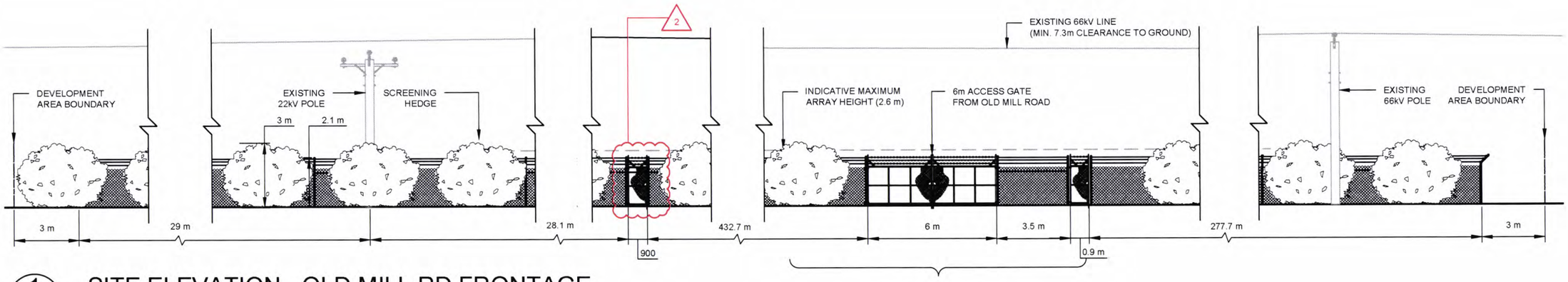
CHECKED: LF, KB
APPROVED: LF, KB

DRAWING: GENERAL ARRANGMENT

PROJECT: AVISFORD MINI SUSTAINABLE ENERGY PARK
CLIENT: ITP SOLAR DEVELOPER
ADDRESS: AROCKA, 129 OLD MILL RD, GULGONG NSW 2852, AUSTRALIA

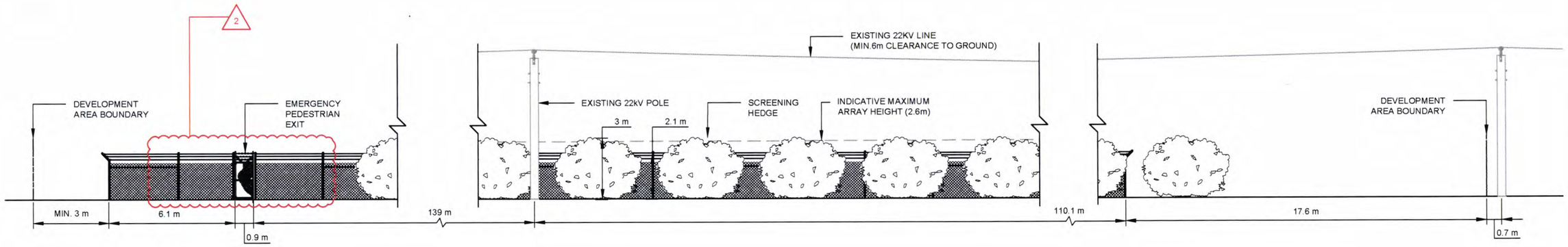
SCALE: AS NOTED
SHEET SIZE: A3
ORIG. DATE: 17/4/19
REV. DATE: 11/10/19

DRAWING NO: GLG2A-G-210
REV NO: 2



1 - SITE ELEVATION - OLD MILL RD FRONTAGE

SCALE: 1:200



2 - SITE ELEVATION - EAST FRONTAGE

SCALE: 1:200

DEVELOPMENT APPLICATION

NO	STAGE	DATE
1	ISSUE FOR DA APPROVAL	13/06/19
2	UPDATED EMERGENCY EXIT	11/10/19
3	####	####
4	####	####
5	####	####
6	####	####

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DRAWING: **SITE ELEVATION**

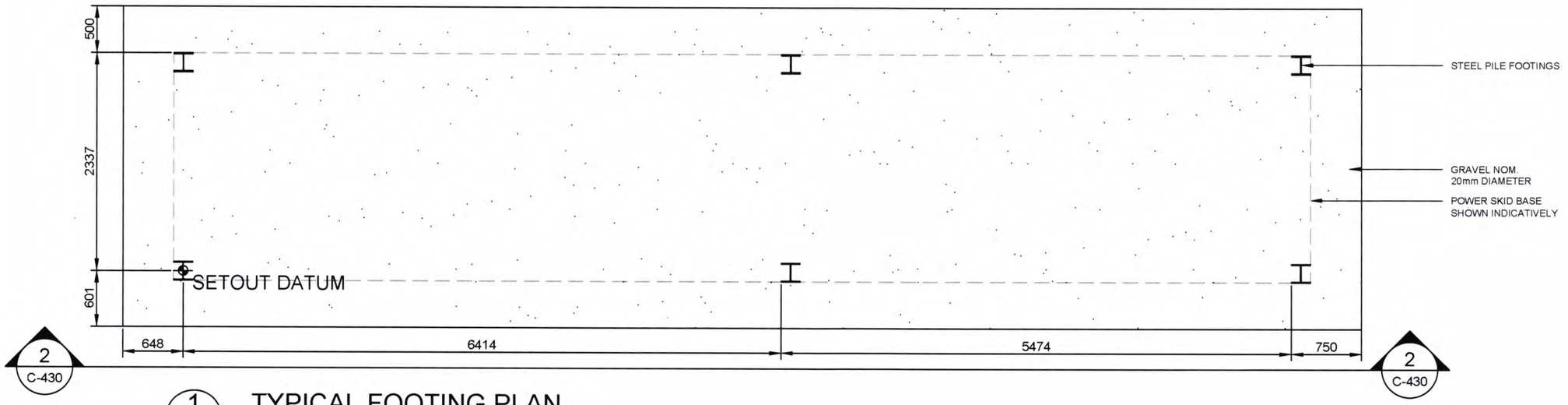
PROJECT: AVISFORD MINI SUSTAINABLE ENERGY PARK

CLIENT: ITP SOLAR DEVELOPER

ADDRESS: AROCKA, 129 OLD MILL RD, GULGONG NSW 2852, AUSTRALIA

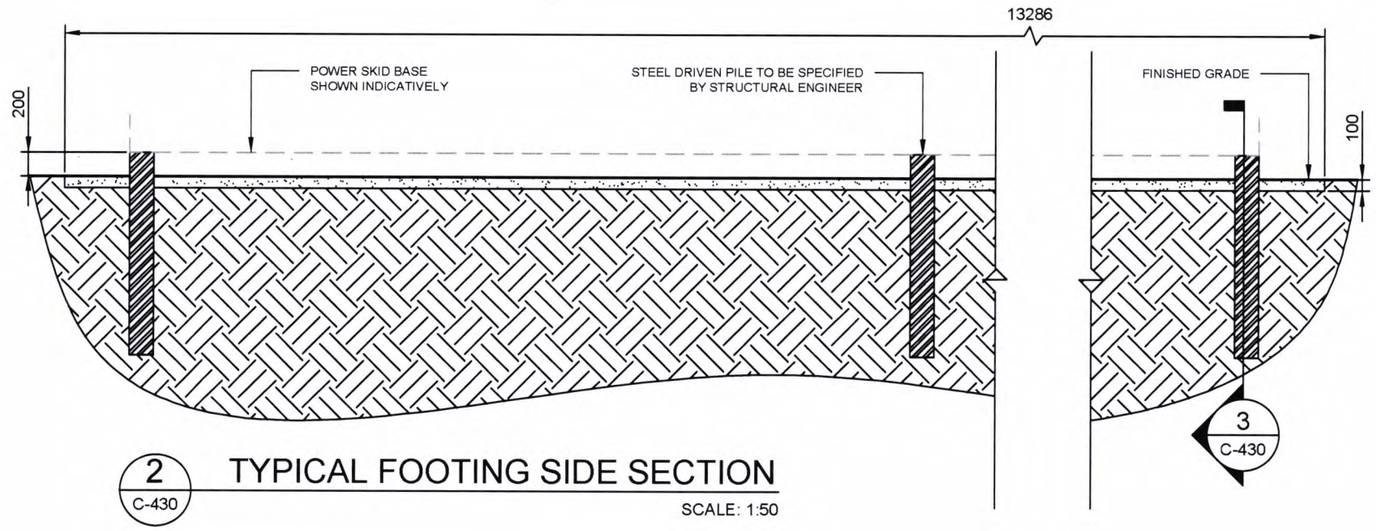
DRAWING NO: **GLG2A-C-130**

SCALE: AS NOTED
SHEET SIZE: A3
ORIG. DATE: 21/5/19
REV. DATE: 11/10/19
REV NO: **2**



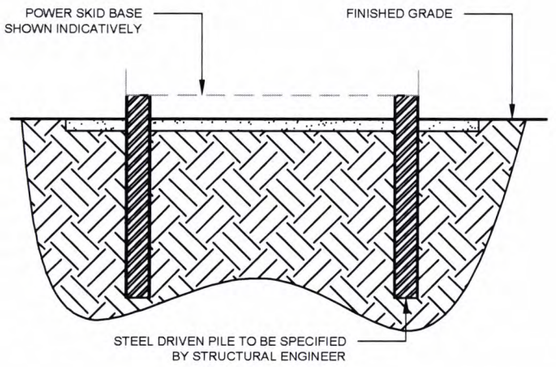
1 C-430 **TYPICAL FOOTING PLAN**

SCALE: 1:50



2 C-430 **TYPICAL FOOTING SIDE SECTION**

SCALE: 1:50



3 C-430 **TYPICAL FOOTING END SECTION**

SCALE: 1:50

DEVELOPMENT APPLICATION

NO	STAGE	DATE
1	ISSUE FOR DA APPROVAL	13/06/19
2	####	####
3	####	####
4	####	####
5	####	####
6	####	####

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AUSTRALIA

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APPROVED LF, KB

DO NOT SCALE.
ALL MEASUREMENTS IN MM UNLESS OTHERWISE STATED

DRAWING **INVERTER STATION FOOTING DETAIL**

PROJECT AVISFORD MINI SUSTAINABLE ENERGY PARK
CLIENT ITP SOLAR DEVELOPER
ADDRESS AROCKA, 129 OLD MILL RD, GULGONG NSW 2852, AUSTRALIA

SCALE AS NOTED
SHEET SIZE A3
ORIG. DATE 23/5/19
REV. DATE 11/10/19

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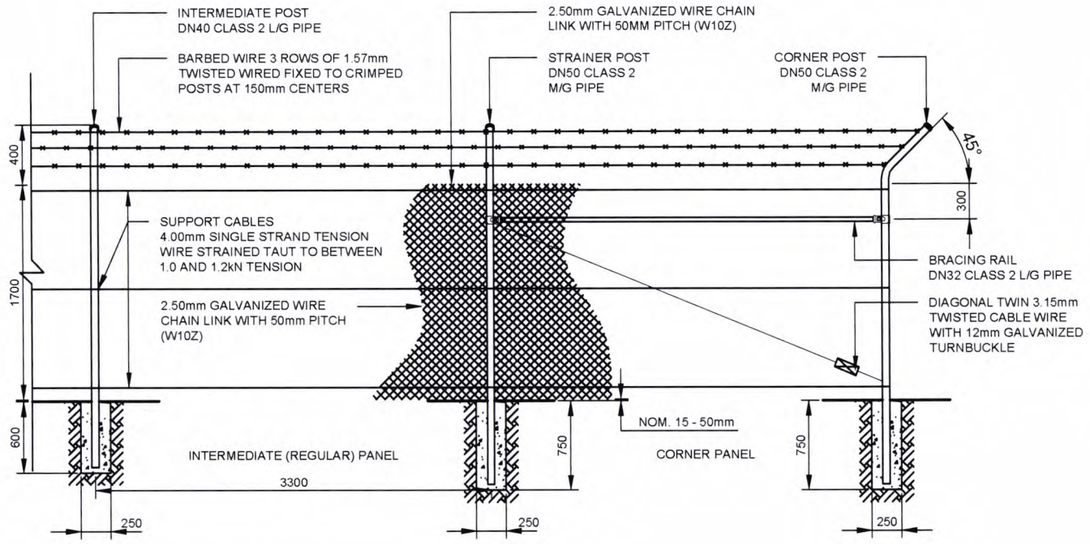
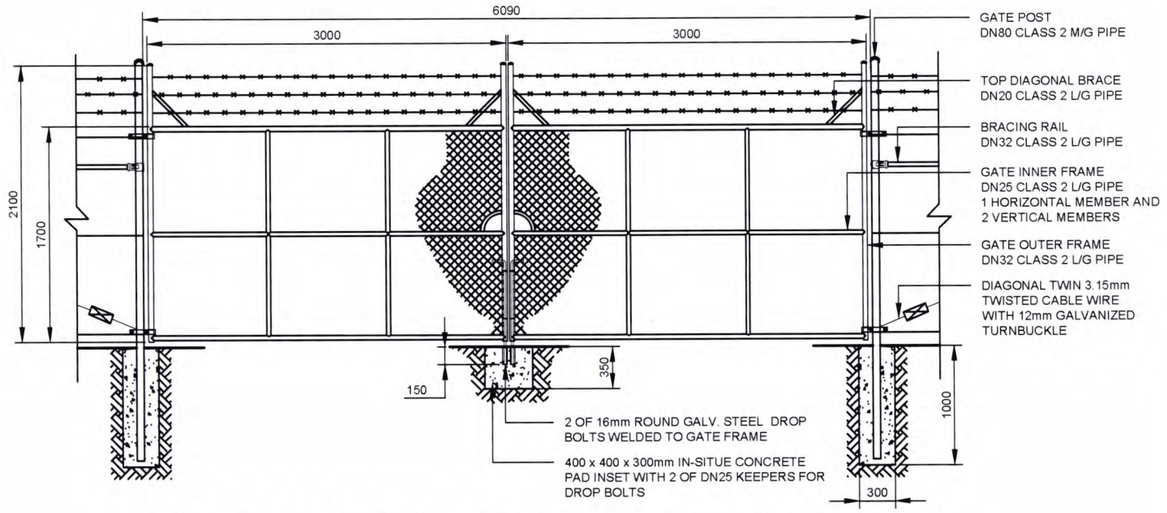
REV NO **1**



1 - TYPICAL FENCE SECTION

SCALE: 1:50



3 - DOUBLE LEAF 6 METER GATE SECTION

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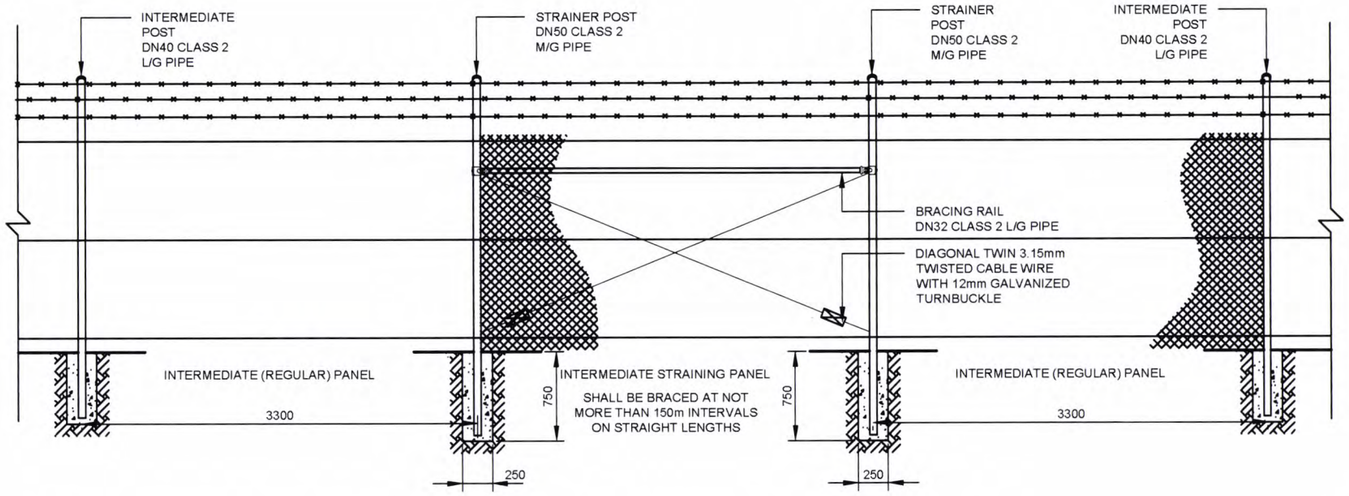

2 - INTERMEDIATE STRAINING PANEL FENCE SECTION

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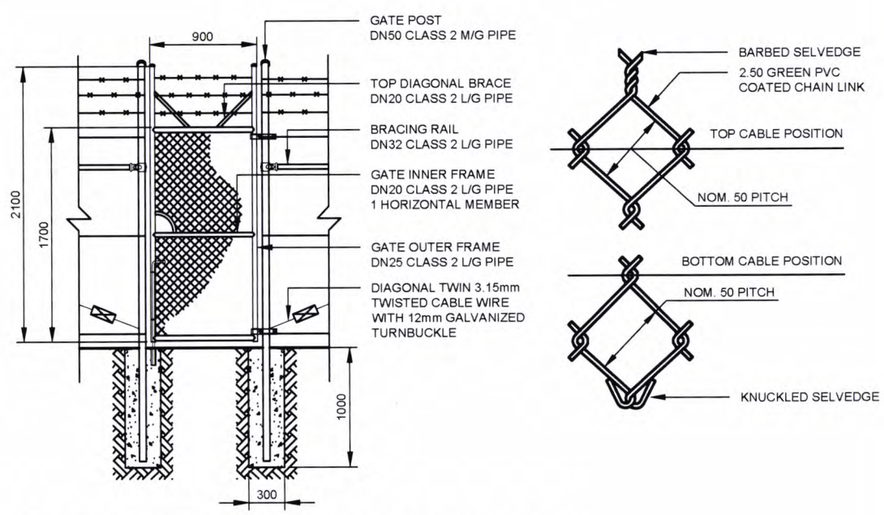

4 - SINGLE LEAF GATE SECTION

SCALE: 1:50

DEVELOPMENT APPLICATION

NO	STAGE	DATE
1	ISSUE FOR DA APPROVAL	13/06/19
2	####	####
3	####	####
4	####	####
5	####	####
6	####	####

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DRAWN: NL
CHECKED: LF, KB
APPROVED: LF, KB

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DRAWING: **TYPICAL FENCING DETAIL**

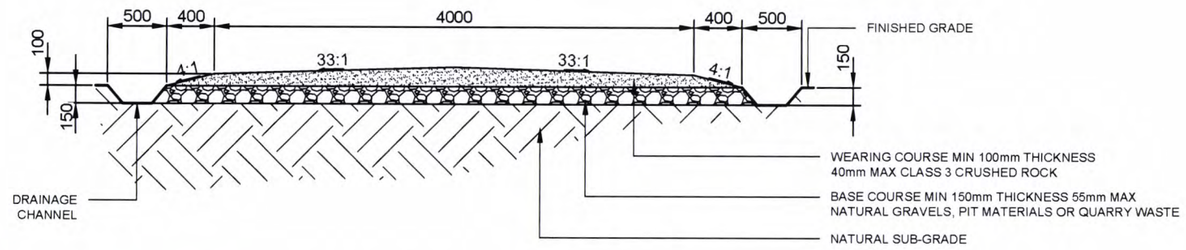
PROJECT: AVISFORD MINI SUSTAINABLE ENERGY PARK

CLIENT: ITP SOLAR DEVELOPER

ADDRESS: AROCKA, 129 OLD MILL RD, GULGONG NSW 2852, AUSTRALIA

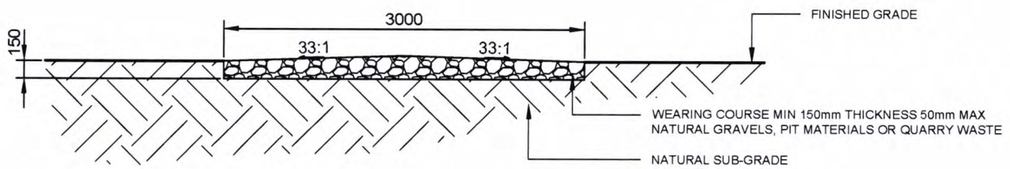
DRAWING NO: **GLG2A-C-530**

SCALE: AS NOTED
SHEET SIZE: A3
ORIG DATE: 22/5/19
REV DATE: 4/6/19
REV NO: 1



1 / - CROSS SECTION - PRIMARY ROAD

SCALE: 1:50



2 / - CROSS SECTION - SECONDARY ROAD

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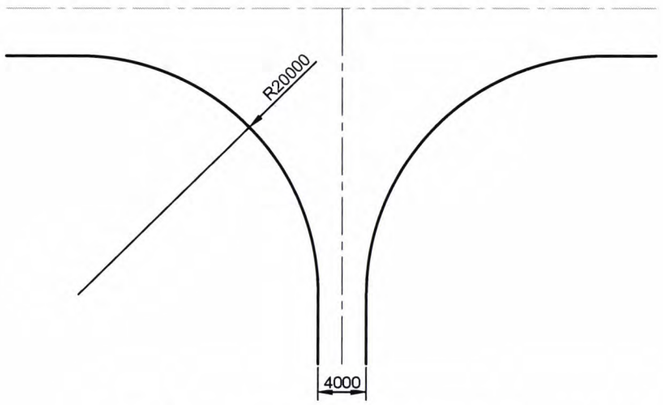

3 / - TYPICAL TURNING DETAIL PLAN

SCALE: 1:500

DEVELOPMENT APPLICATION

NO	STAGE	DATE
1	ISSUE FOR DA APPROVAL	13/06/19
2	####	####
3	####	####
4	####	####
5	####	####
6	####	####

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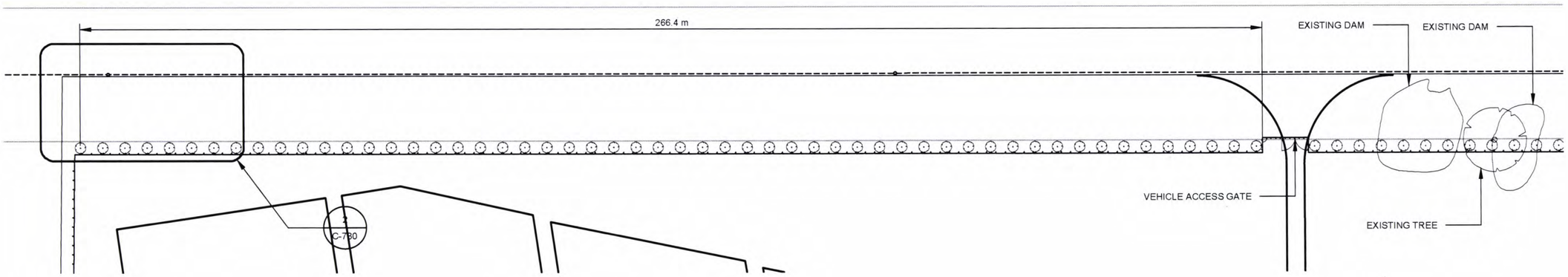
DRAWING **ACCESS ROAD DETAILS**

PROJECT AVISFORD MINI SUSTAINABLE ENERGY PARK
CLIENT ITP SOLAR DEVELOPER
ADDRESS AROCKA, 129 OLD MILL RD, GULGONG NSW 2852, AUSTRALIA

SCALE AS NOTED
SHEET SIZE A3
ORIG. DATE 22/5/19
REV. DATE 11/10/19

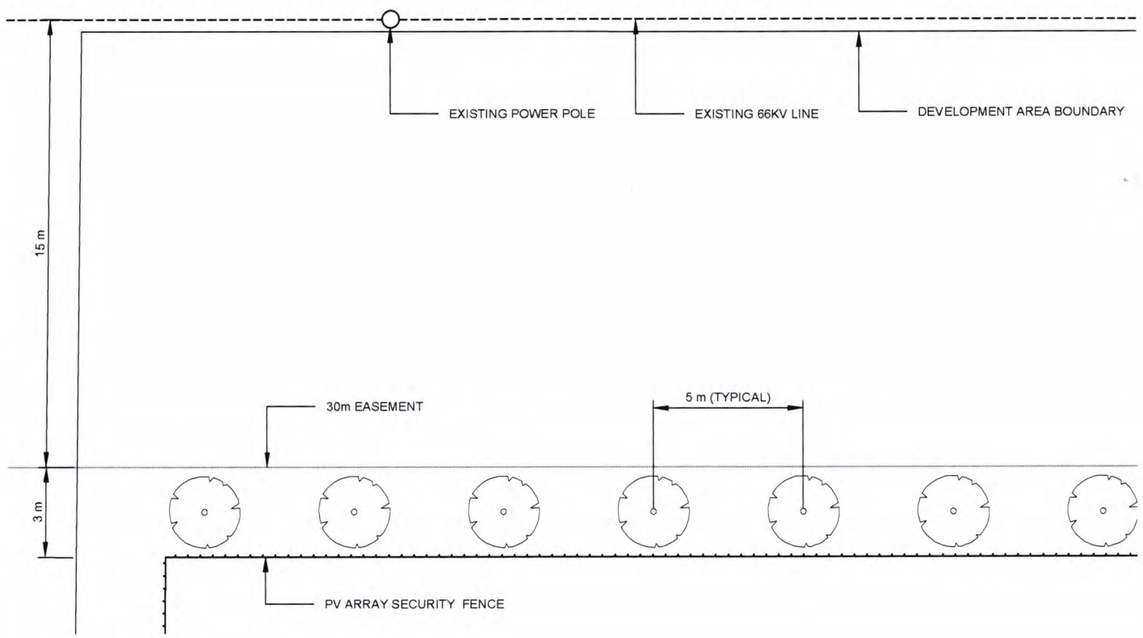
DRAWING NO **GLG2A-C-631**
REV NO **1**

g:\itp solar farm development\a5000 engineering team\6 site-specific work\glg2a gulgong 2a\4 system design\4 01 cad\C-631 ACCESS ROAD DETAILS.dwg, PLOTTED BY WOOKYEUNG JOE AT 11/10/2019 1:21 PM



1 PARTIAL LANDSCAPE PLAN

SCALE: 1:1000



2 DETAILED LANDSCAPE PLAN

SCALE: 1:200

LANDSCAPE INFORMATION	
INDICATIVE VEGETATION TYPE	ACACIA AND GREVILLEAS
PLANT SPACING	5 m
MAX. PLANT HEIGHT	3 m
NO. PLANTS	363

DEVELOPMENT APPLICATION

NO	STAGE	DATE
1	ISSUE FOR DA APPROVAL	13/06/19
2	####	####
3	####	####
4	####	####
5	####	####
6	####	####

NOTES:

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AUSTRALIA

DRAWN WJ
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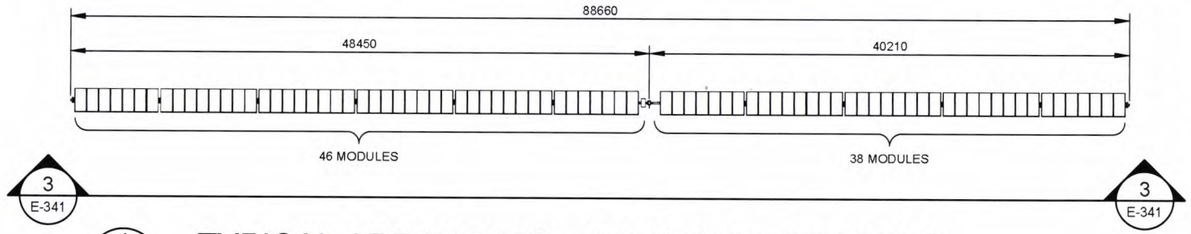
DRAWING: **LANDSCAPE PLAN**

PROJECT: AVISFORD MINI SUSTAINABLE ENERGY PARK
CLIENT: ITP SOLAR DEVELOPER
ADDRESS: AROCKA, 129 OLD MILL RD, GULGONG NSW 2852, AUSTRALIA

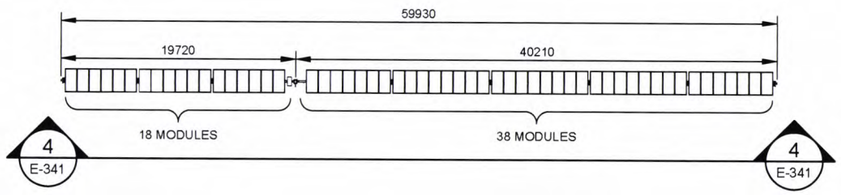
DRAWING NO: **GLG2A-C-730**

SCALE: AS NOTED
SHEET SIZE: A3
ORIG. DATE: 4/6/19
REV. DATE: 11/10/19
REV NO: 1



1 E-341 TYPICAL ARRAY PLAN - 84 MODULE TRACKER

SCALE: 1:500



2 E-341 TYPICAL ARRAY PLAN - 56 MODULE TRACKER

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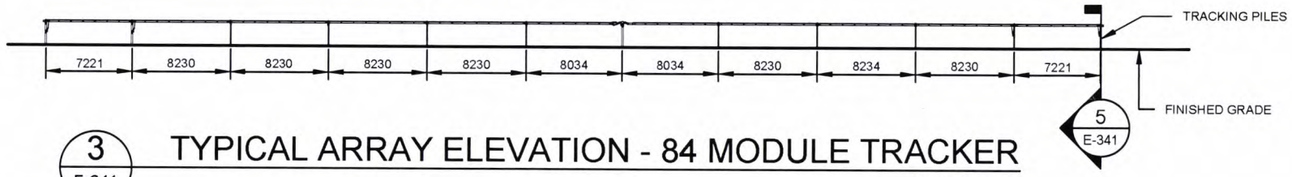
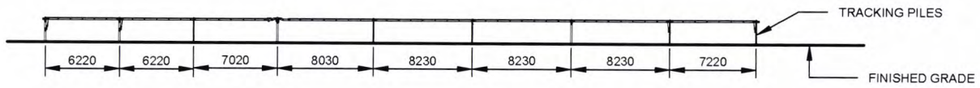


3 E-341 TYPICAL ARRAY ELEVATION - 84 MODULE TRACKER

SCALE: 1:500



4 E-341 TYPICAL ARRAY ELEVATION - 56 MODULE TRACKER

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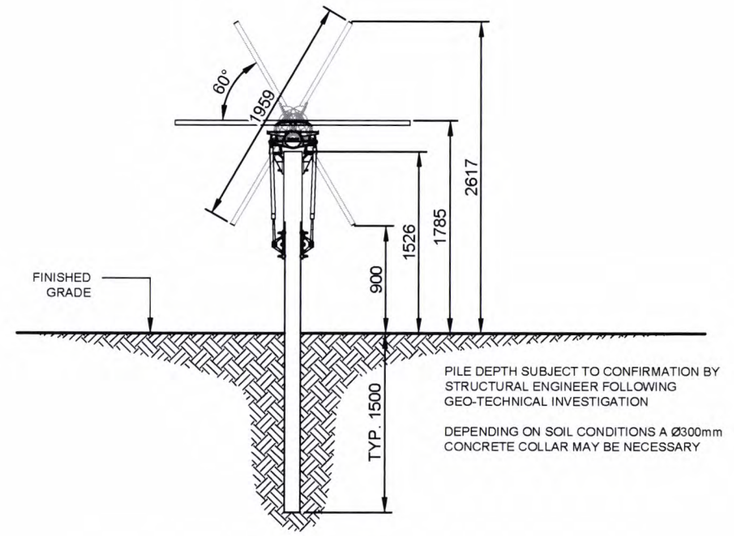

5 E-341 TYPICAL ARRAY SECTION

SCALE: 1:50

DEVELOPMENT APPLICATION

NO	STAGE	DATE
1	ISSUE FOR DA APPROVAL	13/06/19
2	####	####
3	####	####
4	####	####
5	####	####
6	####	####

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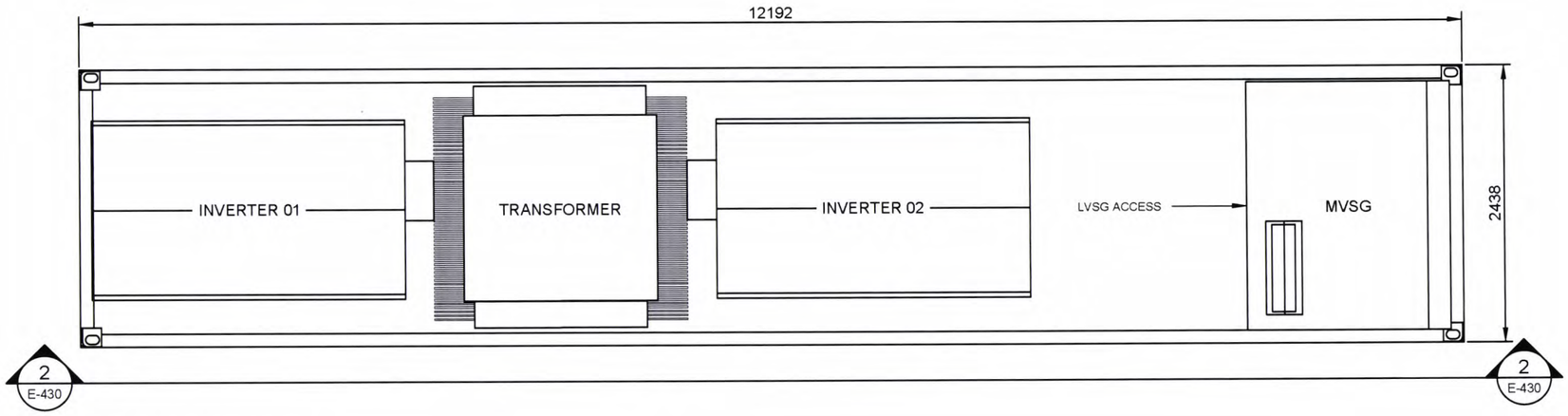
DRAWING: **TYPICAL ARRAY DETAIL**
—

PROJECT: AVISFORD MINI SUSTAINABLE ENERGY PARK
CLIENT: ITP SOLAR DEVELOPER
ADDRESS: AROCKA, 129 OLD MILL RD, GULGONG NSW 2852, AUSTRALIA

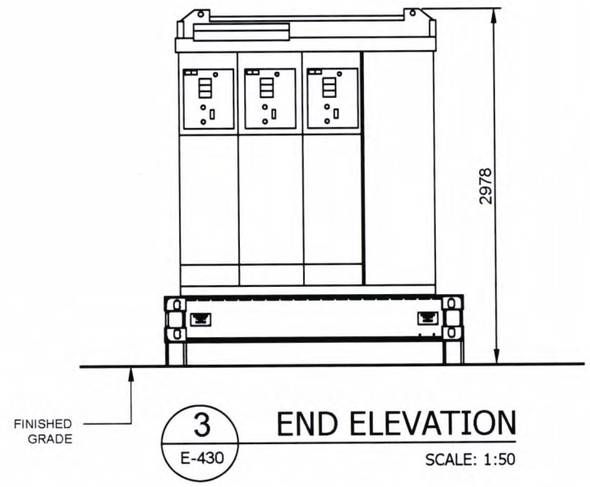
DRAWING NO: **GLG2A-E-341**

SCALE: AS NOTED
SHEET SIZE: A3
ORIG. DATE: 22/5/19
REV. DATE: 11/10/19
REV NO: 1



1 / - PLAN VIEW

SCALE: 1:50



3 / E-430 END ELEVATION

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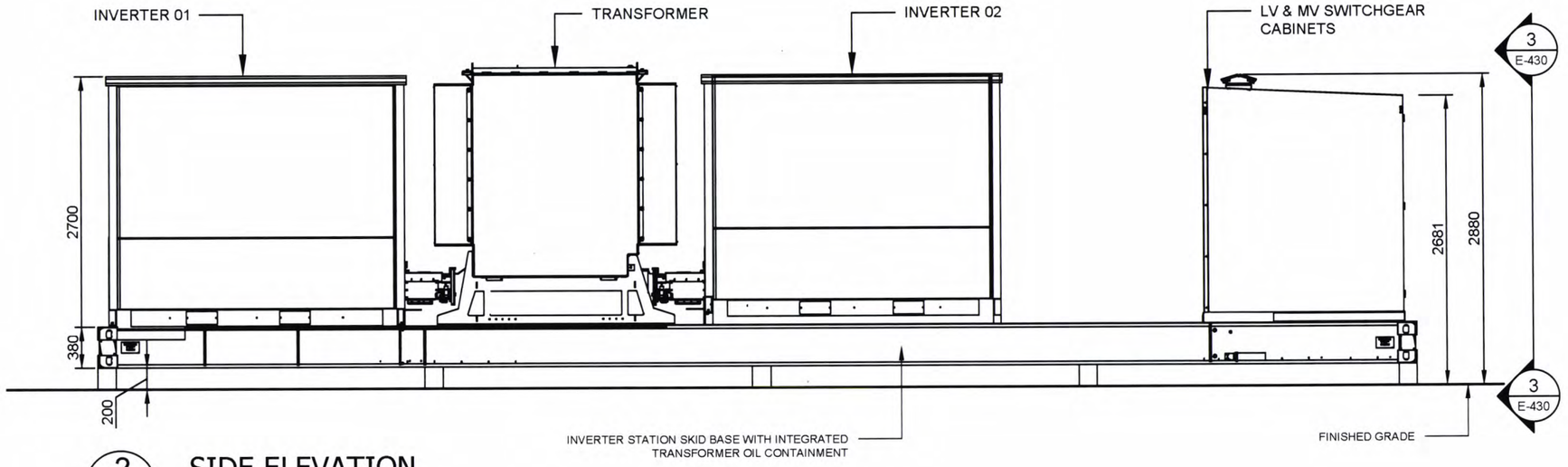

2 / E-430 SIDE ELEVATION

SCALE: 1:50

DEVELOPMENT APPLICATION

NO.	STAGE	DATE
1	ISSUE FOR DA APPROVAL	13/06/19
2	####	####
3	####	####
4	####	####
5	####	####
6	####	####

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AUSTRALIA

DRAWN	NL
CHECKED	LF
APPROVED	KB

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DRAWING	TYPICAL INVERTER STATION DETAIL

PROJECT	AVISFORD MINI SUSTAINABLE ENERGY PARK
CLIENT	ITP SOLAR DEVELOPER
ADDRESS	AROCKA, 129 OLD MILL RD, GULGONG NSW 2852, AUSTRALIA
DRAWING NO	GLG2A-E-430

SCALE	AS NOTED
SHEET SIZE	A3
ORIG. DATE	22/5/19
REV. DATE	11/10/19
REV NO.	1

STATEMENT OF ENVIRONMENTAL EFFECTS

Lots 460-464 DP 755434, 129 Old Mill Road, Gulgong, NSW

Avisford Mini Sustainable Energy Park

Zenith
TOWN PLANNING

sustainable thinking

Zenith Town Planning Pty Ltd
PO Box 591 Moruya NSW 2537
0408 258 877|zenithplan@bigpond.com|www.zenithplan.com.au

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TABLE OF CONTENTS

Document Details & History

Project number	0619
Project title	Avisford Mini Sustainable Energy Park
Document title	Statement of Environmental Effects
Client	IT Power (Australia) Pty Ltd
Author	Allen Grimwood
ABN	11 624 467 349
Version	Draft 28 May 2019
	Final 6 June 2019

1. INTRODUCTION

1.1 Overview

The purpose of this Statement of Environmental Effects is to support an application to Mid-Western Regional Council to develop a solar farm at Lots 460-464 DP 755434, No 129 Old Mill Road, Gulgong, referred to as the Avisford Mini Sustainable Energy Park. The application is for regionally significant development that needs consent and is to be determined by the Western Regional Planning Panel.

There are no other separate approvals required to be obtained under section 4.46 of the *Environmental Planning and Assessment Act 1979*. The application is therefore not integrated development.

This Statement has been prepared having regard to pre-lodgement advice provided by Mid-Western Regional Council during discussions held during January and February 2019. Information has also been sourced from the Council's website, the NSW legislation website, SIX Maps, the website of the Office of Environment and Heritage, and the Department of Planning & Environment's Planning Portal.

All information referenced in this Statement has been sourced from publicly available documents or websites and from expert reports produced to support the application.

1.2 Scope of the report

The scope of this report is to describe the location and physical characteristics of the site on which the development is proposed, identify relevant provisions of plans and policies applying to the land, and to discuss any potential environmental impacts of the development and proposed servicing arrangements.

The purpose of this report is to assist Council's assessment of the proposal against the matters for consideration listed in section 4.15 of the *Environmental Planning and Assessment Act 1979*.

1.3 The proponent

The proponent for the proposed Avisford Mini Sustainable Energy Park is IT Power (Australia) Pty Ltd. IT Power (Australia) is a private sector organization based in Canberra and Sydney, which was established in 2003. It is part of the IT Power Group which was formed in 1981 in the UK to bring together specialists in renewable energy, energy efficiency and carbon markets. IT Power offers expertise in renewable energy and energy efficiency, including research, development and implementation, managing and reviewing government incentive programs, high level policy analysis (including carbon markets), engineering design and project management.

1.4 Justification

Solar energy is energy created by the heat and light of the sun. Solar power is produced when this energy is converted into electricity or used to heat air, water, or other substances. Australia has the highest average solar radiation per square metre of any continent in the world. Despite uncertainty regarding energy policy, the Commonwealth and NSW Governments have recognized the need to supplement energy derived from fossil fuels with energy generated from renewable sources. Alternative energy supply may be sourced from solar photovoltaic, geo-thermal, solar thermal, wave and tidal action, and wind.

The development of solar photovoltaic power is well underway in NSW and across Australia. This growth in the local solar PV sector continues to provide a significant boost for Australia's regional economy with renewable infrastructure development estimated to create upwards of 2,300 direct jobs plus indirect employment.

According to the Australian Renewable Energy Agency (ARENA), the deployment of household solar PV that generates about 5 kW is expected to continue and at the same time an increase in rooftop solar PV installations on commercial premises generating around (10-100 kW) is expected. Large scale solar PV is also rapidly expanding in Australia with several solar farms being constructed that will have the capacity to generate over 50MW. The proposed Avisford Mini Sustainable Energy Park aims to fill the gap in the mid-sized plants. It will generate 5MW of AC power and contribute to renewable energy supply to supplement electricity generation from coal, oil and gas and assist to reduce reliance on these unsustainable means of supply. An alternative site has been considered in Gulgong located at 67 Gossage Road (Lot 479 DP 39712), however, the proposed development site is preferred primarily due to proximity to existing electricity infrastructure and favourable lease arrangements.

The proposed development is in accordance with relevant objects of the *Environmental Planning and Assessment Act 1979* in that it will assist to generate power to be distributed to the residents of NSW thereby promoting the social and economic welfare of the community in a manner that manages and conserves natural resources.

The Avisford Mini Sustainable Energy Park will further the goals of sustainability, and the orderly and economic use of land. The development will not detrimentally affect the environment, biodiversity or cultural heritage.

2. SITE DESCRIPTION AND CONTEXT

2.1 Description

The site of the proposed Avisford Mini Sustainable Energy Park is described as Lots 460-464 DP 755434, No 129 Old Mill Road, Gulgong, NSW. It is located approximately 1.8 kilometres west of the town centre of Gulgong and is an irregular shape with an area of approximately 16 hectares.

The southern boundary is separated from the Castlereagh Highway by an unused section of railway land although the south-western corner of Lot 460 borders the highway for a distance of approximately 50 metres. Existing access to the site is located at the centre of Lot 461 off Old Mill Road.

An unformed road separates the eastern boundary of the site at Lot 464 from farmland. A 66kV line runs along a 30 metre wide easement parallel to Old Mill Road and within the development site. A 22kV line runs south to north to connect to the 66kV line via an easement over Lot 464 and adjoining land to the east. The adjoining property to the west is Crown land and is a rehabilitation reserve.

The location of the site is shown in Figure 1 below.

Figure 1: Locality map. Source: SIX Maps, 2019

The site has been fully cleared in the past for agricultural use other than a single eucalypt tree straddling the boundary of Lots 461 and 462 adjacent Old Mill Road and a farm dam. The topography is flat and there are no structures on the site other than two small dams.

2.2 Context

The site and surrounding countryside is generally flat with gentle undulations. The site is not mapped as being bushfire prone land. An unused rail cutting runs parallel to the southern boundary between the subject site and the Castlereagh Highway. This rail corridor is known as the 'Sandy Hollow – Maryvale Railway' and was commenced during a job creation scheme during the Great Depression.

Land surrounding the development site is predominantly farmland with extractive industries taking place on land directly south of the Castlereagh Highway. Rural farm dwellings are located to the north-west and north-east of the site at distances of 675 metres and 265 metres to the closest point respectively and separated by Old Mill Road. Rural farm dwellings are located to the south and south-east of the site at distances of 177 metres and 395 metres respectively to the closest point and separated from the development site by the Castlereagh Highway and the vacant rail corridor. The nearest dwelling within the urban area of Gulgong is 715 metres to the east of the site.

An aerial image of the site and surrounding land is shown in Figure 2 below. The site is edged red.

Figure 2: Aerial image dated April 2011. Source: SIX Maps, 2019

Below are photographs of the property that show land uses and existing development on the site and adjoining land. All photographs were taken in January 2019 by Zenith Town Planning Pty Ltd.

Plate 1: Looking west along Old Mill Road with the development site on the left

Plate 2: Looking east along Old Mill Road towards Gulgong with the development site on the right

Plate 3: Looking south across farmland from Old Mill Road

Plate 4: Looking west along the Castlereagh Highway with the rehabilitation reserve on the left

Plate 5: Looking south across the development site from the Castlereagh Highway road reserve

Plate 6: Looking into the site with the dam and eucalypt in the foreground

Below is an extract from the topographic map for land in the vicinity of Gulgong. This map shows the location of the settlement, services including transport infrastructure, dams, cadastre and waterways. The development site is 1.1 kilometres south of a landing strip.

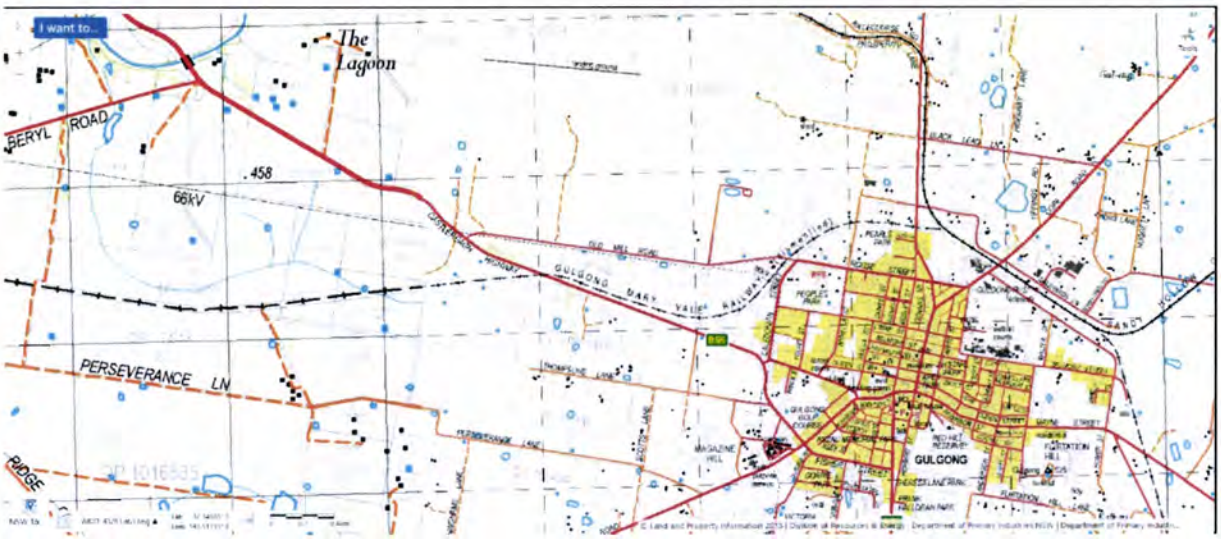

Figure 3: Extract from the topographic map. Source: Land & Property Information 2015

2.3 Climate

Global solar exposure is described on the Bureau of Meteorology website as being the total amount of solar energy falling on a horizontal surface. The daily global solar exposure is the total solar energy for a day. Typical values for daily global solar exposure range from 1 to 35 MJ/m^2 (megajoules per square metre). The values are usually highest in clear sunny conditions during the summer, and lowest during winter or very cloudy days.

Figure 4 below shows average daily solar exposure for the 12 month period 1 May 2018 to 30 April 2019. Mid-Western LGA has received an average of between 16 and 20 MJ/m^2 each day, placing it within the second highest area receiving solar radiation in Australia.

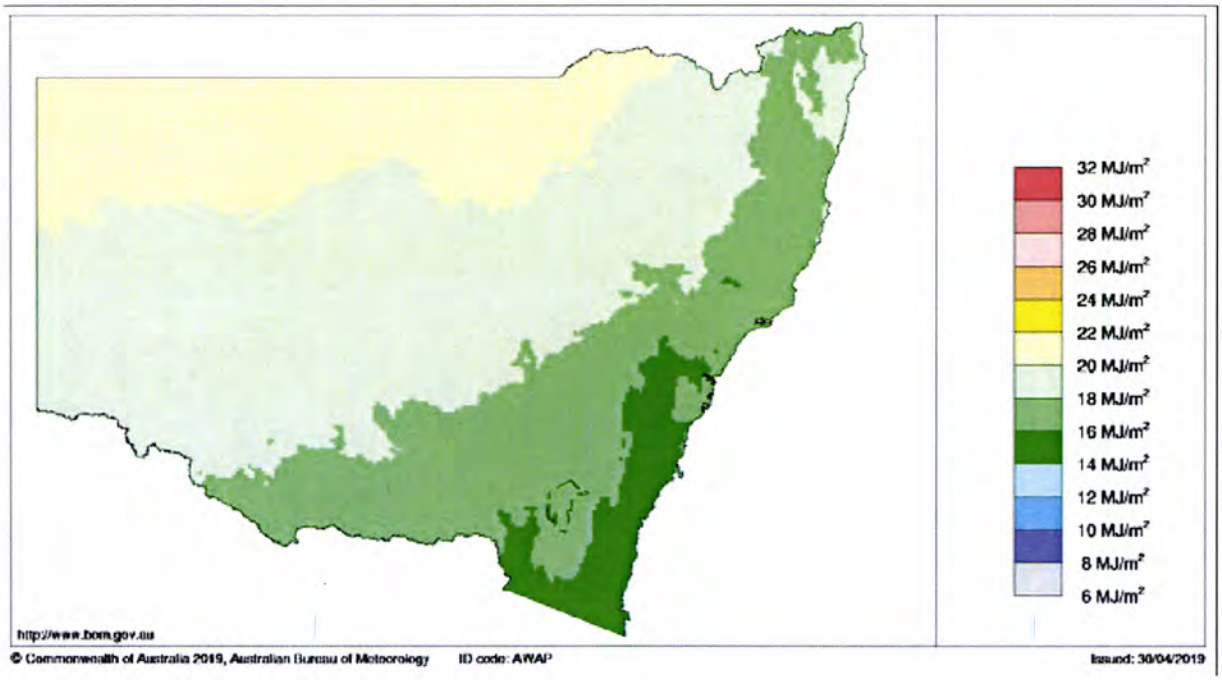

Figure 4: Average daily solar exposure. Source: Australian Bureau of Meteorology

The mean monthly global solar exposure measured at Gulgong Post Office, the closest measuring station to the Avisford Mini Sustainable Energy Park site, is given in Table 1 below. The annual average for 2018 was 18.4MJ/m^2.

Table 1: Mean monthly global solar exposure at Gulgong Post Office, 2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly mean	26.1	21.8	19.9	15.9	11.8	10.3	11.9	14.0	17.8	21.0	23.2	27.2

The map below (Figure 5) shows the average daily hours of sunshine across Australia. Mid-Western LGA receives and average of 7 to 8 hours of sunshine each day.

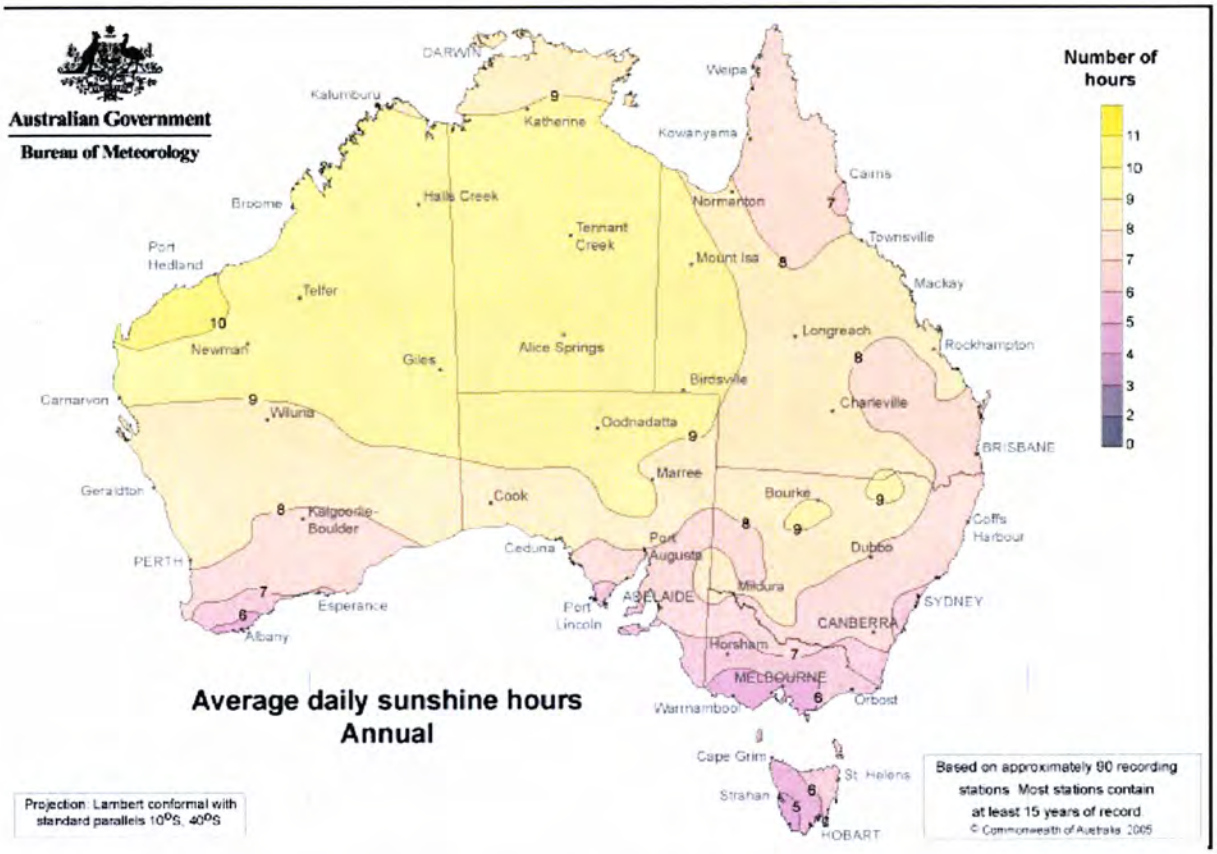

Figure 5: Average daily sunshine hours. Source: Australian Bureau of Meteorology

The global solar exposure coincides with seasons – the longer the daylight hours the greater the solar radiation due to the tilt of the earth during summer months. Rainfall is spread relatively evenly across the year and so does not appear to impact on the level of solar radiation.

Solar exposure estimates are important for a wide range of applications, including for agriculture, power generation and solar heating system design and use. This climatic information sourced from the Australian Bureau of Meteorology indicates that the global solar exposure, or solar radiation, is sufficient to support power generation in the proposed location which benefits from existing grid infrastructure such as the 66kV lines running through the easement parallel to Old Mill Road.

3. DETAILS OF THE PROPOSED DEVELOPMENT

3.1 Overview

The proposed Avisford Mini Sustainable Energy Park is to be located at 129 Old Mill Road, west of the town of Gulgong. The site is approximately 16 hectares of agricultural land that is currently vacant. A lease agreement with terms of 25 years is being negotiated with the land owner with the intention of constructing a solar farm with a DC array capacity of 6.1MW and an AC output of 5MW. It would be capable of generating 12,700MWh annually.

The array is proposed to be placed along the five allotments that comprise the development site and would occupy most of these allotments. Power is to be distributed to the grid maintained by Essential Energy. The solar farm is to connect to the 22kV which feeds into the Gulgong Zone Substation. Any power not consumed by the town would flow up stream to the Beryl substation.

Details of the layout and specifics of the development are show on the General Arrangement plan submitted with the development application (Drawing No GLG2A-G-210).

3.2 Photovoltaic panels

There are proposed to be approximately 16,000 solar modules installed in rows comprising 84 modules of 88.6 metres long and 2 metres wide, and 56 modules being 60 metres long and 2 metres wide. There is approximately 5.7 metres spacing between each row.

Each row of PV modules will rotate to track the sun across the sky from east to west each day. The hub height of each tracker is 1.6 metres with the peak of the modules reaching an approximate height of 2.5 metres when the array is fully tilted to 60 degrees from horizontal, i.e. in the early morning and late evening.

3.3 Inverters and battery storage

Two 2.5 MW AC inverter stations will be installed at the solar farm. These inverters are to be located within the array and are each mounted on a 6 metre long skid. Each of these inverter stations incorporate high and medium voltage switchgear and transformers.

The inverters will connect by way of underground cables to connect to the Essential Energy 22kV feeder that runs roughly north-south at the eastern end of the development site that feeds into the Gulgong Zone Substation to inject power to the electricity grid. Dial-before-you-dig investigations have been carried out during the planning stage

3.4 Services

Reticulated water and sewer services are not required to be provided to the solar farm as there are no permanent offices or amenities proposed on site. Maintenance workers would not be required to remain on site. Cleaning of the PV panels would be carried out on an annual basis to maximise the performance of the system. This is done using water brought into the site and a sponge mop.

Vehicle access to the site would be by way of the existing driveway entrance located at the centre of Lot 461 off Old Mill Road adjacent the existing dam. A secondary emergency access point is proposed at the south-eastern corner enabling vehicles to use a 3 metre setback from the property boundary to the security fence. No access is proposed to be created off the Castlereagh Highway. During the construction stage there would be approximately 45 semi-articulated trucks, with an expected daily maximum of 4 vehicles, accessing the site to deliver PV panels, mounting frame equipment and inverters plus construction machinery to grade the accessways and erect the mounting system. A site access road would run around the perimeter and through the centre of the array.

In addition, it is expected that car parking for up to 40 small vehicles will be needed to cater to the 50 construction workers at the rate of 0.8 spaces per worker. A temporary car parking area for workers vehicles is to be sited to the west of the main vehicle access as shown on the General Arrangement plan. A small bus is also proposed to be used to transport workers from nearby towns to reduce the numbers of small vehicles accessing the site during construction.

Materials laydown areas are located at the south-western and north-eastern corners of the development site and adjacent the site entrance. Internal road will be 5 metre wide roads running through the site in north-south and east-west directions.

3.5 Construction

The mounting system for the PV panels is constructed on piles that are driven into the ground using a vibrating pile driver. The piles will be driven approximately 1.2 to 3.5 metres into the ground, the depth to be confirmed by a geotechnical/structural engineer.

An existing native eucalypt tree and dam that are located alongside the main vehicle access are to be preserved. A dam that is located approximately 230 metres from the eastern boundary of the development site is to be filled.

During construction there is expected to be 50 personnel on site working from 7.00 am – 4.00 pm Monday to Friday. The construction is expected to take approximately three months. Should it be necessary to carry out work outside these hours then activities would be limited to those generating low noise emissions. Once

operational the site will be unmanned. Maintenance is expected to be carried out quarterly by a crew of two to three people.

3.6 Landscaping

Landscaping is proposed around the eastern, northern and southern perimeter of the site after installation of the panel arrays to provide a visual screen for the occupants of nearby rural dwellings as well as motorists travelling along Old Mill Road and the Castlereagh Highway. The western boundary adjoins existing bushland.

It is proposed to plant native shrubs endemic to the Gulgong locality that will grow to a maximum height of 2 to3 metres and to provide 5 metres separation between each plant. Typical plants would be acacia and grevilleas. The length of the northern boundary is 780 metres, the eastern boundary is 275 metres in length and the southern boundary is 800 metres, giving a total of 1,855 metres. The western boundary adjoins a rehabilitation reserve which is already vegetated with native trees and shrubs. Approximately 363 plants will be required and will be planted within the setback between the security fencing and the boundary. Plantings will be maintained and watered by maintenance crew on a regular basis. Vegetation will be planted within the 3 metre setback from the site boundary to the security fence.

Land that is disturbed during construction of the solar farm and not to be used for access or other maintenance purposes will be sown with native grasses following completion of construction. Planting will also assist to minimise site disturbance and contribute to the rural landscape and character of the Gulgong area.

3.7 Security

The Avisford Mini Sustainable Energy Park is to be enclosed within a 1.8 metre high security fence set within the boundaries and surrounding the array. The proposed fence is to be setback 3 metres from the boundary and arrays will be setback 7 metres from the fence. The fence is to be green coated chain mesh steel topped with three rows of barbed wire giving a total height of 2.1 metres similar to that shown in Plate 7 below.

A row of trees is to be planted on the boundary side of the fence on all sides except the western boundary. Consideration has been given to placing shade cloth on the fence to provide additional screening. Council may wish to impose a condition of consent requiring the shade cloth.

3.8 Decommisioning

The Avisford Mini Sustainable Energy Park is intended to remain in operation indefinitely in order to contribute to sustainable electricity power supply to the state of NSW. If, however, circumstances change

and it is necessary to decommission the farm in around 20 to 25 years then all infrastructure, panels, mounting frames including footings and inverters would be disassembled and removed from the site. All gravel surfacing of accessways would be removed unless required for a future use. The site may then return to an agricultural use. If necessary, Council may impose a condition of consent that requires a decommissioning plan to be prepared and approved prior to the event.

Plate 7: Example of security fencing

4. STATUTORY FRAMEWORK

4.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment (EPA) Act 1979* is the principal piece of legislation governing the use and development of land in NSW. The objects of the Act are:

(a) *to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,*
(b) *to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,*
(c) *to promote the orderly and economic use and development of land,*
(d) *to promote the delivery and maintenance of affordable housing,*
(e) *to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,*
(f) *to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),*
(g) *to promote good design and amenity of the built environment,*
(h) *to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,*
(i) *to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State,*
(j) *to provide increased opportunity for community participation in environmental planning and assessment.*

The objects of the EPA Act are intended to guide land planning and management. Section 4.15 of the Act lists matters for consideration when assessing and determining an application for development.

4.2 State Environmental Planning Policies

4.2.1 State Environmental Planning Policy No 55 – Remediation of Land

SEPP 55 requires Council to consider whether land is contaminated and to determine whether the proposed use is suitable with or without contamination. Council can require an applicant for development to conduct a preliminary investigation and a subsequent more detailed investigation if warranted. Where contamination exists and remediation is necessary, Council must be satisfied that the remediation will take place before the land is used for the proposed purpose. It is noted that should the preliminary investigation identify contamination on the site then the NSW *Contaminated Land Planning Guidelines* apply to subsequent investigations.

The property has been cleared and farmed for many years and is not known to be listed on a Council register of potentially contaminated land. There has been no known historical usage that would cause the land to be contaminated. The use of farm chemicals such as pesticides and fertilisers is not considered to contaminate soils to the extent that mediation is required. It is considered that a preliminary investigation is not required for the development of a solar farm.

4.2.2 State Environmental Planning Policy (Infrastructure) 2007

The aims of *SEPP (Infrastructure) 2007* are to ensure a consistent and flexible planning system to facilitate the delivery of services. The policy identifies environmental assessment categories for types of infrastructure, matters to consider when assessing development adjacent to infrastructure and provides for consultation with relevant public authorities. The policy applies to the whole of NSW. *SEPP (Infrastructure)* contains provisions relating to approval processes and assessment requirements for infrastructure proposals according to the type or sector of infrastructure. It outlines land use zones where types of infrastructure are permissible with or without consent and identifies certain works as exempt and complying development.

Part 3 Division 4 of the policy relates to electricity generating works or solar energy systems. Section 34 enables Development for the purpose of electricity generating works to be carried out by any person with consent on any land in a prescribed rural, industrial or special use zone. Zone RU1 Primary Production is a prescribed rural zone. Similarly, development for the purpose of a solar energy system may be carried out by any person with consent on any land, although this is limited to no more than 100kW in a prescribed residential zone. The proposed development is located in zone RU1 Primary Production and is therefore permitted with consent by *SEPP (Infrastructure) 2007*.

4.2.3 State Environmental Planning Policy (Rural Lands) 2008

SEPP (Rural Lands) 2008 applies to all rural LGAs including Mid-Western Regional Council area. This policy sets out *Rural Planning Principles* and *Rural Subdivision Principles* to implement measures that are intended to reduce land use conflicts and to identify State significant agricultural land.

The development site is not listed in a schedule to the policy as being state significant agricultural land.

4.2.4 State Environmental Planning Policy (State and Regional Development) 2011

Development that is state and regionally significant is identified in *SEPP (State and Regional Development) 2011*. Electricity generating works including solar farms which have a capital investment value of more than $30 million, or a capital investment value of more than $10 million and are located in an environmentally sensitive area of State significance, are declared state significant development. Private infrastructure, including electricity generating stations, that have a capital investment value of over $5 million are declared regionally significant. In this case the proposed development has a CIV of over $5

million and is regionally significant. The application will be determined by the Western Regional Planning Panel.

4.3 Local Environmental Plans

4.3.1 Mid-Western Local Environmental Plan 2012

The property is zoned RU1 primary Production under *Mid-Western LEP 2012*. The objectives of zone RU1 are:

- *To encourage sustainable primary industry production by maintaining and enhancing the natural*
- *resource base.*
- *To encourage diversity in primary industry enterprises and systems appropriate for the area.*
- *To minimise the fragmentation and alienation of resource lands.*
- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *To maintain the visual amenity and landscape quality of Mid-Western Regional by preserving the area's open rural landscapes and environmental and cultural heritage values.*
- *To promote the unique rural character of Mid-Western Regional and facilitate a variety of tourist land uses.*

The development is defined as ***electricity generating works*** which means a building or place used for the purpose of making or generating electricity. This use is prohibited in zone RU1. However, *SEPP (Infrastructure) 2007* prevails over *Mid-Western LEP 2012* to the extent of an inconsistency meaning that the use is permitted with consent in zone RU1 by way of *SEPP (Infrastructure).*

The site is not mapped as being environmentally sensitive in the *Sensitivity Biodiversity Map* that accompanies *Mid-Western LEP 2012* and is not affected by land reservation acquisition provisions of the LEP. It is partially mapped as being ground vulnerable on the *Groundwater Vulnerability Map.*

It is not a listed heritage item and is not in the vicinity of a heritage item or heritage conservation area listed in *Schedule 5 Environmental heritage* of *Mid-Western LEP 2012.*

The following clauses of *Mid-Western LEP 2012* apply to the proposed development:

Clause 6.1 Salinity

The objective of this clause is to provide for the appropriate management of land that is subject to salinity and the minimisation and mitigation of adverse impacts from development that contributes to salinity. Where a development is proposed that may affect the process of salinization or is proposed to be carried out on land affected by groundwater salinity, Council is required to consider any potential impacts on processes,

whether salinity will impact on the development and proposed measures to avoid, mitigate or minimize impacts.

The issue of salinity is addressed in the groundwater assessment and findings are summarized in section 5.3 Water Resources. There is no known salinity issue on the development site.

Clause 6.3 Earthworks

The objective of this clause is to ensure that earthworks for which development consent is required will not have a detrimental impact on environmental functions and processes, neighbouring uses, cultural or heritage items or features of the surrounding land.

Development consent is required for earthworks unless the earthworks are ancillary to development for which development consent has been given. In deciding whether to grant development consent for development involving ancillary earthworks, the consent authority must consider:

(a) *the likely disruption of, or any detrimental effect on, drainage patterns and soil stability in the locality of the development,*
(b) *the effect of the development on the likely future use or redevelopment of the land,*
(c) *the quality of the fill or the soil to be excavated, or both,*
(d) *the effect of the development on the existing and likely amenity of adjoining properties,*
(e) *the source of any fill material and the destination of any excavated material,*
(f) *the likelihood of disturbing relics,*
(g) *the proximity to, and potential for adverse impacts on, any waterway, drinking water catchment or environmentally sensitive area,*
(h) *any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.*

Earthworks associated with the development comprise minor excavation to 150mm to install road base for accessways, 750mm footings for the inverters and security fence strainer posts, 1,000mm footings for the access gate and 1,500mm footings for the panel mounting frames. Cable trenching of 600mm for low voltage cables and 1,200mm deep trenching is also to be carried out. All of these earthworks are ancillary to the development of a solar farm and are not expected to impact adversely on drainage, future use of the land if the facility if decommissioned, relics, the natural environment or adjoining developments.

Clause 6.4 Groundwater vulnerability

The objectives of this clause are to maintain the hydrological functions of key groundwater systems, and to protect vulnerable groundwater resources from depletion and contamination as a result of development. Council is required to consider the potential for groundwater contamination due to the proposed

development, adverse impacts on groundwater dependent ecosystems, cumulative impacts and proposed measures to avoid, mitigate or minimize impacts.

The development site is mapped as being groundwater vulnerable. This issue is addressed in the groundwater assessment and findings are summarized in section 5.3 Water Resources.

Clause 6.9 Essential services

This clause requires a consent authority to be satisfied that any of the following services that are essential for the development are available or that adequate arrangements have been made to make them available when required:

(a) *the supply of water,*
(b) *the supply of electricity,*
(c) *the disposal and management of sewage,*
(d) *stormwater drainage or on-site conservation,*
(e) *suitable vehicular access.*

The supply of water and sewerage services is not required for the proposed development. Electrical services are available to the site. Stormwater management is proposed to be addressed by controls recommended in this Statement with full details to be provided with the application for a construction certificate. Adequate vehicular access is proposed by way of an entrance to the site off Old Mill Road.

There are no draft environmental planning instruments that are on exhibition or have been exhibited but not yet published that apply to the site, or that relate to the proposed development of electricity generating works.

4.4 Development Control Plan

Mid-Western Regional Council DCP 2013 applies to all land in the Mid-Western LGA. There are no specific development controls for solar farms. Council has suggested using boundary setbacks that apply to rural development generally, however, proposed setbacks would be assessed on merit having regard to the potential visual impact.

A draft DCP has been exhibited by Mid-Western Regional Council that aims to impose restrictions on the development and location of solar farms. A draft DCP is not a statutory consideration for assessment of a development application under section 4.15 of the EPA Act. The application for the Avisford Mini Sustainable Energy Park has been lodged prior to the draft DCP taking effect. Savings provisions mean that the application is to be assessed under *Mid-Western Regional Council DCP 2013* that is in force at the time of lodgement.

4.5 Land use strategies

4.5.1 Mid-Western Regional Comprehensive Land Use Strategy

The *Mid-Western Comprehensive Land Use Strategy* was prepared by parsons Brinckerhoff Australia Pty Ltd in August 2010. The purpose of the strategy was primarily to inform the *Mid-Western LEP 2012*, and also to provide direction for *Mid-Western Regional Council DCP 2013* and identify sites that should be subject to further investigation to determine optimum land uses.

The strategy contains mapping of opportunities and constraints for rural land surrounding Gulgong. A '*5 kilometre offset area*' around the township is identified as having potential for rural lifestyle development. The development site is located within this offset area but is not within an area nominated for short, medium, or long term rural lifestyle development. Neighbouring and surrounding land remains zoned rural.

4.5.2 Central West and Orana Regional Plan

The *Central West and Orana Regional Plan 2036* was released in June 2017. It establishes a framework for growth over the next 20 years for the Central West and Orana Region. The Mid-Western Regional Council area is located within the Orana district being the upper part of the region. Economic opportunities identified in the plan include renewable energy generation to promote local jobs in small communities and development opportunities for associated industries. It is stated on page 15 of the plan that *the large open plains of Orana provide the best access for solar energy generation*.

A series of goals, directions and actions are to guide land use planning priorities and decision-making. The plan aims to develop the region as *the most diverse regional economy in NSW*.

Direction 9 is to increase renewable energy generation. Action 9.1 is to ident*ify locations with renewable energy generation potential and access to the electricity network*. In the case of the proposed Avisford Mini Sustainable Energy Park, IT Power have identified the development site as being suitable in terms of existing power infrastructure to enable connection and proximity to the township of Gulgong in order to directly generate power for use by the local community. Action 9.2 is to *facilitate small-scale renewable energy projects using ... solar ... through local environmental plans*.

5. ENVIRONMENTAL EFFECTS

5.1 Biodiversity

5.1.1 Methodology

A desktop biodiversity assessment has been carried out to determine the potential impact on threatened species and endangered ecological communities. This is supported by a site inspection carried out in January 2019 and a site survey in May 2019. The following sources of information and data have been used to determine whether any threatened species or endangered ecological communities are likely to occur on or near the site:

- SIX Maps aerial imagery dated October 2013,
- Sensitive Biodiversity mapping of *Mid-Western LEP 2012*,
- BioNet Atlas of Living Australia,
- Mapping by the NSW Office of Environment and Heritage (Central West Lachlan vegetation mapping, Native Vegetation Regulatory Map, Biodiversity Values Map)
- Schedules to the *Biodiversity Conservation Act 2016,* and
- Protected Matters Report of the *Environment Protection and Biodiversity Act 1999*.

5.1.2 Mid-Western LEP 2012

The development site is located in the Central West Region and is within a rural landscape that has been cleared for agricultural use. It has been recently ploughed and contains one eucalypt tree near the centre of the northern boundary adjacent a dam.

The site is located about 2.3 kilometres south of Wialdra Creek at the closest point which drains to the Cudgegong River south-west of Gulgong. There are no watercourses or wetlands within the site. All native vegetation other than the eucalypt has been cleared including the area for the proposed arrays of panels.

The development site is not shown as being affected by biodiversity on the Sensitive Biodiversity Map of *Mid-Western LEP 2012* as shown in Figure 7 below. Land to the west, which is Crown land and rehabilitation reserve, is mapped as being of high biodiversity sensitivity as is land on the southern side of the Castlereagh Highway.

Figure 7: Extract from Mid-Western LEP 2012 Sensitive Biodiversity Map Sheet BIO_005

5.1.3 Significant flora

A search of the BioNet Atlas (10 km radius from the site) revealed records for two (2) threatened flora species, both listed in the schedules of the NSW *Biodiversity Conservation Act 2016* only with the nearest record about 1 kilometre from the site (report appended as Attachment A). An Environment Protection and Biodiversity Conservation Act Protected Matters Search Report showed nine *EPBC Act* listed threatened flora species as being predicted for the locality (report appended in Attachment B). The likelihood of occurrence of each species, within and adjacent to the subject land, is assessed in Table 2 below.

A search of the Bionet Atlas also found potentially five endangered ecological communities in the search area. These are:

- Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes and South Eastern Highlands Bioregions
- Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions
- Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions
- White Box Yellow Box Blakely's Red Gum Woodland

A search of datasets maintained by OEH was then carried out to produce a map of vegetation communities on the development site and surrounding land (mapped in Figure 8, below, and listed in Table 2 below).

There are no recorded vegetation communities on the development site, as confirmed with aerial imagery available on SIX Maps and during site visits. Remnants of these communities are found on land adjoining the immediate area to be developed for the solar farm to the west and south of the Castlereagh Highway. All are representative of White Box Yellow Box Blakely's Red Gum Woodland endangered ecological community under the *Biodiversity Conservation Act 2016* and critically endangered ecological community under the *EPBC Act*. Refer to the likelihood of occurrence assessment below for further information.

Table 2: Remnant vegetation communities in the vicinity of the development site

Plant community type (PCT)	Conservation status	Location	Direct Impact	Indirect impact
PCT 281, Rough-barked Apple – Yellow Box - Red Gum Woodland on alluvial clay to loam soils on valley flats, NSW SWS and BBS bioregions.	'Box Gum Woodland' (EEC - BC Act; CEEC - EPBC Act)	Road reserve (C'reagh Hwy), buffered by cleared railway easement	Nil	Nil
PCT 277, Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW SWS bioregion.		Directly west of site	Nil	Potential

*CEEC = critically endangered ecological community

5.1.4 Significant fauna

The BioNet search showed records of six threatened fauna species within a 10 km radius of the site. All are listed under the NSW BC Act, two of these are also listed under the EPBC Act (see Table 3, below). An EPBC Act Protected Matters Search Report showed nine EPBC Act listed threatened fauna species as being predicted for the locality (report appended as Attachment B).

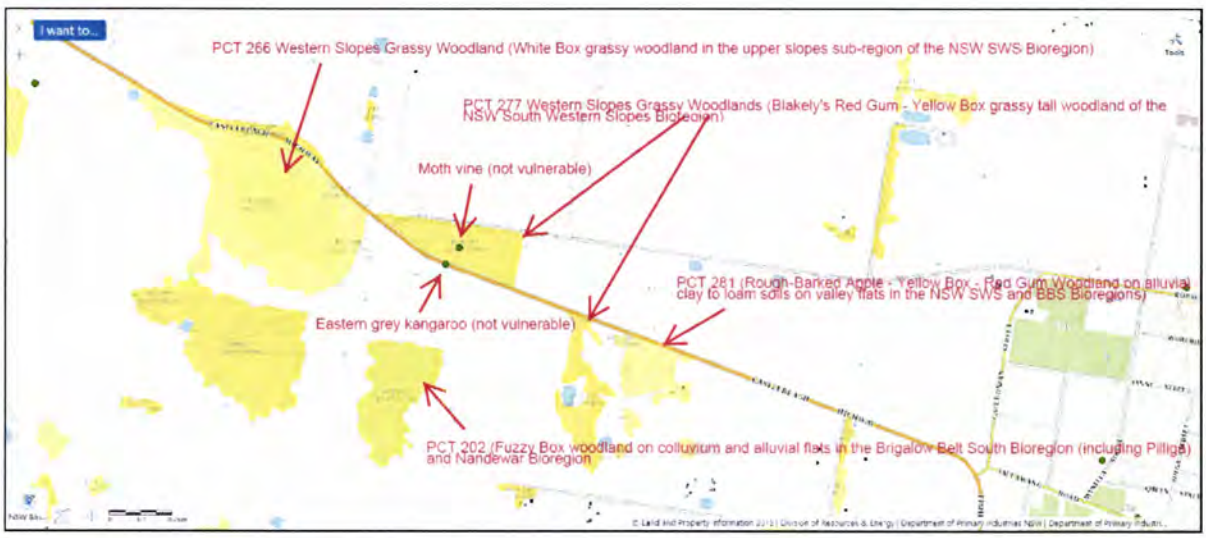

Figure 8: Recorded vegetation communities and species sightings. Source: OEH 2019

5.1.5 Likelihood of occurrence assessment

Potential direct impacts

Given that the part of the site to be developed as a solar farm has been fully cleared and used for agriculture for many years, it does not contain any habitat value for threatened or migratory species (or ecological communities). One native paddock tree is present within on site which does not contain any hollows. As shown in Figure 8, no threatened or migratory species or ecological communities have been recorded on the development site.

Potential indirect impacts

The cleared and heavily modified land within the railway easement directly south of the proposal is not considered to be of any habitat value for listed entities. This land also buffers the vegetation/habitat that occurs within the Castlereagh Highway road reserve and other vegetation to the south. A patch of Box Gum Woodland approximately 5.0 hectares in area occurs adjacent to the western boundary of the development site. This ecological community, and any threatened or migratory species that are likely to use it, are included in the significance assessments, below due to the potential for indirect impacts from the development.

Table 3: Likelihood of occurrence assessment, for species known from within 10km of the site.

Scientific name	Common name	BC Act	EPBC Act	Likelihood of occurrence (in crown reserve patch to west)
Flora				
Acacia ausfeldii	Ausfeld's Wattle	V		Unlikely – this species is widespread in the locality and easily detectible, therefore likely to have been recorded previously.
Diuris tricolor	Pine Donkey Orchid	V		Unlikely - nearest record 6km away. Likely to have been recorded previously as crown reserves are commonly surveyed.
Fauna				
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V		Potential
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Unlikely – nearest record 6 km away on major waterway. This species mainly found in areas with extensive cliffs and caves. It roosts in caves, crevices in cliffs, old mine workings and disused Fairy Martin Nests.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		Potential
Falco subniger	Black Falcon	V		Potential
Stagonopleura guttata	Diamond Firetail	V		Potential
Phascolarctos cinereus	Koala	V	V	Unlikely - nearest record 4.5 km away with good connectivity to major watercourse/other vegetation, while the subject habitat is isolated and on a major road.

E = Endangered; CE = critically endangered; V=vulnerable.

5.1.6 Biodiversity Values Map

The Biodiversity Values Map is given in Figure 9 below. This map identifies land with high biodiversity value as defined by clause7.3(3) of the *Biodiversity Conservation Regulation 2017*. The Biodiversity Offsets Scheme applies to all clearing of native vegetation and other biodiversity impacts prescribed by the regulation on land identified on the map. The Biodiversity Offsets Scheme is used to determine whether the Biodiversity Assessment Method is to be used to assess the impacts of a development proposal and applies to local development.

The scheme is triggered based on threshold levels of clearing comprising the land area to be cleared and whether the area is mapped on the Biodiversity Values Map. In this case the development site is not mapped as being of high biodiversity value. A minimum lot size of 100 hectares applies to Lots 460-464. The threshold for clearing of native vegetation above which the Biodiversity Assessment Method applies is 1 hectare or more. It is not proposed to clear the land of any native vegetation, therefore, it is not necessary to engage an accredited assessor to determine the offsets required to enable the project to proceed.

Figure 9: Biodiversity Values Map. Source: OEH, 2019

5.1.7 Biodiversity Conservation Act 2016 Test of Significance

A test of significance under section 7.3 of the *Biodiversity Conservation Act 2016* is required to be carried out for local development proposals that do not exceed the Biodiversity Offsets Scheme threshold. This test determines whether the potential impacts of development are likely to significant affect threatened species, ecological communities, and their habitats. Below are the results of the test of significance for the proposed solar farm.

Entities assessed are:

- Eastern Bentwing-bat
- Yellow-bellied Sheathtail-bat
- Black Falcon
- Diamond Firetail
- Box Gum Woodland EEC (i.e. in the crown reserve to the west of the site)

(a) *in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

The development site is located in the Central West Region and is within a rural landscape that has been cleared for agricultural use. It is currently sown with pasture and contains two eucalypt trees near the centre of the northern boundary and at the far south-western corner of the site. The site is located about 2.3 kilometres south of Wialdra Creek at the closest point which drains to the Cudgegong River south-west of Gulgong. There are no watercourses or wetlands within the site. As can be seen in Figure 10 below, all native vegetation other than one remnant eucalypt has been cleared including the area for the proposed arrays of panels.

The site has been cleared and farmed for many years and is not known to be inhabited by any threatened species. The Bionet Atlas does not contain any records of species on the development site.

The crown reserve to the west is potential habitat for the fauna species listed above. While no direct disturbance would occur from the development, there is potential for noise disturbance (and light if working at night) reaching the adjacent habitat during initial construction and ongoing maintenance activities. However, these factors are already in operation in this location due to existing farming activities and road noise/light from the adjacent Castlereagh Highway.

Furthermore, in the case of the microchipteran (micro) bats, they feed from dusk onwards when construction activities, etc. are likely to have ceased each day. These animals are accustomed to noise/vibration disturbance when nesting during the day as evidenced by them commonly using locations such as under bridges as nesting habitat.

It is assumed that all recommended mitigation measures, as listed in the body of this report, shall be implemented as safeguards against any potential impacts.

Therefore, the proposed development unlikely to adversely affect the lifecycle of any threatened species or pose a threat to the local population of any species.

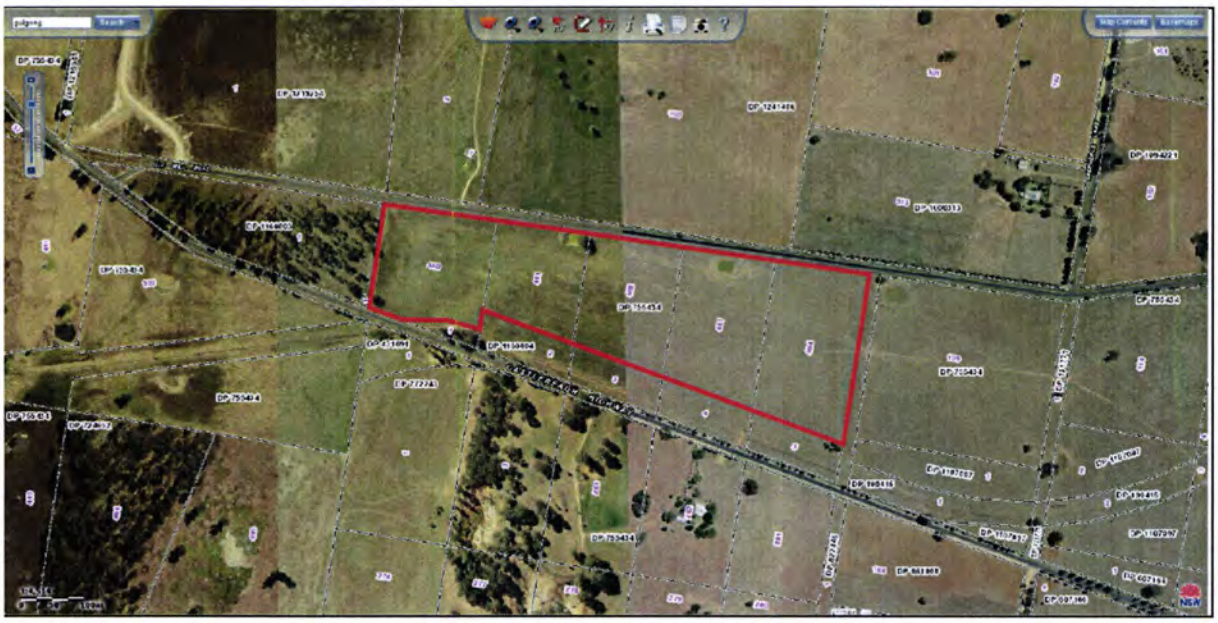

Figure 10: Aerial image of the development site. Source: SIX Maps

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Mapping of vegetation communities indicates that there are no endangered ecological communities located within the site. The area of land to be developed as a solar farm is cleared and farmed. A preliminary flora survey found that any remaining grassland to have well above 50% exotic cover and therefore does not represent a native grassland or a derived grassland.

Adjoining properties to the west and south of the development site are potentially sensitive due to the presence of endangered ecological communities predicted by OEH mapping. However, the EECs located on these properties have already impacted by primary production activities including the introduction of weeds and nutrients, and soils erosion/sedimentation impacts.

Any significant impact from the proposed solar farm is unlikely provided that the mitigation measures (or safeguards) provided below are implemented.

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

No vegetation/habitat clearing is required for the proposal.

The proposal would occur on cleared farmland and any nearby remnant vegetation is already fragmented and isolated in a rural landscape - this includes the 5 ha Box Gum Woodland patch in the crown reserve to the west of the development footprint which is isolated from other native vegetation/habitat.

It is assumed that all recommended mitigation measures, as listed in the body of this report, shall be implemented as safeguards against any potential impacts.

In conclusion, no habitat shall be removed or modified, fragmented or isolated. Based on existing species records, existing habitat condition and historical/ongoing land use, there is no habitat considered to be of importance to long-term survival of the species or ecological community in the locality.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

The site is not mapped as being of high biodiversity value on the Biodiversity Values Map. The development of a solar farm is not likely to have any adverse effect on areas of outstanding value.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The development of electricity generating works, including the installation of solar PV modules and ancillary facilities, is not listed as a key threatening process in Schedule 4 of the *Biodiversity Conservation Act 2016*.

There is a number of listed KTP's already in operation within the site and in the wider vicinity. The proposal is unlikely to increase the impact or operation of these due to existing land use impacts in the locality.

Examples of typical KTP's in rural landscapes include:

- Clearing of native vegetation: The site comprises improved pastures for grazing, with a single native paddock tree requiring which is to be preserved. Superior habitat occurs adjacent to the site and in the wider landscape.
- Loss of Hollow-bearing Trees. There are no hollow-bearing trees on the site.
- Removal of dead wood and dead trees. There are no dead trees or dead wood remaining from decaying trees required to be removed

- Predation/habitat degradation, etc. by various feral animals. Introduced species such as foxes and rabbits are likely to already exist in the area and would not be introduced by the proposal

5.1.6 Native Vegetation Regulatory Map

The Native Vegetation Regulatory Map covers rural land in NSW and categorises land where management of native vegetation can occur without approval or where management of native vegetation may be carried out in accordance with Part 5A Land Management (native vegetation) of the Local Land Services Act 2013. The categories are Category 1 (unrestricted management where clearing is exempt from the LLS Act 2013), Category 2 is regulated land where the LLS Act applies to clearing as either code based, vulnerable or sensitive, and Excluded Land which is not regulated by the LLS Act 2013. The Native Vegetation Regulatory Map for Lots 460-464 is given as Figure 11 below. This land is not mapped as *sensitive regulated land* (shown in pink) or *vulnerable regulated land* (shown in yellow).

Figure 11: Native Vegetation Regulatory Map. Source: OEH, 2019

5.1.7 Environment Protection & Biodiversity Conservation Act significance assessment

The EPBC Act Administrative Guidelines on Significance set out **'Significant Impact Criteria'** that are to be used to assist in determining whether a proposed action is likely to have a significant impact on matters of national environmental significance. Matters listed under the EPBC Act as being of national environmental significance include:

- Listed threatened species and ecological communities
- Listed migratory species
- Wetlands of international importance

- The Commonwealth marine environment
- World heritage properties
- National heritage places
- Nuclear actions
- Great Barrier Reef Marine Park
- A water resource, in relation to coal seam gas development and large coal mining development.

Specific **'Significant Impact Criteria'** are provided for each matter of national environmental significance except for threatened species and ecological communities, in which case separate criteria are provided for species listed as endangered and vulnerable under the EPBC Act.

Attachment B contains a copy of the desktop search results covering threatened and migratory species listed under the EPBC Act which are considered to potentially occur within the locality. The relevant Significant Impact Criteria have been applied to these species to determine the significance of impact of the project.

Migratory Species

No migratory species have been recorded within or adjacent to the subject site (BioNet search). A total of five (5) migratory species have been recorded in the wider locality (i.e. 10 km BioNet search, Attachment A). The EPBC Protected Matters Search listed various other migratory species as predicted in the locality (Attachment B). Some of these species could potentially use the study area as a forage resource, however it is not considered to comprise 'important habitat' (DEWHA 2009) for any migratory species as it does not contain:

- Habitat used by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species.
- Habitat that is of critical importance to the species at particular life-cycle stages.
- Habitat used by a migratory species that is at the limit of the species' range.
- Habitat within an area where the species is declining.

  Therefore the proposal is unlikely to impact on these species and no further consideration shall be given to migratory species under this assessment.

Threatened Species

The likelihood of occurrence assessment (section 5.1.5 above) determined it unlikely that any EPBC Act listed threatened species would use the habitat directly adjacent to the proposal (i.e. the crown reserve, west of the subject land), Therefore the proposal is unlikely to impact on these species and no further consideration shall be given to them under this assessment.

Critically endangered and endangered ecological communities

White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community (CEEC) (hereafter referred to 'Box Gum Woodland').

Will the action reduce the extent of an ecological community?

No. The Box Gum Woodland occurs adjacent to the development site.

Will the action fragment or increase fragmentation of an ecological community?

No. The action will not fragment or increase fragmentation of the ecological community. The Box Gum Woodland remnant (5.0 ha) occurs adjacent to the development site and is already fragmented from other habitat due to previous clearing.

Will the action adversely affect habitat critical to the survival of an ecological community?

No. The Box Gum Woodland occurs adjacent to the development site and any potential indirect impacts during and after construction would be managed through implementation of various mitigation measures, as listed in section 5.1.8 below.

Will the action modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival?

No. The subject ecological community (in the crown reserve) is already surviving, despite the surrounding area having been used for rural land uses over, presumably, an extended period. Water (e.g. hydrology, nutrients and soil shall be managed during and after construction through a number of stormwater management techniques, erosion and sedimentation control and vegetation management.

Erosion and sedimentation control measures (e.g. for access tracks, crossings etc.) will be implemented during the construction process.

Local hydrology and nutrient regimes are likely to return to more natural levels under the proposal than at present as current practices such as cultivation or fertilisation shall be ceased.

Will the action cause a substantial change in the species composition of an occurrence of an ecological community?

No. See previous and mitigation measures listed in section 5.1.8 of this report.

Will the action cause a substantial reduction in the quality or integrity of an occurrence of an ecological community? This includes, but is not limited to:

- *assisting invasive species, that are harmful to the listed ecological community, to become established, or*
- *causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or*
- *interfere with the recovery of an ecological community.*

No. As described previously, the ecological community is already subject to invasive species (weeds and feral animals such as fox, rabbit). The proposal would see the cessation of current land uses which involve broad scale soil disturbance, and likely use of fertilisers, herbicides and other chemicals or pollutants. Refer also to mitigation measures listed in section 5.1.8 of this report.

Conclusion of EPBC significance assessment

Based on the above assessments, a significant impact on Box Gum Woodland CEEC is considered unlikely, provided the proposed mitigation measures listed in section 5.1.8 of this report are adopted. It is concluded that the proposed activity will not require referral to the Commonwealth Minister.

5.1.8 Mitigation measures

Land to the west and south of the subject site is mapped as being of High Biodiversity Sensitivity in *Mid-Western LEP 2012*. A setback of the security fence for the solar farm of 3 metres to the boundary of adjoining land to the west plus a setback between fencing and panel arrays of a further 9.5 metres at the closest point gives a minimum total setback of 12.5 metres. The Castlereagh Highway separates sensitive land to the south.

To avoid interference with vegetation communities located on the adjoining land and to mitigate against significant impacts on any threatened or migratory entities it is recommended that:

- any vegetation planted to screen the development are to be native species endemic to the area
- Access to the site is to be limited to that point shown on development plans and within the development area taking care not to damage the root system of the remnant eucalypt
- Storage of materials is to be carried out wholly within the development area
- Ensure adequate erosion and sedimentation control measures are in place during construction to mitigate against soil entering adjacent native vegetation
- Hydrology: existing overland flows should be maintained over the life of the development to prevent alteration to species composition in any nearby habitat
- The planting of any species listed on the Weeds Australia NSW weeds list (www.weeds.org.au) should be prohibited for the life of the development

- Any soil stabilisation or landscaping using grasses must either be done with locally native species or sterile/innocuous species, e.g. Sterile Oats (*Avena sterilis*). Invasive grass species such as Kikuyu or Buffalo Grass should not be used

5.2 Natural hazards

5.2.1 Flooding

The site is not mapped as being flood prone in *Mid-Western LEP 2012*, however, Council has advised that there is the potential for limited localised flooding. Flood mitigation measures and stormwater management have been considered in section *4.3 Water resources* of this Statement.

5.2.2 Bushfire

Infrastructure comprising electricity generating works is not a habitable building and is not listed as a *special fire protection purpose* under section 100B of the *Rural Fires Act 1997*. The site is not mapped as being bushfire prone. A bushfire assessment is not required to be prepared and submitted with the development application.

5.3 Water resources

5.3.1 Assessment of impacts

A desktop assessment of potential impacts on groundwater and surface water flows has been carried out. The assessment examines:

- Local hydrology and catchment and water quality data,
- Surface and groundwater quality data,
- Flood-risk potential of the site,
- Impacts of the development against NSW policies and industry standards, and
- Management procedures and mitigation measures for construction and operation.

It is noted that the site is located 2.3 kilometres south of Wialdra Creek which flows west into the Cudgegong River. Gulgong is located within the water sharing plan for the *Macquarie Bogan Unregulated And Alluvial Water Sources 2012* area. The water source for the area is listed as being the Cooyal Wialdra Creek within the major catchment of the Macquarie River. Water sharing plans relate to the protection of surface water and alluvial groundwater resources. The *Macquarie Bogan Unregulated and Alluvial Water Sources 2012* covers 30 unregulated surface water sources and four alluvial groundwater sources. The relevant groundwater sharing plan for Gulgong is the *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011*. The site is within the Lachlan Fold Belt groundwater

management area. Both of these plans relate to licencing and use of water resources under the *Water Management Act 2000*. As it is not proposed to extract water neither water sharing plan applies to the proposed solar farm development.

The site is partly shown as being groundwater vulnerable under clause 6.4 of *Mid-Western LEP 2012*. However, the proposed development is not expected to materially contribute to any regional groundwater issues particularly those associated with nearby irrigation districts. Based on current available information which includes an independent assessment carried out for the Murray Darling Basin Authority, potential adverse surface water-related impacts to the site include impediments to site accessibility and managing downstream sedimentation.

The development site is not mapped as subject to flooding in *Mid-Western LEP 2012*. However, heavy rainfall during storm events may cause disruption during construction activities or for material suppliers. As the site is not within a flood prone area and is some distance (2.3 km south) from the nearest waterway this is considered to be an unlikely impact. There may be small scale water flows on site draining to the north and west during rainfall events. There is no known salinity issue on the development site.

The proposed development has the potential to alter existing water quality conditions within the site. The impervious area of solar facilities is typically only marginally increased owing to associated hardstand and building areas. However, the panels may impact the nature of pasture and grass coverage on the site, which has the potential to increase surface runoff and peak discharge. Increased flow concentration off the panels also has the potential to erode soil at the base of solar panels. There is the potential that site runoff may contain sediments and increase turbidity or other water quality parameters in downstream water ways. With the limited topographic relief of the site and the distance to the nearest waterway (Wialdra Creek), these issues are considered manageable.

5.3.2 Mitigation measures

The following mitigation measures given in Table 4 are recommended to manage downstream sedimentation.

Table 4: Proposed mitigation measures to manage downstream sedimentation

Stage	Measure	Activities/approach
Design	Site drainage and water quality controls	Design Basis • Undertake hydrological assessment of the sites catchment in accordance with relevant methods outlined in Australian Rainfall and Runoff. • Determine sediment management targets and

Stage	Measure	Activities/approach
		drainage control standards in accordance with Managing Urban Stormwater: Soils and Construction Vol 1 (Blue Book) (DECC, 2008). • Develop a site erosion and sediment control plan in accordance with the Blue Book. • Develop site drainage design incorporating detention basins and sedimentation management structures where relevant. • Permanent site drainage should coincide with temporary arrangements where possible
Construction and/or Demolition	Site drainage and water quality controls	General site works: • Catch drains to be located downslope of any proposed road works. • Install location appropriate sediment fences or other applicable control measures depending on whether the feature is upstream or downstream of a disturbed part of the site or will need to be trafficable. • All stormwater collection points need to have appropriate sedimentation and erosion controls. • Undertake ongoing inspections of stormwater facilities and water control measures to assess their effectiveness. • Vibration grids or wash bays at all construction exits. • Level spreaders at locations where concentrated flow is discharged offsite to ensure sheet flow like conditions are maintained. • Flat land erosion control options include erosion control blankets, gravelling, mulching, soil binder, turfing and revegetation
Construction and/or Demolition	Stormwater point source control	In the event of concrete works: • Do not undertake works if chance of heavy rain. • Store rinsate water, if applicable, separately to

Stage	Measure	Activities/approach
		other water on site and dispose of offsite as appropriate. • Block on site drains in the area of the works and remove any contaminated runoff. In the event that dewatering practices are required: • Pump hose intakes for withdrawing water from excavations will be elevated to minimise sediment pumping and directed to a containment area for settling prior to discharge. • Limit direct discharge off site (consistent with the design requirements for sediment pond discharge). • Stormwater collected on site should be reused where possible. Controls should be inspected and maintained on a regular basis. All water released from sediment basins should be clear or disposed off site by vehicle. • Material and waste storage areas should be designed and operated to minimise interaction with surface waters. • Vehicle washdown areas should be located away from water courses

5.4 Visual and scenic amenity

5.4.1 Methodology

Impacts on the visual and scenic amenity of the proposed Avisford Mini Sustainable Energy Park have been assessed using the RMS guideline *Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment* (EIA-N04 Version 2-0 released on 28 March 2013). Details of methodology are given below.

Site inspections of the location of the proposed works and the surrounding area took place on Wednesday 30 January 2019 and Friday 24 May 2019. The visual catchment, the context of the site of the proposed works and viewpoints were identified at these times. Land uses and characteristics of the environment

such as topography, vegetation, architecture of neighbouring buildings and any heritage values of any significant sites in the vicinity of the proposed solar farm were noted and the capacity of the area to absorb physical change is assessed. Development plans for the solar farm have been reviewed and the likely impacts on landscape character identified. This is determined by the sensitivity of the landscape to physical change and the magnitude, or relative size and scale, of the works.

The visual significance of the site to viewpoints and receivers within the visual catchment is described in terms of proximity to the site, landscape character, the composition of views and the sensitivity to change that will affect scenic values. The visual impacts that will be experienced by each receiver are identified and evaluated in terms of the sensitivity of each receiver to change and the magnitude of that change in terms of the proposed works. The impacts are calculated and ranked according to negligible, low, moderate or high impact based on the following matrix (sourced from the RMS *Guideline for Landscape Character and Visual Impact Assessment).*

Table 5: Landscape character and visual impact grading matrix. Source: RMS Guideline for Landscape Character and Visual Impact Assessment, 2013

Landscape character and visual impact grading matrix					
	Magnitude				
Sensitivity		High	Moderate	Low	Negligible
	High	High impact	High-moderate	Moderate	Negligible
	Moderate	High-moderate	Moderate	Moderate-low	Negligible
	Low	Moderate	Moderate-low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

The findings of the landscape character and visual impact assessments are summarised in the conclusion. Recommendations as to refinements of the development plans to avoid or mitigate significant landscape and visual impacts are made if necessary.

5.4.2 Description of the landscape

The character of the landscape near Gulgong is predominantly an open modified agricultural landscape that has been shaped by farming. It is gently undulating country with large expanses of flat land. There is relatively little extant native vegetation. A large solar farm exists to the west of Gulgong and an extractive industry is located to the south of the development site. The development site is cleared rural land on the western edge of the township of Gulgong. Structures within the vicinity of the site comprise rural farm dwellings set within primary production land uses. Photographs taken during the site visits and provided in section *2. Site location, description and context* of this Statement illustrate the site and surrounding area. The landscape is assessed to have moderate sensitivity to change.

5.4.3 Assessment of impacts on landscape character

The proposed Avisford Mini Sustainable Energy Park will comprise 16,184 solar modules installed in 201 rows placed within the 16 hectare property. The security fence to the solar farm is to be setback 3 metres from each boundary and panel arrays are to be setback a minimum 7 metres inside the fence along the eastern and southern boundaries, a minimum of 9.5 metres from the western boundary, and approximately 18 metres from the northern Old Mill Road boundary .

The sensitivity of private property and public roads to landscape change would be moderate given the predominantly agricultural landscape. An extractive industry is operating to the south of the site, however, this is adequately screened from public places and surrounding properties by vegetation. The magnitude of the project and impact on landscape character is therefore considered to be moderate for private property, low for the Castlereagh Highway and high for Old Mill Road due to proximity and visibility.

5.4.4 The visual catchment

The visual catchment of the site of the proposed Avisford Mini Sustainable Energy Park is defined by an area within 500 metres of the development site from which the works may be clearly visible if unimpeded by trees or structures as shown inside orange edging on the visual catchment map below. This area is less than has been considered in the glare and glint analysis as the greater the distance from the development site the less clear is the view of the solar farm. The ability to distinguish the type of land use and the actual composition of materials diminishes with distance.

The visual impact of solar farms depends on the scale and type of infrastructure, the prominence and topography of the site relative to the surrounding environment; and any proposed screening measures to reduce visibility of the site. Topography and vegetation have an influence on the visual catchment. It is unlikely that the site will be visible from adjoining private properties and public roads beyond 500 metres. Some potential viewpoints were therefore discounted because of significant existing features such as built structures and vegetation.

The site itself is cleared and there are no existing structures or vegetation in the Old Mill Road road reserve adjoining Lots 460-464 that would screen the site. Vegetation on the adjoining Crown land to the west provides screening as do scattered eucalypt trees along the Castlereagh Highway to the south.

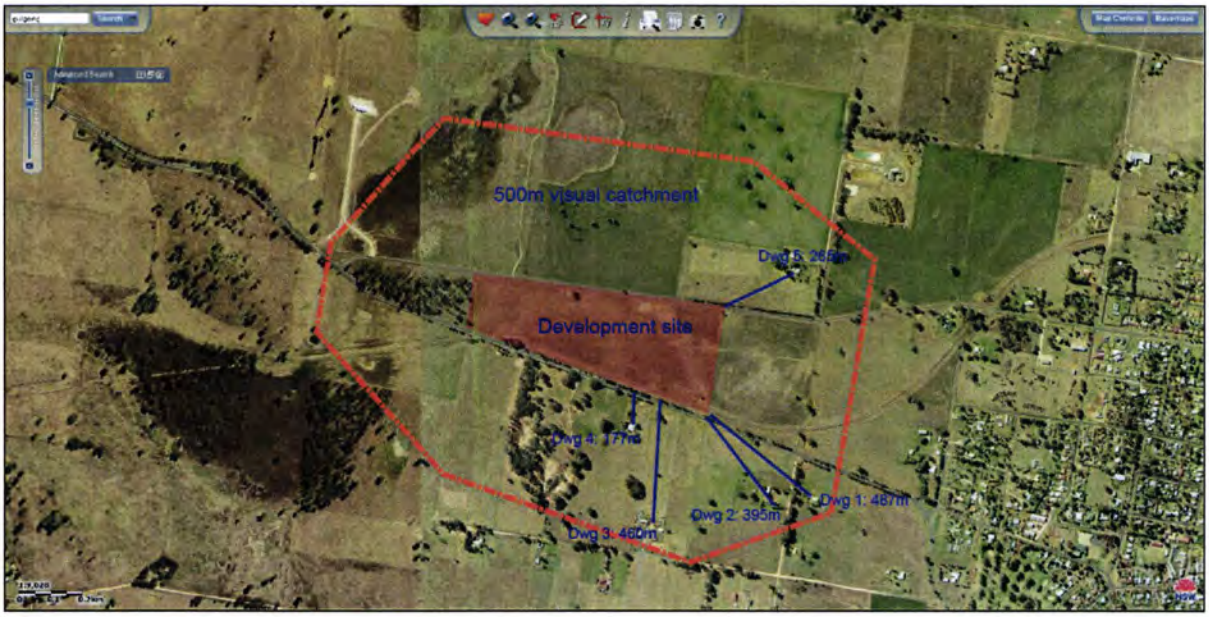

Figure 12: 500 metre visual catchment. Source: SIX Maps

There are five dwellings within 500 metres of the development site. The separation distances from each dwelling to the nearest point of the site are shown in Figure 12. It would be visible from public roads such as the Castlereagh Highway on approach from both east and west directions and from Old Mill Road.

The sensitivity of the neighbouring dwellings to landscape change varies from low (dwellings 1, 2 and 3) to moderate (dwellings 4 and 5) given the existing open landscape of the site though tempered by proximity to urban development and the highway location. The sensitivity would decrease with distance so that visibility of the solar farm to dwellings and other structures beyond 500 metres outside the visual catchment would be negligible.

Vegetation along the Castlereagh Highway as well as trees within private property boundaries would partially screen the development from dwellings 1, 2, 3 and 4 to the south of the site. Similarly, internal property trees and vegetation along Old Mill Road would provide substantial screening from dwelling 5. The rear of panels will be visible to motorists travelling along the Castlereagh Highway, however, the partial vegetation screening and the speed limit of 100 kilometres per hour means that sensitivity is low.

5.4.5 Assessment of visual impacts

Table 4 below indicates the magnitude of the proposed solar farm in terms of the visual change in the landscape and proximity to the viewpoint, and the degree of sensitivity based on the quality of the view, whether the site is clearly visible or obscured by landform or vegetation, the direction and composition of the view, and how sensitive the view is to changes in the landscape that will result from the proposed development. A rating is then given based on magnitude and sensitivity using the landscape character and visual impact grading matrix.

Table 6: Viewpoint impacts

Viewpoint	Magnitude	Sensitivity	Rating
Castlereagh Highway eastern approach	Low	Low	Low
Castlereagh Highway western approach	Low	Low	Low
Old Mill Road	High	High	High
Dwelling 1	Moderate	Low	Low-moderate
Dwelling 2	Moderate	Low	Low-moderate
Dwelling 3	Moderate	Low	Low-moderate
Dwelling 4	Moderate	Moderate	Moderate
Dwelling 5	Moderate	Moderate	Moderate

5.4.6 Summary of impacts

The landscape on the urban edge of Gulgong is one that has been modified by human activity associated with agriculture.
It is characterised by a mix of rural uses including an extractive industry, an existing solar farm and utilities including the arterial road and the 66kV power lines.

The impact of the proposed Avisford Mini Sustainable Energy Park on landscape character has been assessed to be moderate based on magnitude of works and the sensitivity to change of surrounding properties. The solar farm would be highly visible to motorists travelling along Old Mill Road in either direction. The works would also be visible to motorists travelling along the Castlereagh Highway, however, given the character of the proximity to the urban area, the speed limit and scattered trees within the road reserve on the approaches towards and away from town it is expected that acceptance of and adaptation to change will occur within a relatively short space of time following completion of works.

The visual impact of the proposed works are assessed to be low to moderate for the residential viewpoints identified in this assessment. Vegetation along the highway, proposed vegetation and fencing measures along the Old Mill Road frontage, and existing vegetation within private properties would serve to screen and distract visual interest away from the development. These impacts are considered acceptable given the nature of the proposed development and that it will contribute to renewable energy generation.

5.4.7 Mitigation measures

It is recommended that a vegetated buffer be incorporated to screen the development from Old Mill Road, the property to the east and the Castlereagh Highway. This should include large shrubs planted outside the perimeter security fencing. If Council considers it necessary, shade screen material may be placed on the security fencing to provide screening until such time as the shrubs are mature and have grown to full height.

The photomontages below indicate the current views of the development site from each approach along the Castlereagh Highway and Old Mill Road. Screening of the Avisford Mini Sustainable Energy Park following the establishment of trees is shown on when heading west after leaving Gulgong. This is indicative of the effectiveness that screening that mature vegetation provides. When heading east towards Gulgong, glimpses of the solar farm are possible whilst descending the hill. Screening is afforded by the Crown Land rehabilitation reserve to the west of the development site and by vegetation within the highway road reserve. The PV modules will not be clearly visible to motorists travelling along the Castlereagh Highway after the establishment of vegetated screening.

Plate 8: Heading east along the Castlereagh Highway with the development site in the distance on the left

Plate 9: Heading east along the Castlereagh Highway with the development site on the left

Plate 10: Heading west along Old Mill Road with the development site on the left

Plate 11: Heading east along Old Mill Road with the development site on the right

Plate 12: Heading west along the Castlereagh Highway with the development site in the distance on the right

Plate 13: Heading west along the Castlereagh Highway with the development site in the distance on the right screened with trees

Plate 14: Heading west along the Castlereagh Highway with the development site on the right

Plate 15: Heading west along the Castlereagh Highway with the development site on the right screened with trees

5.5 Traffic and access

5.5.1 Existing access arrangements and proposed movements

An assessment of the impacts on traffic and the adequacy of access arrangements has been carried out. The assessment includes a description of the existing road network and notes that the Castlereagh Highway (B55) is a state highway, managed by Roads and Maritime Services. The primary function of the section of the Castlereagh Highway is to provide vehicular access between Gulgong and Dunedoo. Rouse Street is nominated in the Gulgong Traffic Study (2007) as a sub-arterial road, managed by Mid Western Regional Council Both of these roads are listed as approved B-Double Routes. At the time of the assessment was carried out the most recent traffic data from Mid Western Regional Council was unavailable for either the Castlereagh Highway or Rouse Street. Similarly, traffic data available from RMS on-line did not include any data for the relevant section of the Castlereagh Highway. Consultants visited the site on 15 May 2019 and counted 21 light vehicles using Old Mill Road and 2 heavy vehicles between 8.00am and 9.00am.

The assessment is based on the following:

Vehicles accessing the site during construction:

- 45 B-Double trucks (total number of B-Doubles over the construction phase that will deliver equipment and materials between 10.00am and 2.00pm weekdays.
- Light vehicles suitable for transporting up to 50 workers with work being carried out between 7.00am and 4.00pm weekdays.
- Bus service for workers if required.

Vehicles accessing the site during operation:

- Maintenance access vehicles (1 light vehicle) access to the site in 3 monthly intervals

It is estimated that during construction there would be on average two B-Double trips per hour and a maximum of 25 light vehicle trips per hour (or 10 light vehicle trips per hour if a bus service transports workers to the site), giving a total of maximum of 30 vehicle trips per hour. On a daily basis there would be 4 B-Double trips per day and a maximum of 50 light vehicle trips per day (or 10 with a bus service), giving a total maximum of 50 vehicle trips per day.

It is noted that the greatest interaction with traffic external to the site will be during the peak PM period, estimated to be between 4pm – 5pm. The AM peak period with traffic heading to the site will not generate as many interactions due to the expected peak arrival time of 6am – 7am by the workers. It is expected that the increase in light vehicles during peak times would have only a minor impact and not reduce the current level of service (A) of Old Mill Road.

It is recommended that the existing site entry that is located approximately mid-way along the Old Mill Road frontage be constructed as a sealed access point. Plans accompanying the assessment indicate that the proposed site entrance has been designed to accommodate the turning path of a B-Double truck, with a sealed entrance a minimum of 26 metres into the site to minimise disruption to Old Mill Road and to ensure that a B-Double is able to queue off the road if necessary when accessing the site. The proposed site entry location will have in excess of 250m of sight distance in either direction in accordance with the requirements of Austroads Guide to Road Design and Council specifications.

As the site is located on the Western side of Gulgong and Old Mill Road is accessible from Rouse Street or the Castlereagh Highway, construction worker site access and parking areas should be constructed in accordance with appropriate safe construction site management principles.

The findings of the assessment are that the proposed construction of the solar farm will cause no major long-term effects to the surrounding road network due to the need for minimal regular maintenance by a small number of staff. Construction traffic appropriately managed with a bus service for workers and out of peak hour deliveries to the site, combined with the construction of an appropriate site entry catering for B-Double access will ensure traffic impacts are minimised during the construction phase of the project.

5.5.2 Mitigation measures

The following mitigation measures are recommended:

- If possible, provide a bus service to convey workers to the site during construction to minimise the number of light vehicles accessing the site,
- Construct the site entrance according to Triaxial Plan MX10595.00SK01 appended to the traffic assessment, and
- Heavy vehicles should arrive and depart from the site outside of the morning and afternoon peak traffic periods, i.e. between 10.00am and 2.00pm weekdays.

5.6 Noise

5.6.1 Assessment of impacts

The noisiest components in a solar farm are the inverters, which generate a low buzzing sound as they convert electricity from the direct current (DC) generated by PV modules to alternating current (AC) used by the electricity grid. Tracking equipment allowing PV modules to face the sun over the course of the day can also generate a low level of noise. However, the noise generated by solar farms is generally not audible above ambient noise outside of the facility fence. (U.S. Department of Energy, National Renewable Energy Laboratory, www.nrel.gov/state-local-tribal/blog/top-five-large-scale-solar-myths.html)

An assessment of the impacts of noise emissions has been carried out. The purpose of the noise assessment is to quantify potential environmental noise emissions associated with the construction and operation of the project. Where impacts are identified, recommendations are made to mitigate and manage noise.

The assessment includes the following key tasks:

- review construction and operating activities to identify key noise generating plant, equipment, machinery or activities proposed to be undertaken as part of the project;
- identify the closest and/or potentially most affected receptors situated within the area of influence to the project;
- establish existing noise levels to determine project-specific construction Noise Management Levels (NMLs), and operational noise criteria;
- undertake 3D noise modelling to predict levels that may occur as a result of the construction and operation of the project at the closest and/or potentially most affected receptors;
- provide a comparison of predicted noise levels against relevant construction NMLs and operational criteria;
- assess the potential noise impacts associated with construction and operational aspects of the project; and
- provide feasible and reasonable noise mitigation and management measures, and monitoring options, where NMLs or operational criteria may be exceeded.

The assessment has been conducted in accordance with the following key policy and guidelines where relevant:

- NSW Department of Environment and Climate Change, NSW Interim Construction Noise Guideline (ICNG), 2009,
- Environment Protection Authority's (EPA's), Noise Policy for Industry (NPI), 2017,
- NSW Department of Environment, Climate Change and Water (DECCW), NSW Road Noise Policy (RNP), 2011.
- Australian Standard AS 2436–2010 (R2016) (AS 2436) – Guide to Noise and Vibration Control on Construction, Demolition and Maintenance sites,
- Australian Standard AS 1055:2018 – Description and Measurement of Environmental Noise,
- Australian Standard AS IEC 61672.1–2004 (AS 61672) – Electro Acoustics - Sound Level Meters Specifications Monitoring, and
- Australian Standard AS IEC 60942-2004 (AS 60942) – Electroacoustics – Sound Calibrators.

A number of potential noise sensitive receptors were identified as listed in Table 7 and shown in Figure 13 below. These receptors comprise residential and rural properties.

Table 7: Noise sensitive receptors

ID	Description/address	Coordinates (MGA55)	
		Easting	Northing
R1	13 Shepherds Lane	737026	6417562
R2	52 Shepherds Lane	737338	6417860
R3	11 Old Mill Road	737496	6417385
R4	3 Caledonian Street	737597	6417297
R5	12 Caledonian Street	737422	6417018
R6	12 Caledonian Street	737378	6416962
R7	31 Slaughter Yards Road	737062	6416840
R8	12 Slaughter Yards Road	736918	6416875
R9	78 Thompsons Lane	736531	6416769
R10	105 Castlereagh Highway	736484	6417089
R11	89 Thompsons Lane	736402	6416592
R12	109 Thompsons Lane	736185	6416697
R13	129 Thompsons Lane	735979	6416726
R14	210 Old Mill Road	735632	6418120
R15	164 Old Mill Road	736221	6418385

Construction and operational noise levels were predicted to each assessed receptor assuming receiver heights of 1.5m above ground level for typical construction activities and allowing for road traffic noise.

The findings of the assessment are that construction noise levels have the potential to exceed relevant construction NMLs at some receptor locations depending on their proximity to construction activities and that operational noise levels satisfy the criteria for assessed receptors.

The affected receptors are R1 located at 13 Shepherds Lane, R8 at 12 Slaughter Yards Road and R10 at 105 Castlereagh Highway.

Operational noise predictions identify that relevant noise criteria would be satisfied at all receivers. The noise assessment demonstrates that road noise criteria will be satisfied at all receivers on the proposed transport route.

Recommendations have been provided to minimise the potential noise impacts from construction, albeit of a temporary nature during the daytime construction period. Recommendations are also given to ensure operational noise levels are verified.

Based on the results, there are no noise related issues which would prevent approval of the application. The results of the assessment shows compliance with the relevant operational and road noise criteria. Accordingly, no additional ameliorative measures are required.

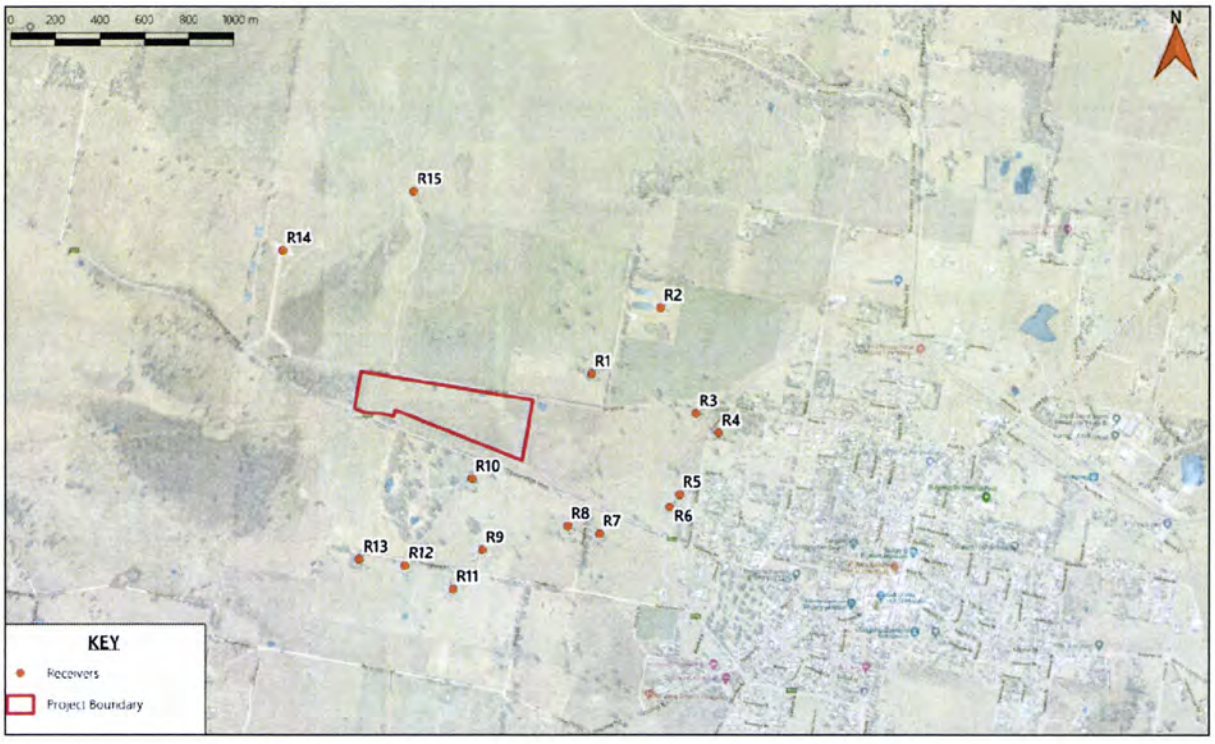

Figure 13: Location of noise sensitive receptors

5.6.2 Mitigation measures

The following mitigation measures are recommended to address noise emissions during the construction phase:

- a construction noise management protocol to minimise noise emissions, manage out of hours (minor) works to be inaudible, and to respond to potential concerns from the community,
- where possible use localised mobile screens or construction hoarding around plant to act as barriers between construction works and receivers, particularly where equipment is near the site boundary and/or a residential receiver including areas in constant or regular use (e.g. unloading and laydown areas),
- operating plant in a conservative manner (no over-revving), shutdown when not in use, and be parked/started at farthest point from relevant assessment locations,
- selection of the quietest suitable machinery available for each activity,
- avoidance of noisy plant/machinery working simultaneously where practicable,
- minimise impact noise wherever possible,
- utilise a broadband reverse alarm in lieu of the traditional high frequency type reverse alarm,
- provide toolbox meetings, training and education to drivers and contractors visiting the site during construction so they are aware of the location of noise sensitive receivers and to be cognisant of any noise generating activities,

- signage is to be placed at the front entrance advising truck drivers of their requirement to minimise noise both on and off-site, and
- utilise project related community consultation forums to notify residences within close proximity of the site with project progress, proposed/upcoming potentially noise generating works, its duration and nature and complaint procedure.

It is recommended that noise emissions from the solar farm be minimised when operational. To assist in noise management, it is recommended that a one-off noise validation monitoring assessment be completed to quantify emissions from the site and to confirm that relevant criteria are satisfied.

5.7 Air quality

5.7.1 Assessment of impacts

The Office of Environment and Heritage maintain air quality monitoring stations across rural NSW. The nearest monitoring station to the development site is located at Dubbo. The instruments used at most rural network sites are low cost indicative particulate monitors that respond to all aerosols including smoke and fog.

Total Suspended Particles (TSP) are measured at this station. Data is collected in 15 minute intervals and reported hourly on the OEH website. Total suspended particulates are solid particles and liquid droplets 100 micrometres or less in diameter. They come from natural and human-made sources, such as pollen, bushfires and motor vehicle emissions. Dust emissions are also a source of air pollution in the hot, dry climate of the Central West and can cause poor air quality.

Particles are measured as PM_{10} and $PM_{2.5}$. PM_{10} are particles less than 10 micrometres in diameter. Sources include crushing or grinding operations and dust stirred up by vehicles on roads. Particles less than 10 micrometres in diameter are measured as an hourly average reading of 12 at Dubbo at 1.00pm on Sunday 19 May 2019. $PM_{2.5}$ are fine particles less than 2.5 micrometres in diameter. Sources include all types of combustion, including motor vehicles, power plants, residential wood burning, forest fires, agricultural burning, and some industrial processes. Particles less than 2.5 micrometres in diameter are also measured as an hourly average reading of 12 at Dubbo at 1.00pm on Sunday 19 May 2019. Total suspended particles have an average hourly reading of 12 on 19 May 2019. This is a comparatively moderate to high reading indicative of the autumn climate of Dubbo and the Central West region and is possibly due to hazard reduction burns carried out by the NSW Rural Fire Service and other agencies that manage native bushland, and the ploughing and sowing of new crops and pasture. By comparison, the hourly average at 9.00am on Tuesday 21 May 2019 at Dubbo was 3 which is low and likely to be due to light nocturnal winds causing dispersal of smoke and dust.

Activities that disturb the earth's surface and that is carried out with the use of machinery have the potential to generate dust emissions. This may be exacerbated by wind exposure to an exposed ground surface.

The previous use of the land for farming may have involved regular tilling, sowing and harvesting that may create dust and impact on air quality. The current condition of the land is poor due to the loss of vegetation leading to exposed soil surfaces.

The construction of the solar farm will not involve extensive earthworks and only excavation for footings for the array framework and ancillary structures will be carried out. Along with the delivery of materials using heavy vehicles, construction works may generate dust, however, once operational the change of use of the land from agricultural to solar photovoltaic electricity generation is expected to reduce particulate emissions and lead to an improvement in local air quality. Vehicle movements would be restricted to internal access roads and the majority of the site would be revegetated with pasture grasses.

5.7.2 Mitigation measures

To minimize dust generation during the construction and operational phases the following mitigation measures are proposed:

During construction:

- Limit vehicle movements to areas necessary to deliver panels, ancillary structures and equipment
- Suppress dust emissions using watering and cease works during dry and windy conditions
- Ensure ground disturbance is limited to areas necessary to place footings or to be used for access
- Ensure minimal handling of excavated materials
- Ensure stockpiles of excavated material are bunded and protected from wind and vehicle movements

During operation:

- Grade and add road base to internal accessways
- Revegetate the site with suitable endemic native groundcover immediately construction works are completed
- Ensure all plant and equipment operates in accordance with specifications

5.8 Waste management

5.8.1 Waste materials and management

Life Cycle Analysis considers the total energy input and annual energy output of the project. This is termed the energy payback time and varies depending upon the project's design and geographic location. For solar projects the general timeframe for energy payback is achieved in less than four years for projects with a 25-30 year operating period (Bhandari et al., 2015; Department of Industry, Resources and Energy NSW,

2016). Alsema et al (2006) found that PV modules have an energy payback of 1.5-2 years in southern Europe and 2.7–3.5 years for central Europe. Due to the greater solar resource in Australia the energy payback for this project is expected to be at the lower end of these ranges.

The Fraunhofer Institute for Solar Energy Systems (2015) considered the ratio of energy produced by a solar photovoltaic module compared to the energy used to create the module. It was estimated that the PV modules would provide more than 10 times the amount of energy used to make the system.

A desktop assessment of the waste generated during construction and operation of the proposed Avisford Mini Sustainable Energy Park has been carried out to determine the appropriate means of waste disposal and recycling. The assessment takes into account the requirements of relevant legislation and policy including the Protection of the Environment Operations (POEO) Act 1997, POEO (Waste) Regulation 2014 and the Waste Avoidance and Resource Recovery Act 2001.

The largest amount of waste will be generated during the construction phase. Wastes would include wooden pallets, cardboard and plastics. Construction of a solar farm would not generate any putrescible waste products. Minimal waste would be generated when the farm is operational other than small amounts of replacement parts and packaging required for maintenance and repair works.

It is expected that the solar farm will be operational for at least 20 to 25 years. Upon decommissioning all infrastructure, panels and mounting frames including footings and inverters would be disassembled and removed from the site. There are currently limited opportunities to recycle the components of solar panels, however, it is anticipated that the waste recycling industry will expand and develop new technologies and uses for those components by the time decommissioning occurs.

There are two waste facilities near the project site, both of which are operated by Mid-Western Regional Council. The Mudgee Waste Depot is located 30 km south of the site and is open 8.00 am to 5.30 pm Monday to Friday, and 8:00 am to 5:00 pm on the weekend. The Gulgong Waste Depot is a smaller facility that is located 6 km northeast of the site. It is open 8.00 am to 4.30 pm Monday to Friday, and 8:00 am to 5:00 pm on the weekend.

There are specific requirements for certain waste streams:

- Some wastes can only be disposed of by appointment at the Mudgee Waste Depot, such as asbestos and grease trap waste. The Gulgong Waste Depot accepts only small loads of mixed commercial waste up to a trailer load and larger quantities of sorted brick, concrete, and timbers.
- Tyres, recyclables, green waste and scrap metals are accepted, as directed by staff.

The Council operates the Mudgee Recycling Facility which is run out of the Mudgee Waste Depot. This offers recycling for batteries (household and cars), paint, fluorescent lights, gas bottles, motor and other oils, and fire extinguishers. Dangerous goods and items other than these are not accepted.

The Council also operates a trade waste service for businesses within the Mudgee-Gulgong area five days a week. This includes a bulk recycling collection service for paper, cardboard or commingled recycling.

Estimates of waste materials and proposed management arrangements for each phase of the development project are provided in Table 8 below.

Table 8: Estimated waste materials and waste management arrangements

Phase	Waste material	Proposed management
Construction	• Packaging waste such as cardboard, wood pallets, plastic wrap, scrap metal, general waste including approximately 1,640 wooden pallets and carboard packing boxes • Concrete waste during setting of footings and mounts • Electric cable waste and cable reels • Plastic pipe offcuts/scrap • Empty drums and containers (minimal quantities) • Minimal used lubricating oil and filters • Unused or spent chemicals	Waste products will be sorted and stored separately in skip bins located in the materials laydown area in accordance with EPA Waste Classification Guidelines. This will facilitate disposal through appropriate waste streams as follows: Recycling: • Steel and scrap metal (recycled) • Timber/cardboard (recycled) • Recyclable plastics Landfill: • General wastes and plastic (other than where recyclable) All recycling and general waste would be collected and taken to off-site waste management facilities for disposal Fluids would be recycled where possible or taken to off-site waste management facilities for disposal
Operational	• Minimal volumes of domestic wastes such as office consumables, paper, plastics and glass • Waste resulting from maintenance or replacement of equipment	All waste materials would be taken to off-site waste management facilities for recycling or disposal
Decommissioning	• PV modules (16,184 modules) and supporting poles and mounts • Glass for panels (260 tonnes) • Silicon for wafers (40 tonnes) • Inverters / transformers / batteries	The solar farm infrastructure would be dismantled into separate waste products such as metals, glass, plastics and concrete. All products would be sorted on site into recyclable and general waste streams in

Phase	Waste material	Proposed management
	• PV boxes, skids, scrap metal (840 tonnes) • Electrical cables • Fencing • Storage containers (two 40-foot containers)	accordance with the EPA Waste Classification Guidelines and taken to Council's Waste Management Facility for recycling or disposal. It is expected that the waste recycling industry will expand and develop new technologies and uses for components by the time decommissioning occurs. At the present time only a single company in South Australia has the capacity to recycle specific materials

It is recommended that a waste management plan be prepared following approval and prior to construction to specify precise volumes of each waste material, classify that waste material and identify appropriate management procedures including means of transport and the destination.

Waste management should be predicated on the international hierarchy of waste management to avoid/reduce, reuse, recycle, recover, treat and dispose of waste products to avoid or reduce waste materials where possible, and to re-use, recycle and recover the majority of waste materials generated during each of the construction, operational and decommissioning phases.

5.8.2 Mitigation measures

It is recommended that a waste management plan be developed to provide detailed procedures to manage the waste stream. The plan should contain:

- Strategies to reduce waste during all project phases,
- Recycling, re-use and recovery strategies and opportunities,
- Classification of all waste streams,
- Tracking register and details,
- On site recycling management,
- Allocation of responsibilities for recycling, re-use and disposal,
- Reporting and notification procedures if a waste incident occur.

If vegetation clearance is required during preparation of the site prior to and/or during the construction phase, that vegetation should be re-used for mulch and on-site soil erosion control where possible.

5.9 The community and economy

5.9.1 Change of use of agricultural land

According to the *Mid-Western Regional Comprehensive Land Use Strategy*, approximately 61% of land in the LGA is used for agriculture, comprising 2% for cropping, 57% for grazing, less than 1% for horticulture and less than 1% for intensive animal production. Power generation occupies less than 1% of land.

The development site has a land capability class of 3. This indicates high capability land – land that has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive, readily available and widely accepted land management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental degradation (*The land and soil capability assessment scheme – A general rural land evaluation scheme for NSW, 2nd Approximation*, OEH).

Figure 14 below shows land capability mapping for the development site and land surrounding Gulgong. Land shaded dark blue is class 3 land capability.

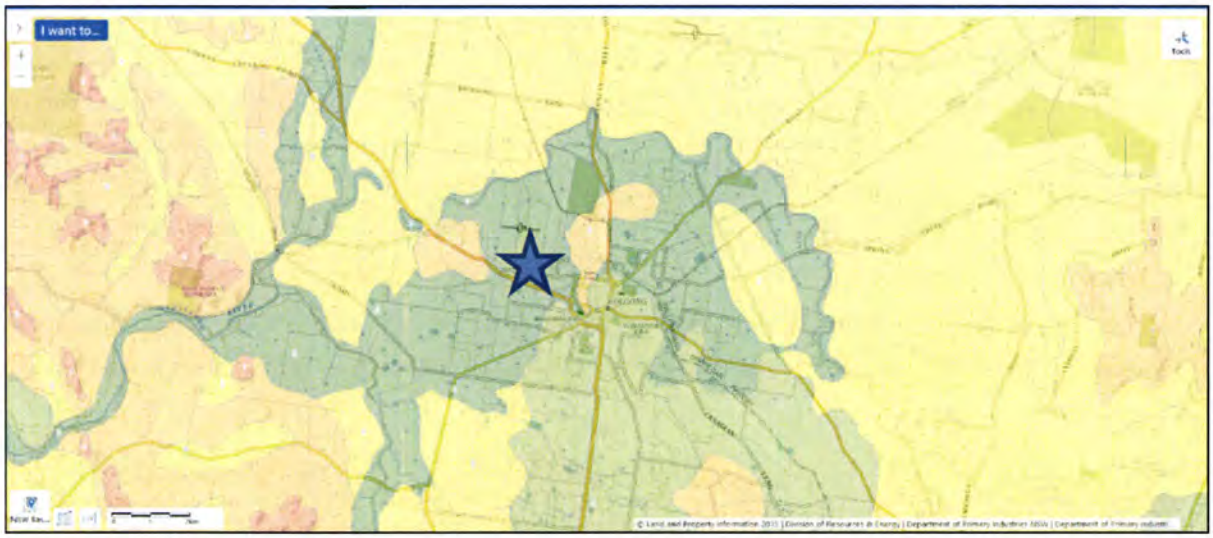

Figure 14: Land capability mapping. Source: OEH 2019

The loss of agricultural land would be minimal and temporary. It would be offset by the contribution that the solar farm will make to the local economy through direct and indirect employment and expenditure over the short term and through the benefits that renewable energy power supply will bring to the nation. If necessary and practical in terms of security, the land surrounding panel arrays can continue to be used for farming purposes such as the cultivation of vegetables or the grazing of cattle during the operation of the solar farm. The arrays of panels can be removed once the facility is decommissioned and the land can be returned to agricultural use. It is considered that the impact in terms of loss of productive agricultural land

should be seen in the context of the impacts on farmland of other forms of power generation, for example, fracking for coal seam gas, and mining for coal and uranium as well as the infrastructure to support the processing of coal and gas.

Local officials and planners often restrict solar farms in residential, commercial, and sometimes agricultural zoning districts, limiting their location to industrial districts. Industrial zoning is primarily intended to separate intense land uses, such as factories and distribution centres and their associated pollution, noise, and traffic, from residential areas. However, after construction, solar farms are quiet, clean facilities that generally have no on-site employees. (U.S. Department of Energy, National Renewable Energy Laboratory, www.nrel.gov/state-local-tribal/blog/top-five-large-scale-solar-myths.html)

5.9.2 Employment

The Avisford Mini Sustainable Energy Park is designed to generate in excess of 12.7 GWh of energy annually with the system offsetting almost 8.5 thousand tonnes of CO^2 equivalent emissions (Sources: *National Greenhouse and Energy Reporting (Measurement) Determination 2008 (Schedule 1)* and Department of the Environment and Energy) and providing enough energy to power about 2,150 NSW homes.

Most power generated by the solar farm will be directed to the township of Gulgong. Another benefit to the community will be through an understanding of sustainable development and by gaining a commitment to greater reliance on renewable energy. Similarly, the clustering of solar power generation would bring regional economic development benefits as the Central West area gains a reputation as a suitable location for renewable energy and linked industries.

It is anticipated that there will be 50 personnel directly involved in construction on site which is expected to take approximately three to six months. Varying levels of expertise will be required ranging from labourers to qualified electricians and project managers.

In addition, personnel would be involved in transport and delivery of materials to the site. Some of this employment is to be sourced locally. This will bring direct economic benefits to the local economy through wages and salaries and indirect benefits through the need for accommodation and sustenance in the area for non-local employees.

Once operational the site will be unmanned, however, two to three personnel will be necessary to carry out maintenance every quarter or as required.

The skills required to be involved in the construction and ongoing maintenance of Avisford Mini Sustainable Energy Park may require some personnel to undergo further training and education, leading to an upskilling of the local workforce and enhanced employment opportunities generally.

5.9.3 Summary and mitigation measures

In summary:

- The development of a 5MW solar farm will contribute to the electricity grid in a sustainable manner that reduces greenhouse gas emissions and will assist the transition of our economy from reliance on fossil fuels to renewable sources to decarbonise electricity production
- The solar farm will assist Commonwealth and NSW Governments to achieve targets and objectives relating to emissions and addressing climate change
- The solar farm will generate community economic benefits through employment opportunities during the construction phase as well as limited maintenance and inspection jobs once operational. The development of a solar farm will create a new market for local contractors and expand diversity of income for the land holder
- The loss of productive agricultural land is minimal and temporary. The arrays of panels can be removed once the facility is decommissioned and the land can be returned to agricultural use
- If necessary and practical in terms of security, the land surrounding panel arrays can continue to be used for farming purposes such as the cultivation of vegetables or the grazing of cattle during the operation of the solar farm
- Any impacts on the natural environment including the scenic quality of the rural landscape are minimal and can be mitigated. Alternatively, the natural environment may benefit such as through the restoration of native grasses in and around panel arrays

While the impacts of a solar farm on neighbouring property values have not been studied in-depth, numerous studies have found the impact of wind energy generation on neighbouring property values to be negligible. As solar farms do not have the same impacts as wind farms (i.e., PV facilities do not cast a shadow on neighbouring properties, cause light flicker, or have the same visual impact as wind farms), the impacts on property values caused by solar farms are anticipated to be less than the impacts of wind farms. Some communities have opted for mitigation measures to reduce visual impacts of solar farms through the use of vegetative screening or decorative fencing, since PV modules are usually mounted close to the ground. (U.S. Department of Energy, National Renewable Energy Laboratory, www.nrel.gov/state-local-tribal/blog/top-five-large-scale-solar-myths.html)

It is recommended that labour to construct the solar farm be sourced from within Mid-Western LGA wherever possible.

5.10 Heritage

The First Nation people of the Mudgee area belonged to the Wiradjuri Nation, which extended from the Blue Mountains in the east to the Lachlan and Murrumbidgee rivers in the west, with the Murray River forming the southern border and the Wellington plains and hills the northern border.

The Mowgee clan extended over a 50km radius and settled around the Cudgegong River which provided food, and water. Local districts were named after the Wiradjuri tribal areas, including Mudgee which means *nest in the hills* and Gulgong meaning either *a gully* or *deep waterhole*.

The first European to arrive in the Mudgee area was James Blackman who crossed the Cudgegong River in 1821. Blackman was followed by William Lawson who took up 6,000 acres along the Cudgegong River, then George and Henry Cox who established the 'Menah' run, 3 km north-west of the present township of Mudgee. Following the discovery of gold at Hargraves, prospectors arrived and settled in the Gulgong area. The settlement was established by the 1870s. The famous poet and novelist, Henry Lawson lived in the town for a short time.

5.10.1 Indigenous heritage

The generic due diligence process outlined in the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* was implemented to ensure that an adequate due diligence process that addresses Aboriginal cultural heritage issues has been carried out. This process follows the following five steps:

1. Will the activity disturb the ground surface?

Earthworks will involve trenching which is required for cabling of each PV array/module to inverters and a substation. Other earthworks would be pile-driving to support module frames, and to enable the placement of concrete slabs and gravel accessways. Most of the infrastructure would be pre-fabricated off-site, delivered and assembled on-site.

2a. Search the AHIMS database

In accordance with the code, an on-line search was carried out of the *Aboriginal Heritage Information Management Service (AHIMS)* that is maintained by the Office of Environment and Heritage. The search is part of the due diligence process and remains valid for 12 months. The search results are appended as Attachment C.

A search of Lots 460-464 DP 755434 was performed on 9 May 2019. The search results are:

- There are no Aboriginal sites recorded in or near the selected location, and
- There are no Aboriginal places that have been declared in or near the selected location.

It is noted that surveys for Aboriginal objects have not been carried out in all parts of NSW and Aboriginal objects may exist on a parcel of land even though they have not been recorded in *AHIMS*. Further, not all known Aboriginal sites are registered on the *AHIMS* database and not all sites consist of physical evidence or remains, e.g. dreaming and ceremonial sites.

2b. Activities in areas where landscape features indicate the presence of Aboriginal objects

The site does not possess landscape features that indicate the presence of Aboriginal objects. It is not likely to have been used for camping or feasting due to the potential for ponding of water during rain events.

3. Can you avoid harm to the object or disturbance of the landscape features

Not applicable as the site has been disturbed and farmed, does not possess significant landscape features and no known Aboriginal objects are listed in *AHIMS*.

4. Desktop assessment and visual inspection

Not applicable as the site has been disturbed and no known Aboriginal objects are listed in *AHIMS*.

5. Further investigations and impact assessment

An extensive search of *AHIMS* records, is not necessary given that there are no recorded sites or places at the development site.

Mudgee Local Aboriginal Lands Council has been advised of the plans to develop the Avisford Mini Sustainable Energy Park and a representative carried out a ground survey on Friday 24 May 2019. A clearance report has not yet been issued and will be provided to Council upon receipt.

Council may also impose a condition of consent to comply with provisions of the *National Parks and Wildlife Act 1974* should any evidence of Aboriginal occupation be found during site works. An *Aboriginal Heritage Impact Permit* may be required to be obtained if indigenous heritage objects are found.

5.10.2 Non-indigenous heritage

There are 172 heritage properties in Gulgong that are listed in *Schedule 5 Environmental heritage* of *Mid-Western LEP 2012*. All of these properties have been assessed to be of local heritage significance other than the former 'Railway Station and stationmaster's house group' (item 349) located in Saleyards Lane and "Hobsons Shops Golden West Trading Post" and house (item 242) located in Herbert Street which are of state significance. The Gulgong Heritage Conservation Area, which covers most of the urban area of Gulgong, is also listed as being of local significance in Schedule 5.

Lots 460 – 464 DP 755434 are not listed as items of environmental heritage in *Schedule 5 Environmental heritage* of *Mid-Western LEP 2012* and there are no listed heritage items in the vicinity of the site. The closest items to the site are a dwelling located at 2 Cainbil Street (item 218) within the urban area of Gulgong

that is some 1.4 kilometres to the east at the nearest point to the site, and "The Lagoon" Homestead (item 391) located on the Castlereagh Highway 1.2 kilometres to the north-west of the development site.

Clause 5.10 Heritage conservation of *Mid-Western LEP 2012* applies to development relating to a listed heritage item and to development within the vicinity of a heritage item. The relevant objective of clause 5.10 is *to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views*. Clause 5.10 (5) enables a consent authority to require that a heritage management document be prepared for development of a listed item, or development in the vicinity of a heritage item, that assesses the extent of effects on heritage significance. Development in the vicinity of a heritage item is taken to mean development that is proposed on a site that is located adjoining or adjacent a site which is occupied by a heritage item. In this case, there are no listed items in the vicinity of the development site, therefore a heritage management document is not required.

5.10.3 Mitigation measures

In relation to indigenous heritage and depending on results of the site survey, it may be necessary to consult with the Mudgee Local Aboriginal Lands Council prior to commencing site works and construction to determine whether it is necessary for representatives of the lands council to be present on site during ground-disturbing works.

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No mitigation measures are necessary in relation to non-indigenous heritage.

5.11 Electromagnetic radiation

5.11.1 Potential radiation sources

Solar facilities generate electro-magnetic fields similar to household appliances within close proximity, which dissipate with increasing distance and pose no health risk to neighbouring residents. Concerns about proposed solar farms are often offset by local benefits such as significant local employment and spending during construction, increased property tax revenues with minimal drain on public services, and low water use, emission-free electricity generation. (U.S. Department of Energy, National Renewable Energy Laboratory, www.nrel.gov/state-local-tribal/blog/top-five-large-scale-solar-myths.html)

The information presented in this section has been sourced from the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). It includes a description of the type of electromagnetic radiation that may be produced by the generation and distribution of electricity.

The generation, distribution and use of electricity can produce extremely low frequency (ELF) electric and magnetic fields (EMF) from electrically charged particles. The electric field is produced by the voltage whereas the magnetic field is produced by the current. The strength of the electric field is measured in

units of volts per metre whilst the strength of the magnetic field is expressed in units of tesla (T), microtesla (μT), gauss (G) or milligauss (mG).

ELF EMF is produced by both natural and artificial sources. Naturally occurring ELF EMF is associated with atmospheric processes such as ionospheric currents, thunderstorms and lightning. Artificial sources are the dominant sources of ELF EMF and are usually associated with the generation, distribution and use of electricity at the frequency of 50 or 60 Hz. The widespread use of electricity means that people are exposed to ELF electric and magnetic fields in the home, in the environment and in the workplace.

According to the Australian Radiation Protection and Nuclear Safety Agency, which maintains continual oversight of emerging research into the potential health effects of the EMF exposure, there is no established evidence of health effects from exposure to electric and magnetic fields from powerlines, substations, transformers or other electrical sources, regardless of proximity.

5.11.2 Mitigation measures

The location of the proposed Avisford Mini Sustainable Energy Park and the distance separation between nearby dwellings and the site mean that any impacts on health are mitigated. No additional mitigation measures are proposed.

5.12 Glare and glint

5.12.1 Potential glare and glint

Glare is defined as a continuous source of excessive brightness relative to ambient lighting. Glint is defined as a momentary flash of bright light. Solar photovoltaic (PV) panels are constructed of dark, light-absorbing material and covered with anti-reflective coating. In order to maximise the efficiency, the panels are designed to limit reflection and to absorb around 98% of the light received. The glare generated from solar panels is significantly lower than many other surfaces, including water, however, the glass panels and metal frames have the potential to generate glare and glint. An assessment of the potential glare and glint generated by the proposed solar farm is necessary to ensure visual receptors such as road users, air traffic control towers and pilots are not impacted by the development of solar farms.

Residents and local government officials often cite glare or blinding from solar facilities as a primary concern. While concentrating solar technologies do use mirrors which can cause glare, most solar farms use PV modules to generate electricity. PV modules use non-reflective glass and are designed to absorb rather than reflect the light that hits the panels in order to convert solar energy into electricity. PV modules are generally less reflective than windows and are installed at numerous airports. (U.S. Department of Energy, National Renewable Energy Laboratory, www.nrel.gov/state-local-tribal/blog/top-five-large-scale-solar-myths.html)

In a fixed PV solar array, the angle of incidence varies as the sun moves across the sky, that is, the angle of incidence is at its lowest around noon where the sun is directly overhead and increases in the early

mornings and late evenings as the incidence angles increase. The variation of the angle is reduced where the PV array is mounted on a single axis tracking system whereby the panels rotate to remain perpendicular to the sun as proposed in the Avisford Mini Sustainable Energy Park. Therefore, an array mounted on a tracking system has less potential to cause glare whilst it tracks the sun.

A desktop assessment has been carried out using the Solar Glare Hazard Analysis Tool. The results of the glare analysis are appended as Attachment D. The assessment is based on identifying the potential sensitive receptors and then assessing the potential glare and glint hazard and impacts on those receptors using the tool. Glare resulting from PV solar farms is analysed at different viewpoints based on the location, orientation and specifications of the solar panels. Mitigation measure are recommended to reduce potential impacts to an acceptable level. This tool is used by the United States Federal Aviation Administration for glare hazard analysis near airports and is also recognised by the Australian Government Civil Aviation Safety Authority (CASA).

The analysis estimates green glare and yellow glare received at each identified potential receptor. Green glare is glare with low potential to cause an after-image when observed prior to typical blink response time, and yellow glare has a higher potential to cause an after-image when observed prior to a typical blink response time. The analysis is on a minute-by-minute basis because sun reflections from solar panels are likely to last at least one minute. Glint is a short-term flash which lasts for less than a minute is therefore unlikely to occur from the sun, due to the pace at which the sun and panels move. Glint is not considered to be a factor affecting motorists or pilots and is not considered further in this assessment.

The heights of the observation points were assumed to be 1.5 m for a motorist and 1.65 m for a standing person. Existing vegetation or structures can affect visual connectivity with solar panels. Similarly, atmospheric conditions such as cloud cover can influence light reflection and the resulting impact on visual receptors. Many of the potential visual receptors were discounted because local topography would obscure views towards the solar farm. Other potential visual receptors were discounted because the view of the solar farm would be obscured by stands of trees, for example, trees surrounding observation point 3 (OP3) would act as a visual barrier.

It is noted that the site is fully cleared with only a single tree remaining on the site. There are no existing structures on the development site. Of the twenty-eight observation points identified, only ten residences were identified as potential visual receptors. Potential sensitive receptors, called observation points, are shown in Figure 15. Three road observation routes and ten residential observation points were identified as potential visual receptors. These were identified as follows:

- Considering the elevation of the site relative to surrounding land to determine land potentially affected. The blue shaded area in Figure 15 indicates areas of possible visual impact,
- Including residential properties and public roads within a 2 km radius of the site. Properties located at greater distances are unlikely to be affected, and
- Excluding properties where existing structures, topography or vegetation will act as visual barriers, for example, to the south-west of the site.

Mudgee Airport was not considered a potential visual receptor due to elevation and its location approximately 24.5 kilometres south-east of the development site.

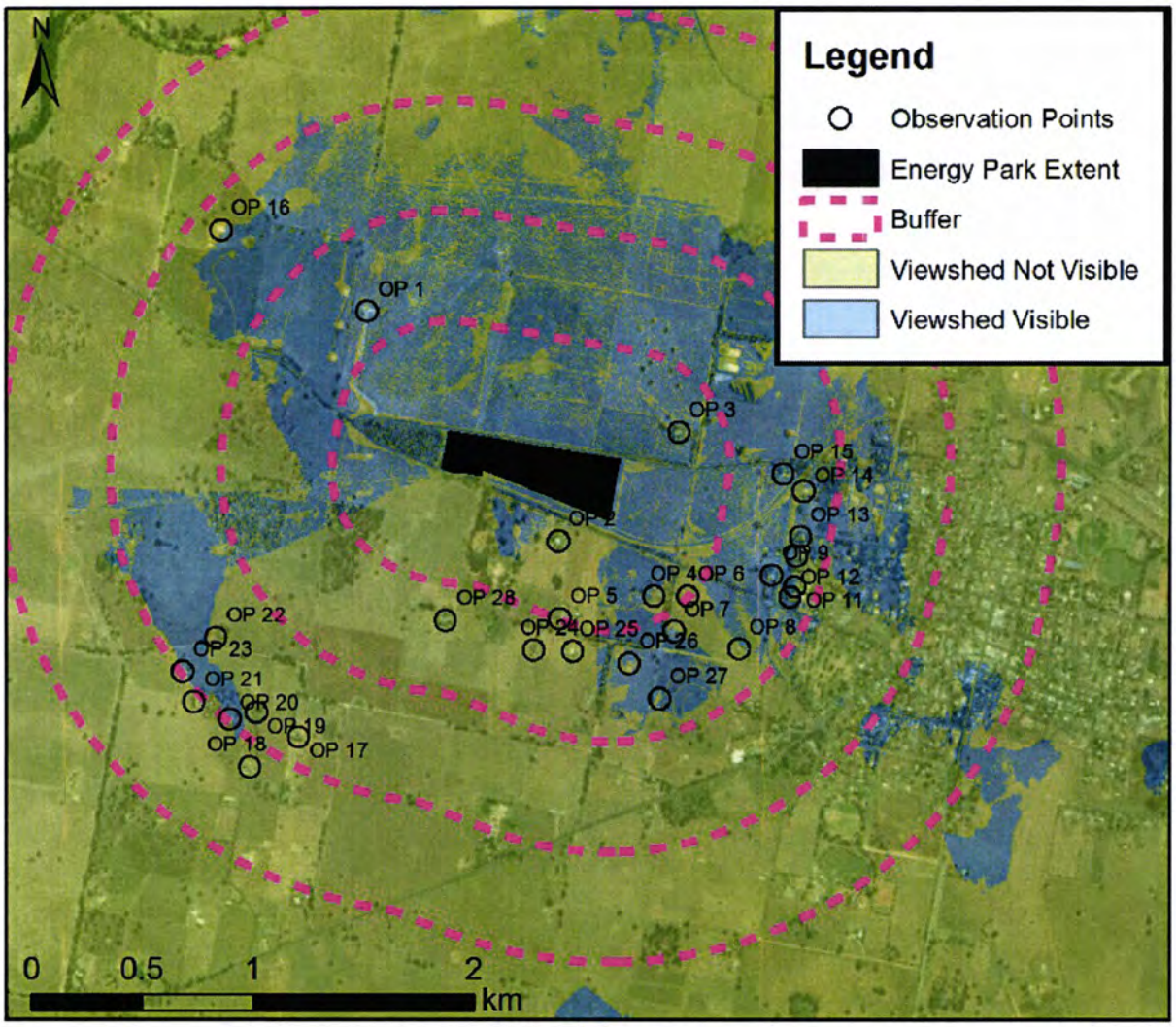

Figure 15: Viewshed and observation points

The results of the Solar Glare Hazard Analysis Tool for the Avisford Mini Sustainable Energy Park are detailed in Table 9.

Table 9: Solar Glare Hazard Analysis Tool specification inputs

Observation point (property)	Type or property	Location relative to solar farm	Green glare	Yellow glare	Results
OP1	Residence	675m north west	0	0	No glare
OP2	Residence	177m south	0	0	No glare
OP3	Residence	265m north east	0	0	No glare
OP4	Residence	395m east	0	0	No glare

Observation point (property)	Type or property	Location relative to solar farm	Green glare	Yellow glare	Results
OP5	Residence	460m south	0	0	No glare
OP6	Residence	860m east	0	0	No glare
OP7	Residence	860m east	0	0	No glare
OP8	Residence	1380m north west	0	0	No glare
OP9	Residence	1600m south west	0	0	No glare
OP10	Residence	1500m south west	0	0	No glare
Caledonian Street	Route	800m east	0	0	No glare
Castlereagh Highway	Route	80m south	0	0	No glare
Old Mill Road	Route	675m north west	0	0	No glare

The results of the analysis indicate that persons occupying the selected properties are unlikely to be affected by either green or yellow glare as a result of the proposed solar farm.

The relatively flat topography ensures that even minor topographic features and large stands of trees obscure the view of the solar farm from most potential visual receptors. While glare is unlikely to be experienced by road users of the Castlereagh Highway the roadside vegetation is mature with little understorey which allows for glimpses of the solar farm along this route. If screening was required, this could relatively easily be achieved by vegetation grown to 2.5m, either within the road reserve or as a perimeter around the solar farm.

5.12.2 Mitigation measures

Additional vegetation screening could be considered around the perimeter of the solar farm to further mitigate any impacts to visual amenity experienced by users of Old Mill Road or Caledonian Street.

6. CONCLUSION

The site is considered suitable for the proposed development of the Avisford Mini Sustainable Energy Park. It is located adjacent a 66kV power line easement and can connect to the 22kV power line which links to the Gulgong Zone Substation enabling efficient connections to transfer power generated by the solar PV panels to the township and grid.

The site is flat, is free of constraints and is accessible to large delivery vehicles during the construction phase and utility vehicles for ongoing maintenance.

The likely impacts of the development have been considered in this Statement and supporting documents. Considerations include impacts on biodiversity, natural hazards, visual and scenic amenity, glare and glint, traffic, noise, air quality, waste management, water resources, indigenous and non-indigenous heritage, the community and the local economy. Any impacts on these interests have been found to be acceptable and mitigation measures have been recommended where necessary.

According to the Australian Radiation Protection and Nuclear Safety Agency, which maintains continual oversight of emerging research into the potential health effects of the EMF exposure, there is no established evidence of health effects from exposure to electric and magnetic fields from powerlines, substations, transformers or other electrical sources, regardless of the proximity.

Below is a summary of mitigation measures. It is recommended that an environmental management plan be prepared to cover the construction and operational phases. Where necessary Table 10 includes a recommendation as to whether the mitigation measure should be included in the management plan.

Table 10: Summary of mitigation measures

Consideration	Mitigation measures	Environmental Management Plan
Biodiversity	To avoid interference with vegetation communities located on the adjoining land and to mitigate against significant impacts on any threatened or migratory entities it is recommended that: • any vegetation planted to screen the development are to be native species endemic to the area • Access to the site is to be limited to that point shown on development plans and within the development area • Storage of materials is to be carried out wholly within the development area. • Ensure adequate erosion and sedimentation control measures are in place during construction to mitigate against soil entering adjacent native vegetation. • Hydrology: Existing overland flows should be maintained over the life of the development to prevent alteration to species composition in any nearby habitat	Yes

Consideration	Mitigation measures	Environmental Management Plan
	• The planting of any species listed on the Weeds Australia NSW weeds list (www.weeds.org.au) should be prohibited for the life of the development • Any soil stabilisation or landscaping using grasses must either be done with locally native species or sterile/innocuous species, e.g. Sterile Oats (*Avena sterilis*). Invasive grass species such as Kikuyu or Buffalo Grass should not be used	
Natural hazards	None recommended	n/a
Water resources	Design – site drainage and water quality controls: • Undertake hydrological assessment of the sites catchment in accordance with relevant methods outlined in Australian Rainfall and Runoff. • Determine sediment management targets and drainage control standards in accordance with Managing Urban Stormwater: Soils and Construction Vol 1 (Blue Book) (DECC, 2008). • Develop a site erosion and sediment control plan in accordance with the Blue Book. • Develop site drainage design incorporating detention basins and sedimentation management structures where relevant. • Permanent site drainage should coincide with temporary arrangements where possible	Yes
	Construction and/or demolition – site drainage and water quality controls: • Catch drains to be located downslope of any proposed road works. • Install location appropriate sediment fences or other applicable control measures depending on whether the feature is upstream or downstream of a disturbed part of the site or will need to be trafficable. • All stormwater collection points need to have appropriate sedimentation and erosion controls. • Undertake ongoing inspections of stormwater facilities and water control measures to assess their effectiveness. • Vibration grids or wash bays at all construction exits. • Level spreaders at locations where concentrated flow is discharged offsite to ensure sheet flow like conditions are maintained. • Flat land erosion control options include erosion control blankets, gravelling, mulching, soil binder, turfing and revegetation	Yes
	Construction and/or demolition – stormwater point source control: In the event of concrete works: • Do not undertake works if chance of heavy rain. • Store rinsate5 water, if applicable, separately to other water on site and dispose of offsite as appropriate. • Block on site drains in the area of the works and remove any contaminated runoff. In the event that dewatering practices are required:	Yes

Consideration	Mitigation measures	Environmental Management Plan
	• Pump hose intakes for withdrawing water from excavations will be elevated to minimise sediment pumping and directed to a containment area for settling prior to discharge. • Limit direct discharge off site (consistent with the design requirements for sediment pond discharge). • Stormwater collected on site should be reused where possible. Controls should be inspected and maintained on a regular basis. All water released from sediment basins should be clear or disposed off site by vehicle. • Material and waste storage areas should be designed and operated to minimise interaction with surface waters. • Vehicle washdown areas should be located away from water courses	
Visual & scenic amenity	It is recommended that a vegetated buffer be incorporated to screen the development from Old Mill Road, the property to the east and the Castlereagh Highway. This should include large shrubs planted outside the perimeter security fencing. If Council considers it necessary, shade screen material may be placed on the security fencing to provide screening until such time as the shrubs are mature and have grown to full height.	Yes
Traffic	• If possible, provide a bus service to convey workers to the site during construction to minimise the number of light vehicles accessing the site, • Construct the site entrance according to Triaxial Plan MX10595.00SK01 appended to the traffic assessment, and • Heavy vehicles should arrive and depart from the site outside of the morning and afternoon peak traffic periods, i.e. between 10.00am and 2.00pm weekdays.	Yes, with reference to site access during the establishment and construction phases
Noise	The following mitigation measures are recommended to address noise emissions during the construction phase: • a construction noise management protocol to minimise noise emissions, manage out of hours (minor) works to be inaudible, and to respond to potential concerns from the community, • where possible use localised mobile screens or construction hoarding around plant to act as barriers between construction works and receivers, particularly where equipment is near the site boundary and/or a residential receiver including areas in constant or regular use (e.g. unloading and laydown areas), • operating plant in a conservative manner (no over-revving), shutdown when not in use, and be parked/started at farthest point from relevant assessment locations, • selection of the quietest suitable machinery available for each activity, • avoidance of noisy plant/machinery working simultaneously where practicable, • minimise impact noise wherever possible, • utilise a broadband reverse alarm in lieu of the traditional high frequency type reverse alarm,	Yes, for construction and operational phases

Consideration	Mitigation measures	Environmental Management Plan
	• provide toolbox meetings, training and education to drivers and contractors visiting the site during construction so they are aware of the location of noise sensitive receivers and to be cognisant of any noise generating activities, • signage is to be placed at the front entrance advising truck drivers of their requirement to minimise noise both on and off-site, and • utilise project related community consultation forums to notify residences within close proximity of the site with project progress, proposed/upcoming potentially noise generating works, its duration and nature and complaint procedure. It is recommended that the noise emissions from the solar farm be minimised when operational. To assist in noise management, it is recommended that a one-off noise validation monitoring assessment be completed to quantify emissions from site and to confirm emissions relevant criteria are satisfied.	
Air quality	During construction: • Limit vehicle movements to areas necessary to deliver panels, ancillary structures and equipment • Suppress dust emissions using watering and cease works during dry and windy conditions • Ensure ground disturbance is limited to areas necessary to place footings or to be used for access • Ensure minimal handling of excavated materials • Ensure stockpiles of excavated material is bunded and protected from wind and vehicle movements During operation: • Grade and add road base to internal accessways • Revegetate the site with suitable groundcover immediately construction works are completed • Ensure all plant and equipment operates in accordance with specifications	Yes, for construction and operational phases
Waste management	It is recommended that a waste management plan be developed to provide detailed procedures to manage the waste stream. The plan should contain: • Strategies to reduce waste during all project phases, • Recycling, re-use and recovery strategies and opportunities, • Classification of all waste streams, • Tracking register and details, • On site recycling management, • Allocation of responsibilities for recycling, re-use and disposal, • Reporting and notification procedures if a waste incident occur. If vegetation clearance is required during preparation of the site prior to and/or during the construction phase, that vegetation should be re-used for mulch and on-site soil erosion control where possible.	Yes, for construction phase

Consideration	Mitigation measures	Environmental Management Plan
The community & local economy	Labour be sourced from within Mid-Western LGA wherever possible	n/a
Heritage	Depending on results of the site survey, it may be necessary to consult with the Mudgee Local Aboriginal Lands Council prior to commencing site works and construction to determine whether it is necessary for representatives of the lands council to be present on site during ground-disturbing works.	Potentially
Electromagnetic radiation	No mitigation measures are proposed.	n/a
Glare and glint	Additional vegetation screening could be considered around the perimeter of the solar farm to further mitigate any impacts to visual amenity experienced by users of Old Mill Road or Caledonian Street	Yes

The proposed development of the Avisford Mini Sustainable Energy Park is permissible under provisions of *SEPP (Infrastructure) 2007.* It would assist to generate electricity and at the same time contribute to reducing greenhouse gas emissions and achieving the national targets.

Any potential impacts of the development may be avoided, minimized or mitigated. The development is considered to be in the public interest.

ATTACHMENT A

Gulgong Bionet search results (10km radius from site)

Scientific name	Common name	BC Act	EPBC Act
Birds			
Stagonopleura guttata	Diamond Firetail	V	
Falco subniger	Black Falcon	V	
Flora			
Acacia ausfeldii	Ausfeld's Wattle	V	
Diuris tricolor	Pine Donkey Orchid	V	
Mammals			
Chalinolobus dwyeri	Large-eared Pied Bat	V	V
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	
Phascolarctos cinereus	Koala	V	V

V = vulnerable

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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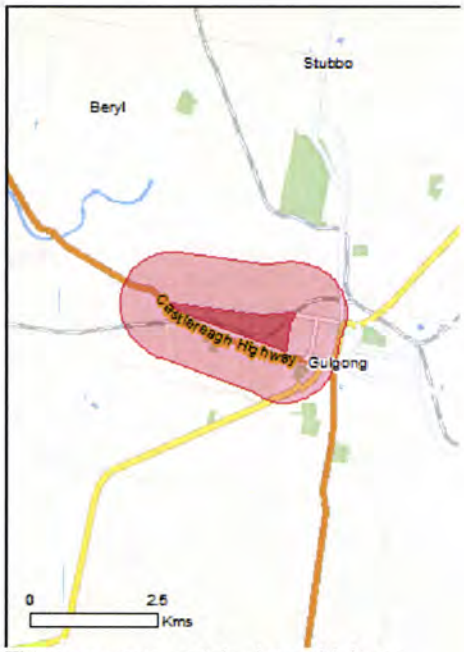

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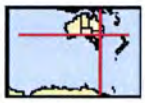


Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	28
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	18
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	28
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Banrock station wetland complex	800 - 900km upstream
Riverland	800 - 900km upstream
The coorong, and lakes alexandrina and albert wetland	900 - 1000km upstream
The macquarie marshes	200 - 300km upstream

Listed Threatened Ecological Communities		[Resource Information]
For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.		
Name	Status	Type of Presence
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe	Endangered	Species or species

Name	Status	Type of Presence
[77037]		habitat may occur within area
Fish		
Galaxias rostratus		
Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat may occur within area
Macquaria australasica		
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Nyctophilus corbeni		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
Petauroides volans		
Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Dichanthium setosum		
bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Euphrasia arguta		
[4325]	Critically Endangered	Species or species habitat may occur within area
Homoranthus darwinioides		
[12974]	Vulnerable	Species or species habitat may occur within area
Leucochrysum albicans var. tricolor		
Hoary Sunray, Grassland Paper-daisy [56204]	Endangered	Species or species habitat likely to occur within area
Philotheca ericifolia		
[64942]	Vulnerable	Species or species habitat may occur within area
Prasophyllum petilum		
Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269)		
a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Swainsona recta		
Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat may occur within area
Tylophora linearis		
[55231]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Reptiles		
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area
Delma impar Striped Legless Lizard [1649]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name

Commonwealth Land - Australian Telecommunications Commission

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-32.354846 149.525342,-32.355735 149.524591,-32.355952 149.524398,-32.35655 149.524226,-32.360465 149.523561,-32.360665 149.523261,-32.360248 149.52296,-32.354411 149.504464,-32.354049 149.503884,-32.353614 149.503198,-32.353269 149.503219,-32.355191 149.519441,-32.354701 149.524312,-32.354864 149.52532,-32.354846 149.525342

Office of Environment & Heritage

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 0619e

Client Service ID : 419733

Zenith Town Planning

P O Box 591

Moruya New South Wales 2537

Attention: Allen Grimwood

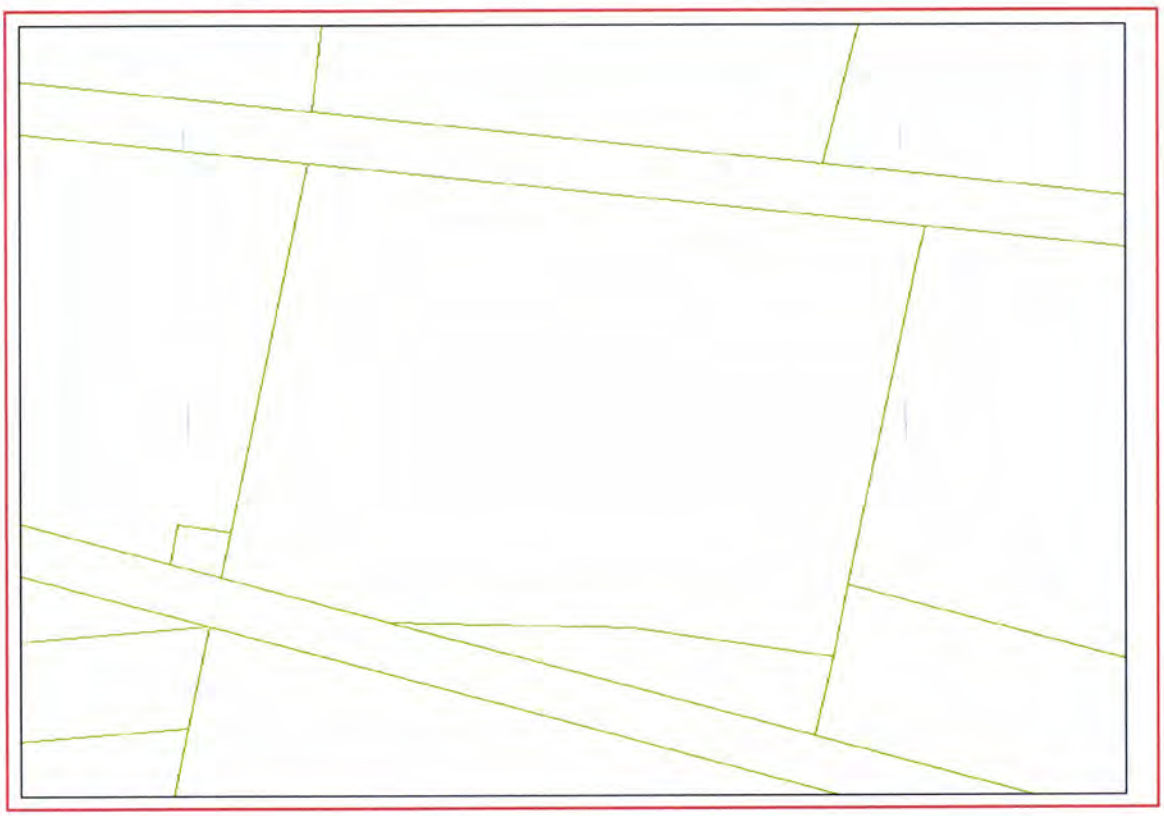
Email: zenithplan@bigpond.com

Date: 09 May 2019

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 460, DP:DP755434 with a Buffer of 50 meters, conducted by Allen Grimwood on 09 May 2019.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

Office of Environment & Heritage

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 0619d

Client Service ID : 419732

Zenith Town Planning

P O Box 591
Moruya New South Wales 2537
Attention: Allen Grimwood

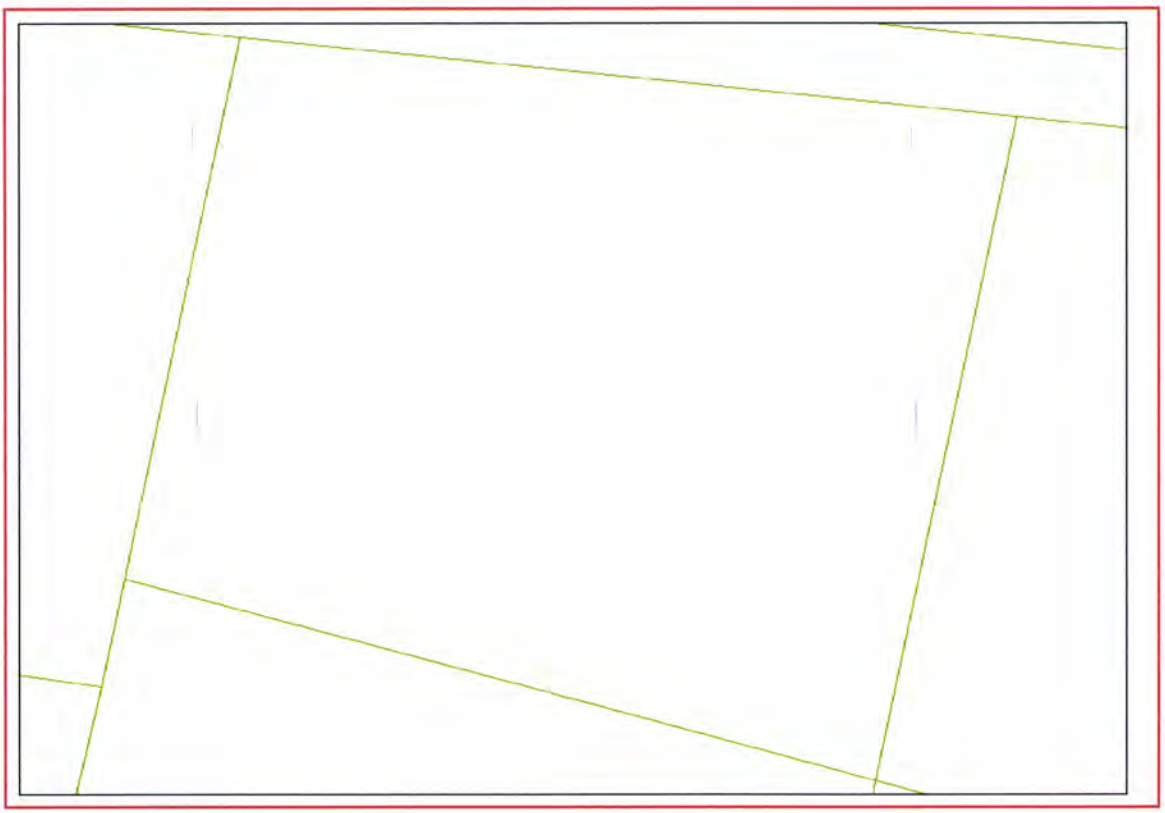
Email: zenithplan@bigpond.com

Date: 09 May 2019

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 461, DP:DP755434 with a Buffer of 0 meters, conducted by Allen Grimwood on 09 May 2019.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

Office of Environment & Heritage

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 0619c

Client Service ID : 419730

Zenith Town Planning

P O Box 591
Moruya New South Wales 2537

Attention: Allen Grimwood

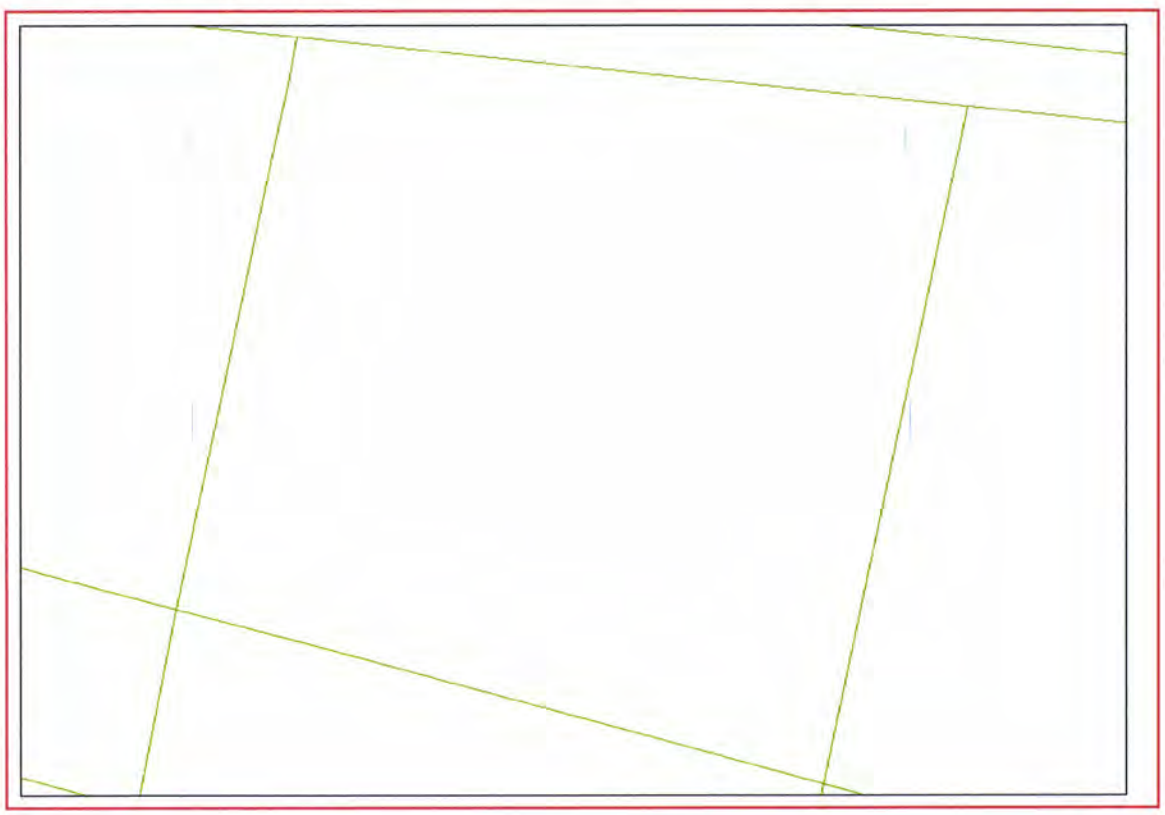
Email: zenithplan@bigpond.com

Date: 09 May 2019

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 462, DP:DP755434 with a Buffer of 0 meters, conducted by Allen Grimwood on 09 May 2019.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

Office of Environment & Heritage

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 0619b

Client Service ID : 419729

Zenith Town Planning

P O Box 591

Moruya New South Wales 2537

Attention: Allen Grimwood

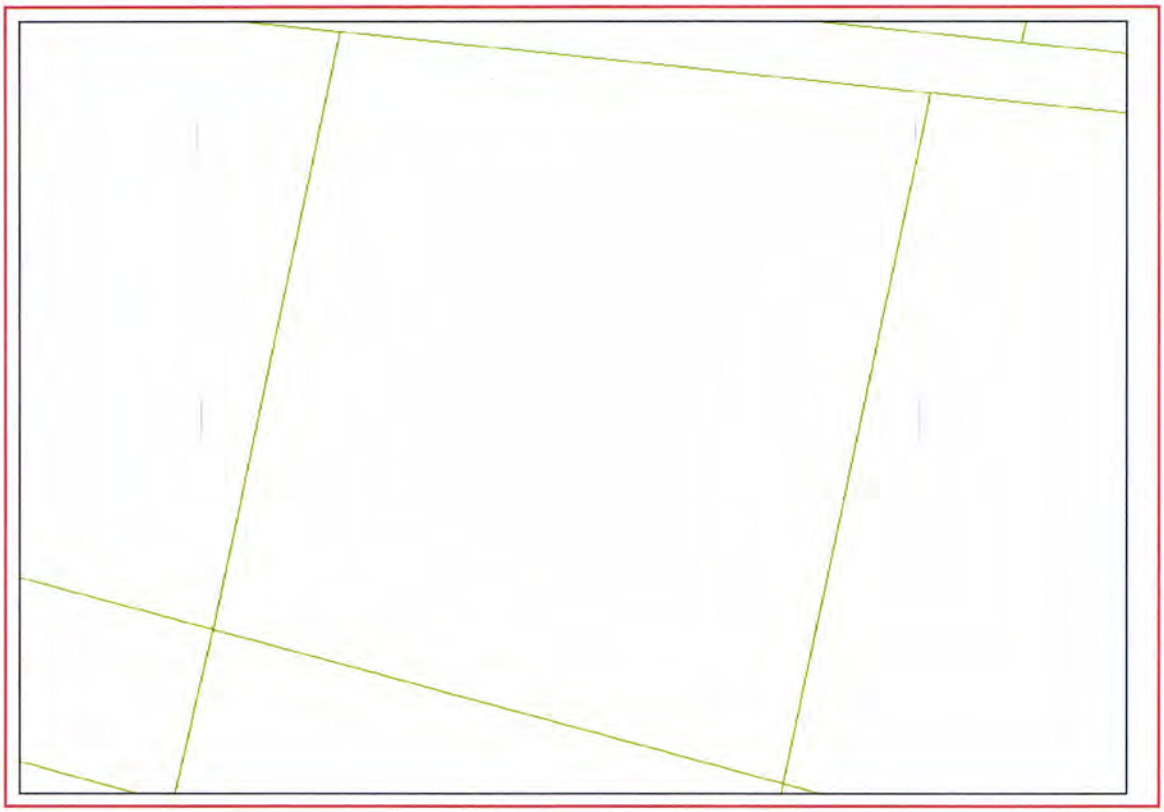
Email: zenithplan@bigpond.com

Date: 09 May 2019

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 463, DP:DP755434 with a Buffer of 0 meters, conducted by Allen Grimwood on 09 May 2019.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

Office of Environment & Heritage

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 0619a

Client Service ID : 419727

Zenith Town Planning

P O Box 591
Moruya New South Wales 2537
Attention: Allen Grimwood

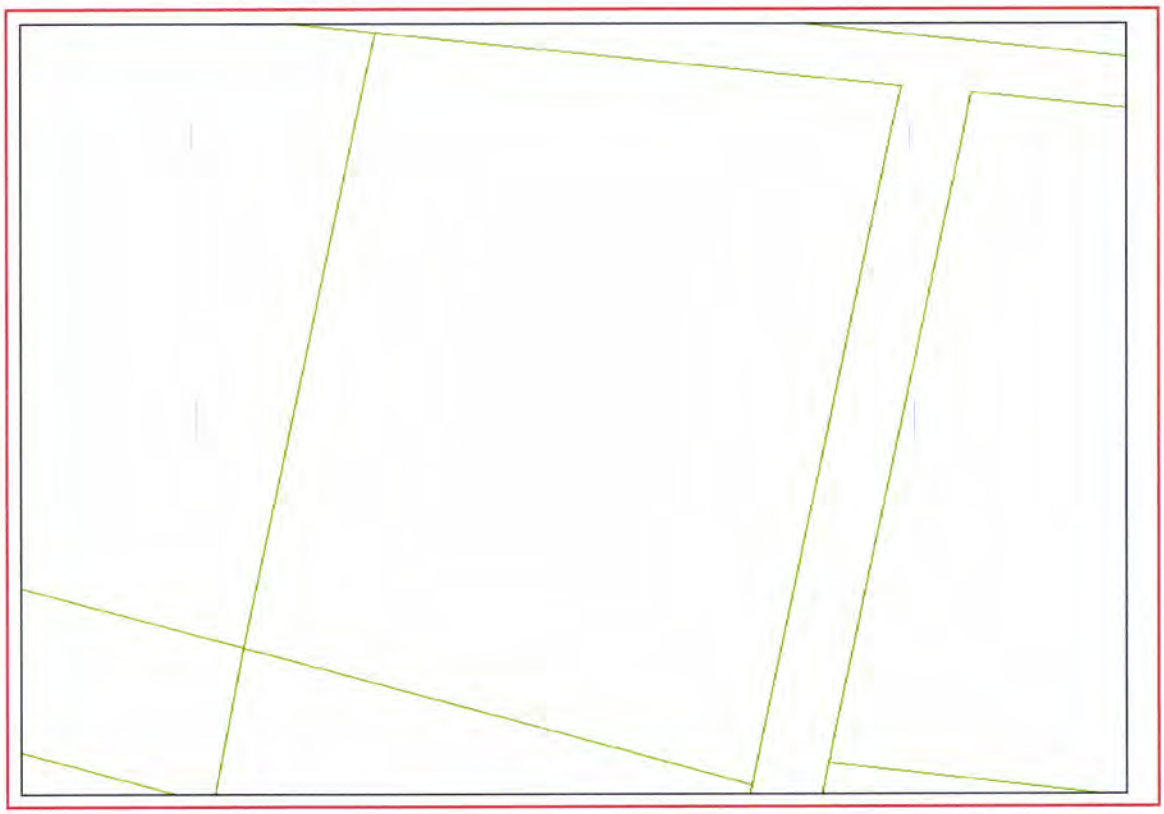
Email: zenithplan@bigpond.com

Date: 09 May 2019

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 464, DP:DP755434 with a Buffer of 0 meters, conducted by Allen Grimwood on 09 May 2019.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

3 Marist Place, Parramatta NSW 2150
Locked Bag 5020 Parramatta NSW 2220
Tel: (02) 9585 6380 Fax: (02) 9873 8599

ABN 30 841 387 271
Email: ahims@environment.nsw.gov.au
Web: www.environment.nsw.gov.au

ATTACHMENT D

FORGESOLAR GLARE ANALYSIS

Project: **Avisford Mini Sustainable Energy Park**
Proposed 5MW solar facility

Site configuration: **Avisford Mini Sustainable Energy Park**
Analysis conducted at 04:09 on 25 May, 2019.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
Flight path(s)	N/A	No flight paths analyzed
ATCT(s)	N/A	No ATCT receptors designated

Default glare analysis parameters and observer eye characteristics (for reference only):

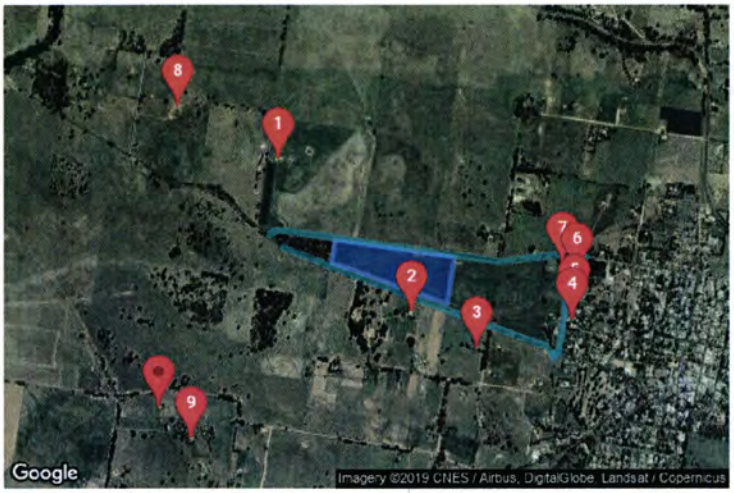
- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m^2
Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad
Site Config ID: 27884.4968



PV Array(s)

Name: PV array 1
Axis tracking: Single-axis rotation
Tracking axis orientation: 0.0°
Tracking axis tilt: 0.0°
Tracking axis panel offset: 0.0°
Max tracking angle: 60.0°
Resting angle: 60.0°
Rated power: -
Panel material: Smooth glass without AR coating
Reflectivity: Vary with sun
Slope error: correlate with material

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	-32.357702	149.515662	428.34	2.50	430.84
2	-32.354893	149.516177	425.16	2.50	427.66
3	-32.353878	149.507723	419.55	2.50	422.05
4	-32.355237	149.507465	420.29	2.50	422.79

Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (m)	Height (m)
OP 1	1	-32.349062	149.503689	421.69	1.50
OP 2	2	-32.358243	149.513119	430.30	1.50
OP 3	3	-32.360418	149.517770	437.06	1.50
OP 4	4	-32.358618	149.524575	446.92	1.50
OP 5	5	-32.357848	149.524747	444.84	1.50
OP 6	6	-32.355972	149.524876	443.78	1.50
OP 7	7	-32.355301	149.523867	440.58	1.50
OP 8	8	-32.345866	149.496562	438.93	1.50
OP 9	9	-32.365820	149.497532	457.17	1.50
OP 10	10	-32.363936	149.495237	442.18	1.50

Route Receptor(s)

Name: Caledonian Street
Path type: Two-way
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	-32.360777	149.523177	444.30	1.65	445.95
2	-32.360632	149.523563	446.92	1.65	448.57
3	-32.356209	149.524357	442.41	1.65	444.06
4	-32.355702	149.524679	443.20	1.65	444.85
5	-32.354850	149.525559	445.44	1.65	447.09

Name: Castlereagh Highway
Path type: Two-way
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	-32.354321	149.504056	421.65	1.65	423.30
2	-32.356025	149.509077	424.65	1.65	426.30
3	-32.358436	149.516780	430.02	1.65	431.67
4	-32.360285	149.522767	443.46	1.65	445.11
5	-32.360937	149.523303	444.39	1.65	446.04

Name: Old Mill Road
Path type: Two-way
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)	Height above ground (m)	Total elevation (m)
1	-32.353578	149.503058	420.65	1.65	422.30
2	-32.353306	149.503423	419.92	1.65	421.57
3	-32.353324	149.504260	419.22	1.65	420.87
4	-32.355173	149.519409	431.06	1.65	432.71
5	-32.354675	149.524204	441.10	1.65	442.75
6	-32.354675	149.524387	441.93	1.65	443.58

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt	Orient	"Green" Glare	"Yellow" Glare	Energy
	(°)	(°)	min	min	kWh
PV array 1	SA tracking	SA tracking	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
OP 7	0	0
OP 8	0	0
OP 9	0	0
OP 10	0	0
Caledonian Street	0	0
Castlereagh Highway	0	0
Old Mill Road	0	0

Results for: PV array 1

Receptor	Green Glare (min)	Yellow Glare (min)
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
OP 7	0	0
OP 8	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
OP 9	0	0
OP 10	0	0
Caledonian Street	0	0
Castlereagh Highway	0	0
Old Mill Road	0	0

Point Receptor: OP 1

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 2

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 3

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 4

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 5

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 6

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 7

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 8

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 9

0 minutes of yellow glare
0 minutes of green glare

Point Receptor: OP 10

0 minutes of yellow glare
0 minutes of green glare

Route: Caledonian Street

0 minutes of yellow glare
0 minutes of green glare

Route: Castlereagh Highway

0 minutes of yellow glare
0 minutes of green glare

Route: Old Mill Road

0 minutes of yellow glare
0 minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
Several calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Glare vector plots are simplified representations of analysis data. Actual glare emanations and results may differ.
The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual results and glare occurrence may differ.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.

GOLDER

REPORT

Avisford Mini Sustainable Energy Park

Water Assessment

Submitted to:

ITP Renewables

ITP Renewables
Southern Cross House
Level 1, 19 Moore Street, Turner ACT
PO Box 6127, O'Connor, ACT, 2602

Submitted by:

Golder Associates Pty Ltd

147 Coronation Drive, Milton, Queensland 4064, Australia

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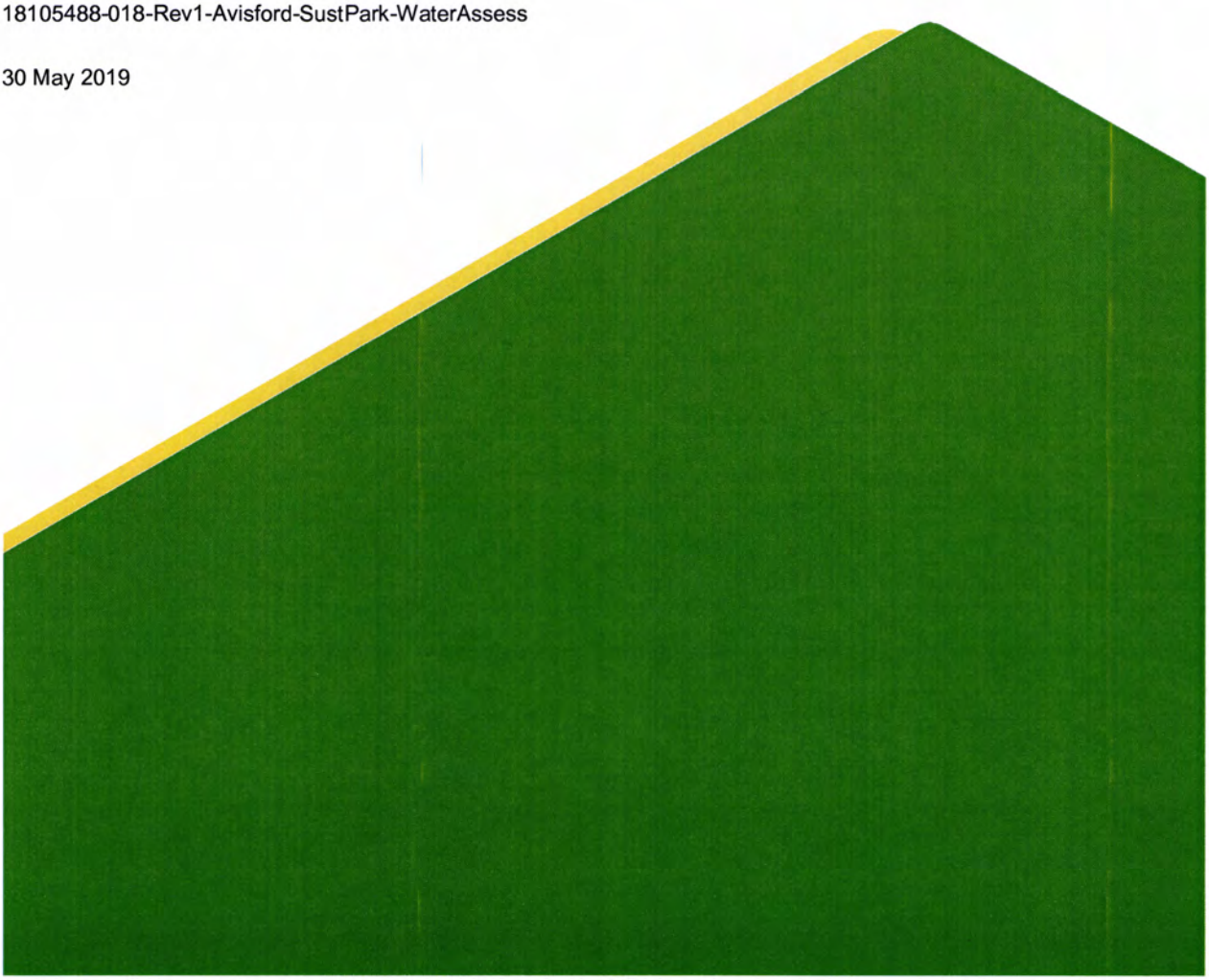
18105488-018-Rev1-Avisford-SustPark-WaterAssess

30 May 2019



Distribution List

ITP Renewables

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APPENDICES

1.0 INTRODUCTION

The proposed Avisford Mini Sustainable Energy Park (also known as Gulgong 2A) is located at 129 Old Mill Road, Gulgong, 85 km east of Dubbo, New South Wales (NSW). The Project site is within Lot 460-464 / 755434. ITP Renewables (Australia) Pty Ltd (ITP Renewables) propose to construct a 5 MW solar facility within the site that is currently used for grazing.

This report, which provides a desktop water assessment to support the Development Application for the project, includes a:

- Desktop review of local hydrology and catchment and water quality data.
- Desktop review of surface and groundwater quality data.
- Desktop review of the flood risk potential against the Local Environmental Plan.
- Desktop impact assessment against NSW policies and referenced industry standards for solar arrays.
- Desktop management assessment with mitigation measures recommend for construction and operation.

1.1 Limitations of assessment

The assessment is based on publicly available information and data and does not include a site inspection, sampling, or any additional hydrological and/or hydraulic modelling.

1.2 Important information relating to this report

Your attention is drawn to the document titled - "Important Information Relating to this Report", which is included in Appendix B of this report. The statements presented in that document are intended to inform a reader of the report about its proper use. There are important limitations as to who can use the report and how it can be used. It is important that a reader of the report understands and has realistic expectations about those matters. The Important Information document does not alter the obligations Golder Associates has under the contract between it and its client.

2.0 PROJECT DESCRIPTION

The proposed Avisford Mini Sustainable Energy Park is located on 129 Old Mill Road, Gulgong, 85 km east of Dubbo and 1.8 km north-west of the town of Gulgong. It is located within the Mid-Western Regional Council area. Figure 1 indicates the area of the proposed facility, which is located 2.3 km south of Wialdra Creek. The Wialdra Creek flows west into the Cudgegon River.

ITP Renewables propose to construct a solar farm with a DC array capacity of 6.1 MW_{DC} and an AC output of 5 MW_{AC} on a site that is currently used for grazing.

There will be 16,184 solar modules installed in rows running north to south. Each row of PV modules will rotate to track the sun across the sky from east to west each day.

The solar farm will also consist of one inverter station, located within the array and mounted on a 20 ft skid. The inverter station will incorporate High/Medium voltage switchgear and transformers.

The mounting system will be constructed on piles that are driven into the ground. During construction, which is expected to take approximately 3 months, there is expected to be around 50 personnel on site working from 7 am – 4 pm Monday to Friday. Once operational the site will be unmanned with maintenance expected to be carried out quarterly by a crew of 2 – 3 people.

The site is relatively flat, with the land sloping downwards approximately 3 m (approximate 0.4% grade) from east to west. The land is mostly cleared of native vegetation and is currently used for grazing (Figure 2).

PATH: R:\01 Client\ITP Renewables\P18105488\99_PROJECTS\18105488-018-R-F001-Rev0-Gulgong-Project-Location.mxd PRINTED ON: 2019-05-23 AT: 8:45:47 AM

LEGEND

- Town
- Rainfall Station
- Roads
- Electricity Transmission Line
- Hydrolines
- Major Watercourses

Cadastre

- Lots/Plans of Interest
- Other Lots/Plans

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

0 250 500 750 1,000
1:25,000 @A3 METRES

CLIENT
ITP RENEWABLES

CONSULTANT
GOLDER

DD/MM/YYYY	23/05/2019
DESIGNED	BG
PREPARED	BG
REVIEWED	DP
APPROVED	JR

NOTE(S)

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

REFERENCE(S)

Rainfall Station: © Commonwealth of Australia 2019, Bureau of Meteorology
All other data: © State of NSW (Spatial Services - Department of Finance, Services and Innovation) 2019.

PROJECT
AVISFORD MINI SUSTAINABLE ENERGY PARK - WATER

TITLE
PROJECT LOCATION

PROJECT NO	CONTROL	REV.	FIGURE
18105488	018	0	1

PATH: R:\01 Client\ITP Renewables\P18105488\99_PROJECTS\18105488-018-R-F002-Rev0-Gulgong-Project-Area.mxd PRINTED ON: 2019-05-23 AT: 11:42:06 AM

LEGEND

- 10 m surface elevation contours
- Roads
- Surface Water Features

Cadastre

- Lots/Plans of Interest
- Other Lots/Plans

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

0 50 100 150 200 250
1:7,500 @A3 METRES

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ITP RENEWABLES

CONSULTANT
GOLDER

DD/MM/YYYY	23/05/2019
DESIGNED	BG
PREPARED	BG
REVIEWED	DP
APPROVED	JR

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

REFERENCE(S)

Rainfall Station: © Commonwealth of Australia 2019, Bureau of Meteorology
All other data: © State of NSW (Spatial Services - Department of Finance, Services and Innovation) 2019.

PROJECT
AVISFORD MINI SUSTAINABLE ENERGY PARK - WATER ASSESSMENT

TITLE
PROJECT AREA

PROJECT NO	CONTROL	REV.	FIGURE
18105488	018	0	2

3.0 LEGISLATIVE CONTEXT

NSW has a comprehensive legislative and policy framework for the management of floodplain risk and flood prone areas of the state with clear areas of responsibility as outlined below in Figure 3.

Figure 3: Floodplain Risk Management and Planning Process

3.1 Local Government Act 1993

This Act provides a legal framework for the NSW system of local government. The Floodplain Management Manual was gazetted in 2005 as the manual relating to the development of flood-liable land for the purposes of section 733. This section exempts councils from liability in relation to flood prone land provided they have undertaken assessments substantially in accordance with the latest manual.

The Floodplain Development Manual (NSW Government, 2005) is the approved Section 733 manual for flood prone land. The manual supports the NSW Government's Flood Prone Land Policy in providing for the development of sustainable strategies for the management of floodplains specifically in relation to human occupation. It provides a framework for councils to implement the policy and a process for managing floodplain risk.

3.2 Environmental Planning and Assessment Act 1979

This is an Act to institute an environmental planning system and assessment arrangements for NSW. In 2017 there were major amendments passed with a view to improving the planning system through simpler processes, improved strategic planning and community participation in order to enable more balanced and transparent decision making. Clause 3.43 makes provision for the preparation of development control plans by relevant authorities (outlined further in Section 3.4.1).

3.3 Water Management Act 2000

The Act provides for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations. Water management principles intended to guide decision making under the Act in relation to floodplain management require the existing and future risk to human life and property arising from occupation of the floodplain to be minimised.

3.3.1 Surface water sharing plan

The Water Management Act 2000 applies to areas of New South Wales that have a water sharing plan. The Project area is located within the Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012 area. The water source for the area is listed as being the Cooyal Wialdra Creek within the major catchment of Macquarie.

Water sharing plans relate to the protection of surface water and alluvial groundwater resources. The Macquarie Bogan Unregulated and Alluvial Water Sources 2012 covers 30 unregulated surface water sources and four alluvial groundwater sources. As this plan relates to licencing and use of water resources under the Water Management Act 2000, it is not relevant for the Project (as no water extraction is proposed).

3.3.2 Groundwater sharing plan

The relevant groundwater sharing plan for the Project area is the Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011 under the Water Management Act 2000. The site is within the Lachlan Fold Belt groundwater management area.

As this plan relates to licencing and use of water resources under the Water Management Act 2000, it is not relevant for the Project (as no water extraction is proposed).

3.4 Mid-Western Regional Local Environmental Plan 2012

The Mid-Western Regional Local Environmental Plan 2012 (hereby referred to as the Plan) aims to make local environmental planning provisions for land in Mid-Western Regional area in accordance with the relevant standard environmental planning instrument. The regional area includes towns of Mudgee, Gulgong, Kandos and Rylstone.

The Plan provides the prohibited and permitted types of development within the local area. Some types of development are also regulated by particular state environmental planning policies.

The Plan (Part 6.1) does provide specific management requirements for flood planning which applies to land at or below the flood planning level (1 in 100 ARI plus 0.5 m freeboard). It requires that development consent cannot be granted unless the proposed development is compatible with the flood hazard of the land, will not cause significantly adverse impacts to other developments, the environment and the community and incorporates measures to manage risk to life. According to the accompanying flood planning map, the site is not considered to be part of the flood planning area as it sits north of the boundary of the CL1 006 flood map (Appendix A).

Groundwater vulnerability mapping (Groundwater Vulnerability Map - Sheet GRV_005 within the Plan) (Figure 4) indicates a portion of the Project area is considered 'groundwater vulnerable' (blue shading). The plan requires that development consent cannot be granted unless the proposed development will be designed and managed to avoid significant environmental impact or if such impact is unavoidable the proposed development will be designed and managed to minimise the impacts or if such impact is unable to be mitigated the proposed developed will be managed to mitigate that impact.

The Plan provides additional provisions for earthworks to ensure that earthworks for which development consent is required will not have a detrimental impact on environmental functions and processes, neighbouring uses, cultural or heritage items or features of the surrounding land.

Figure 4: Vulnerable groundwater

3.4.1 Mid-Western Development Control Plan

The Mid-Western Development Control Plan 2013 (DCP) provides guidance for developments and supports the statutory planning controls of the Local Environmental Plan.

The guidance provides proponents assistance with criteria to address in development applications, however this relates mostly to housing developments.

The DCP contains flood schedules which provides guidance on flood compatible building materials. The DCP recommends that a Soil and Water Management Plans are prepared in accordance with Landcom's Managing Urban Stormwater (2006).

3.4.2 Mid-Western Regional Council Community Plan

The Mid-Western Community Plan is planned and executed under 5 key themes:

- Looking after our Community
- Protecting our Natural Environment
- Building a Strong Local Economy
- Connecting our Region
- Good Government

The themes do not contain specific flood or water management aspects. However, within the protect and enhance our environment theme, the strategies include minimising the impact on the environment from development, maintaining and managing water quantity and quality (keeping waterways clean).

3.5 State Environmental Planning Policy (Infrastructure) 2007

Division 4 of the State Environmental Planning Policy (Infrastructure) 2007 relates to 'Electricity generating works or solar energy systems'. The policy relates to the approval process for solar energy systems, and there are specific details required for flood liable land which means land that is susceptible to flooding by the probable maximum flood event. The policy states consultation with the relevant council is required if the proposal will alter flood patterns other than to a minor extent and their response must be taken into consideration.

The Project area is not in an area mapped as being within the flood planning area under the Local Environmental Plan.

3.6 Protection of the Environment Operations (POEO) Act 1997

The POEO Act aims to protect and restore and enhance the quality of the environment in NSW, while still having regard to ecologically sustainable development.

With relevance to the site, the Act aims to reduce risks to human health and to prevent degradation of the environment by promoting pollution prevention and the reduction in the use of materials and the re-use, recovery or recycling of materials. The Act contains the requirements for the management of water discharges and also the offences that relate to pollution. Section 148 requires that any pollution incidents or those that threaten material harm to the environment must be notified to the relevant authority (e.g., NSW Environment Protection Authority).

3.7 Soil Conservation Act 1938

This Act makes provision for the conservation of soil resources and for the mitigation of erosion. The act allows the Minister for Primary Industries[1] to issue soil conservation notices, declare areas to be sites of erosion hazard, proclaim works in catchment areas and outlines specific regulations in regards to the Rural Assistance Act 1989.

Of general relevance to this project is the promotion of sustainable use and prevention of loss of soil resources from a site.

4.0 CATCHMENT AND FLOOD HISTORY

The Project is located in the Mid-Western Regional Council Area, 1.7 km west of the town of Gulgong. The nearest watercourse is Wialdra Creek which is located 2.3 km north of the Project area. There is a dam located onsite on the northern boundary (Figure 3).The land gently slopes towards the north and west with the dam at an elevation of 422 mAHD and the southern boundary 427 mAHD (Figure 5).

[1] Except Parts 2A, 3 and 4, and sections 15 and 30A in so far as they relate to Parts 2A, 3 and 4, jointly with the Minister for the Environment

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LEGEND

- East-west Cross Section Start and End Points
- North-south Cross Section Start and End Points
- East-west Cross Section Line
- North-south Cross Section Line
- 10 m surface elevation contours
- Roads
- Surface Water Features

Cadastre

- Lots/Plans of Interest
- Other Lots/Plans

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

0 50 100 150 200 250
1:7,500 @A3 METRES

NOTE(S)

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

REFERENCE(S)

10m Contours, Roads, Surface Water Features, Cadastre: © State of NSW (Spatial Services - Department of Finance, Services and Innovation) 2019.
Cross Section: Derived from Google Earth on 16th May 2019.

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DD/MM/YYYY	23/05/2019
DESIGNED	BG
PREPARED	BG
REVIEWED	DP
APPROVED	JR

PROJECT
AVISFORD MINI SUSTAINABLE ENERGY PARK - WATER ASSESSMENT

TITLE
SITE TOPOGRAPHY

PROJECT NO	CONTROL	REV.	FIGURE
18105488	018	0	5

4.1 Mudgee and Gulgong Stormwater Management Plan

Mudgee and Gulgong Stormwater Management Plan (SMP) 2001 aimed to address stormwater management problems within the catchment area (particularly water quality issues). The plan describes the catchment and existing catchment conditions.

Lyall and Macoun Consulting Engineers (1998) identified two catchments in the town of Gulgong. The catchments are divided by a ridge extending northwards from the intersection of Fisher and Herbert Streets to Rouse and Wynella Streets. One catchment drains to the western side of the ridge and the other catchment drains to the east in a northerly direction towards rural land. The Project area is located in catchment X on the outer western side of the town (Figure 6).

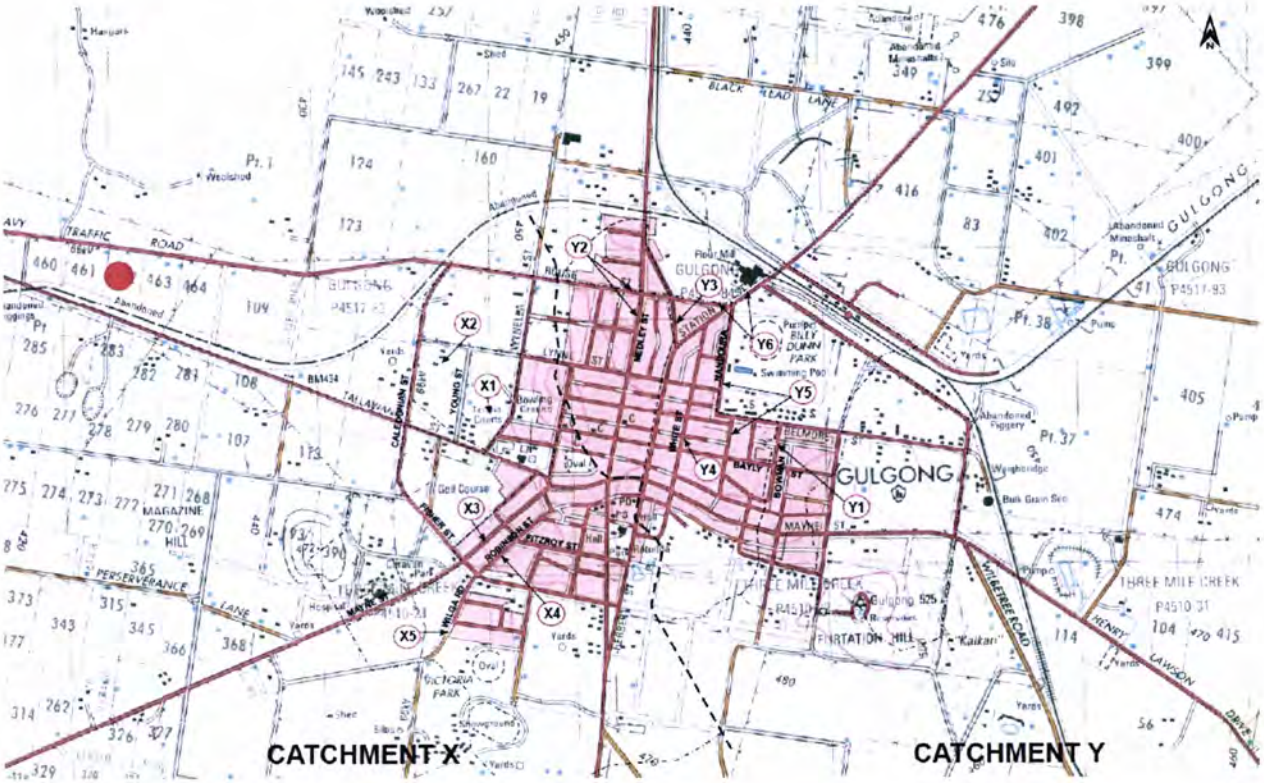

Figure 6: Gulgong town catchments

The SMP discussed drainage studies undertaken that identified problem areas that were prone to flooding. These sites were the intersection of Moonlight and Wenonah Street and Anderson Street and Menchin Lane, Gulgong. These areas are on the eastern side of the town and not near the Project area.

The SMP outlines stormwater management objectives for new developments to aid developers to minimise impacts on receiving waterways. Construction phase stormwater management objectives for new developments taken from the SMP are provide in Table 1.

Table 1: Construction phase stormwater management objectives for new developments

Pollutant / issue	Soil type	Management objective
Quantitative Objectives – for subdivisions and medium-large scale developments		
Suspended solids and turbidity	Dispersible, Fine	Suspended solids concentration not to exceed 50 mg/L for all 5-day rainfall totals up to 75th percentile rainfall event.
	Coarse	Suspended solids concentration not to exceed 50 mg/L for all flow events up to 25% of the 1 year ARI flow.
Qualitative objectives – for all new developments including individual building lots		
Suspended solids (sediment)	-	Minimise soil erosion and the discharge of sediment by the appropriate design, construction and maintenance of erosion and sediment control measures. Employ all practical measures to minimise soil erosion and the discharge of sediment in storms specified under Quantitative Objectives above.
Motor fuels, oils and other chemicals	-	All motor fuels, oils and other chemicals are stored and used on site in a manner which ensures no contamination of stormwater
Litter	-	No litter in a position where it may blow or washed off-site.

4.2 Gulgong Stormwater Drainage Study June 2009

The Gulgong Stormwater Drainage Study (Lyall and Associates Consulting Water Engineers, 2009) focussed on the main town of Gulgong and the stormwater drainage system. Hydraulic modelling was undertaken to assess depths and velocities of flow in several streets during major storm events.

The study did not include the Project area and it focussed on the management of the towns stormwater drainage during major storm events.

5.0 AVAILABLE DATA

Climatic data and water quantity and quality monitoring information is available in the region as outlined in the following sections.

5.1 Rainfall

The Bureau of Meteorology (BOM) has one station within Gulgong (Figure 1). Another site is located 23 km to the south at Mudgee airport. Table 2 outlines the average annual, maximum annual, maximum daily and maximum monthly rainfall. Average monthly values for the two rainfall stations are in Table 3.

Table 2: Rainfall

Station Number	Station Name	Period of Record	Rainfall (mm)			
			Average Annual	Highest Annual	Maximum Daily	Highest Monthly
062013	Gulgong post office	1881 - 2019	650.5	1411.7	134.4	354.3
062101	Mudgee airport	1994 - 2019	663.2	1152.4	174.2	241.6

Table 3: Average Monthly Rainfall

Station Number	Rainfall (mm)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
062013	70.5	60.9	55.0	43.7	44.9	50.8	48.8	45.8	47.0	55.6	60.0	67.3
062101	67.6	63.1	58.9	33.2	37.9	45.0	43.4	35.2	54.6	51.1	75.4	80.7

Flood producing weather systems across the region include inland troughs, cold fronts, and thunderstorms. Consequently, each rainfall event is a function of the prevailing meteorological conditions. Therefore, the rainfall data provides useful information about expected seasonal rainfall in the area.

5.2 Streamflow

There are two government surface water monitoring sites located within 20 km of the site. Streamflow records (Table 4) for these sites are available for various locations in the region from the WaterNSW portal.

Table 4: Stream Gauging Stations

Station Number	Station Name	Available/Relevant Data	Distance from project area
421150	Cudgegong River at Wilbertree Road	Level, discharge	19 km west
421019	Cudgegong River at Yamble Bridge	Level, discharge, EC, water temp	16 km south

Generally, data from the available stream gauges do not provide specific information on local site flooding but are more useful in the context of assessing major regional flooding events which may impact on site access. Information is publicly available from WaterNSW Real-time data portal and could be incorporated into site management plans.

5.3 Groundwater

The Project area falls within the Macquarie-Bogan catchment area where groundwater sources include:

- minor alluvial systems in the highlands
- fractured rock aquifers of the Lachlan Fold Belt

- porous rock aquifers associated with the Gunnedah Basin

The fractured rock, known as the Lachlan Fold Belt, covers the width of the Murray Darling Basin (MDB) in NSW and therefore extends beyond the Macquarie-Bogan catchment. This formation underlies the Bell Alluvium, Cudgegong Alluvium, portions of the Upper Macquarie Alluvium, the Coolaburragundy - Talbragar Alluvium and the Lower Macquarie Alluvium.

In this area, it is considered to exhibit low to moderate connection with surface water. Much of the upper Macquarie catchment is underlain by fractured rock which has a low yield.

The Bell, Upper Macquarie and Lower Macquarie alluvial deposits form a continuous sequence of unconsolidated sediments which generally allows for uninterrupted down valley flow as there is hydraulic connection across contiguous boundaries. A basement high exists between the Upper Macquarie Alluvium and the Lower Macquarie Alluvium which restricts down valley flows.

Alluvial aquifers are the main groundwater sources for town water supply and irrigation water in the Macquarie-Bogan catchment. The Project area falls within the Lachlan Fold Belt fractured rock groundwater management area. As indicated in Figure 7, the site (located 85 km east of Dubbo) is underlain by the fractured rock unit (DECCW, 2010).

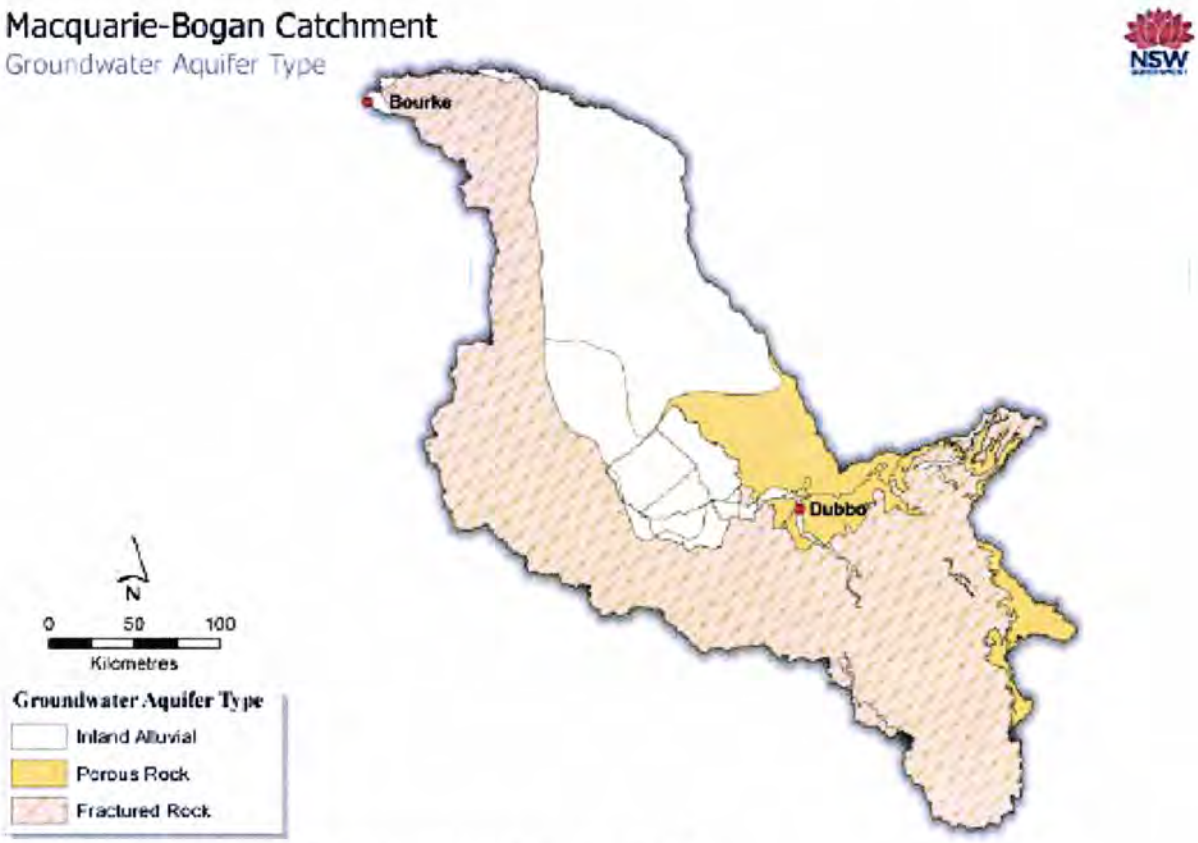

Figure 7: Macquarie-Bogan Catchment Groundwater Aquifer Type

The Murray Darling Basin Authority (MDBA) commissioned an independent assessment of approaches to achieve sustainable use and management of basin groundwater resources which includes the Lachlan Fold Belt (Anderson et al, 2013). Figure 8 shows the location of the nearest groundwater monitor bore (GW096082) used as part of the MDBA study. Figure 9 indicates a relatively long term and stable water level in this government monitoring bore for the groundwater unit.

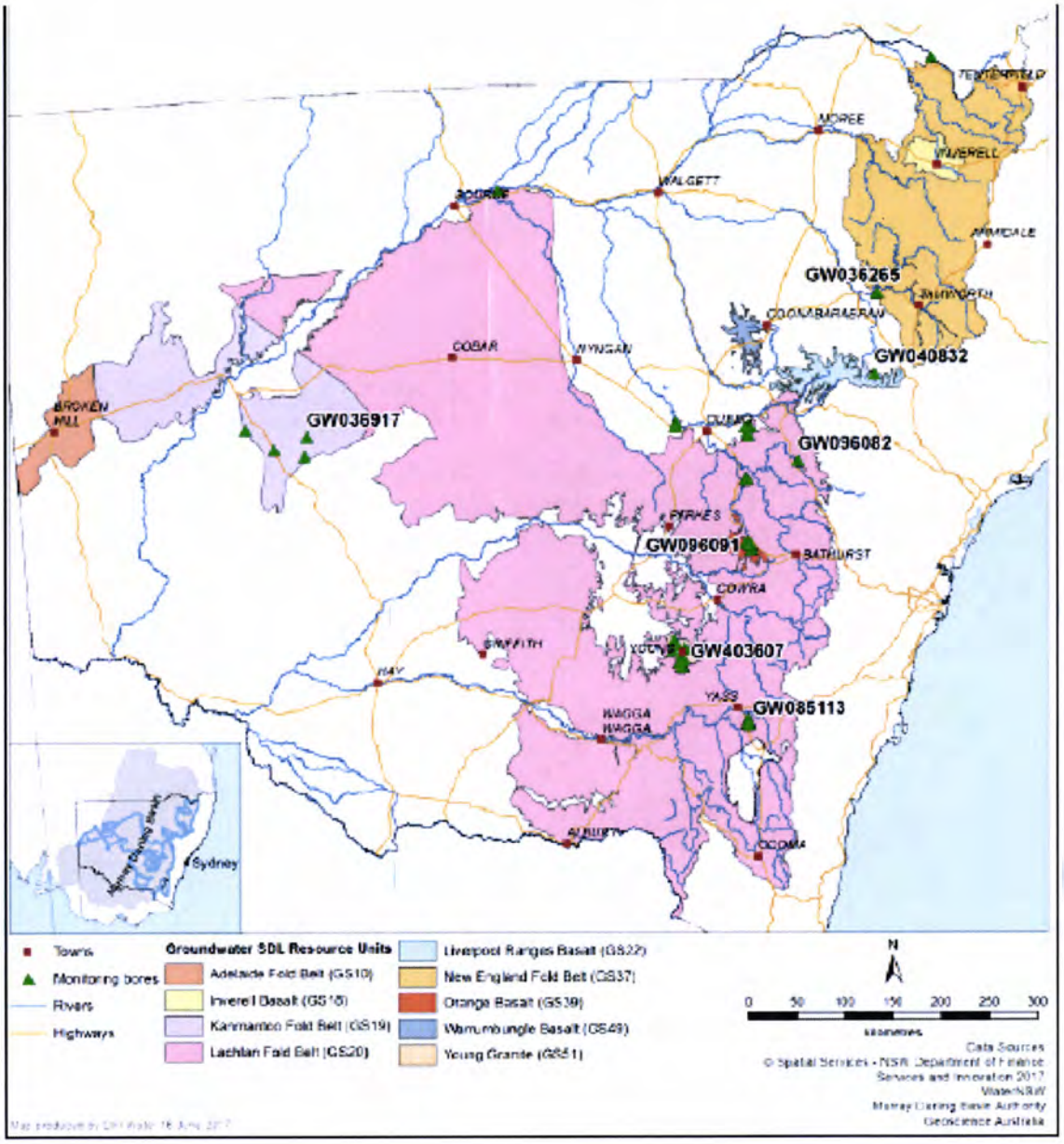

Figure 8: Location of monitoring bores used in the MDBA independent assessment

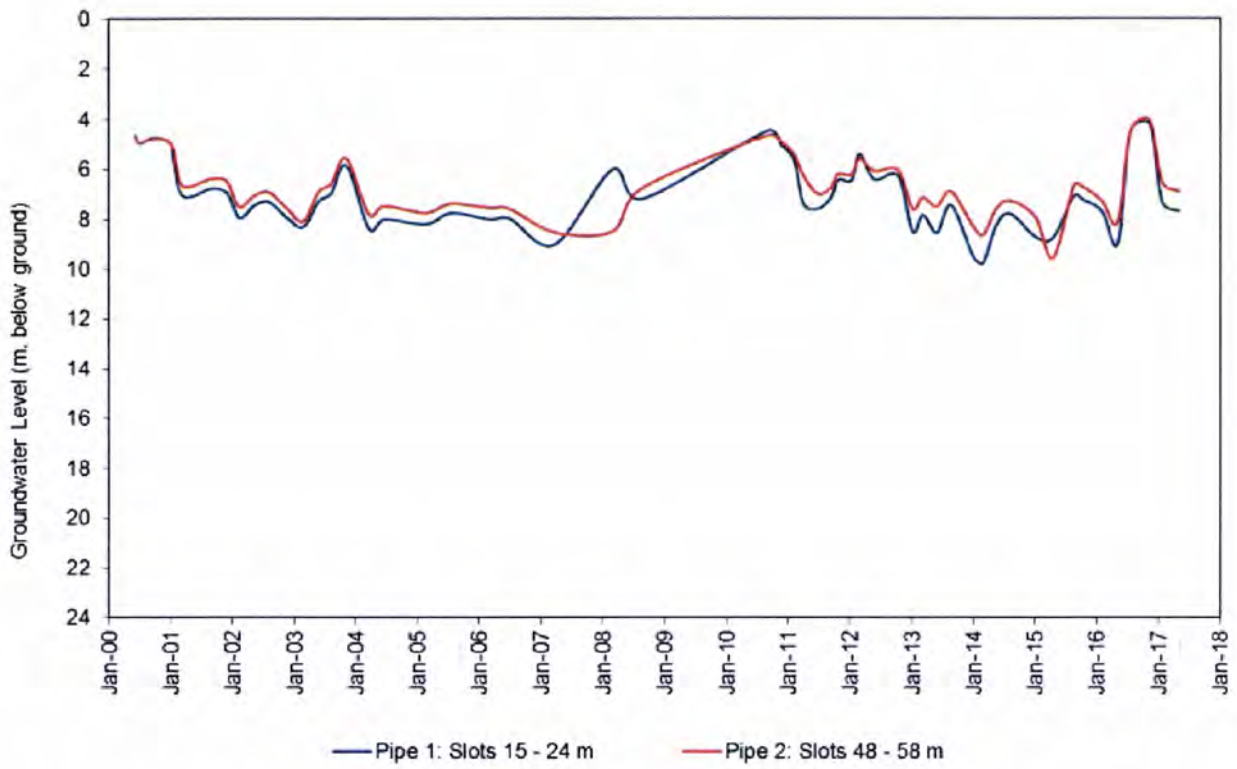

Figure 9: Lachlan Fold Belt groundwater level at GW096082

The nearest real time Groundwater Monitoring Site on the Water NSW database (WaterNSW 2019) is located 16 km south of Gulgong at Mudgee - Wilbertree Rd (Site no. GW096087.1.1). The levels recorded on 16 May 2019 indicated that the bore level below MP was 5.767 m and the ground water level 427.603 m AHD (Figure 10).

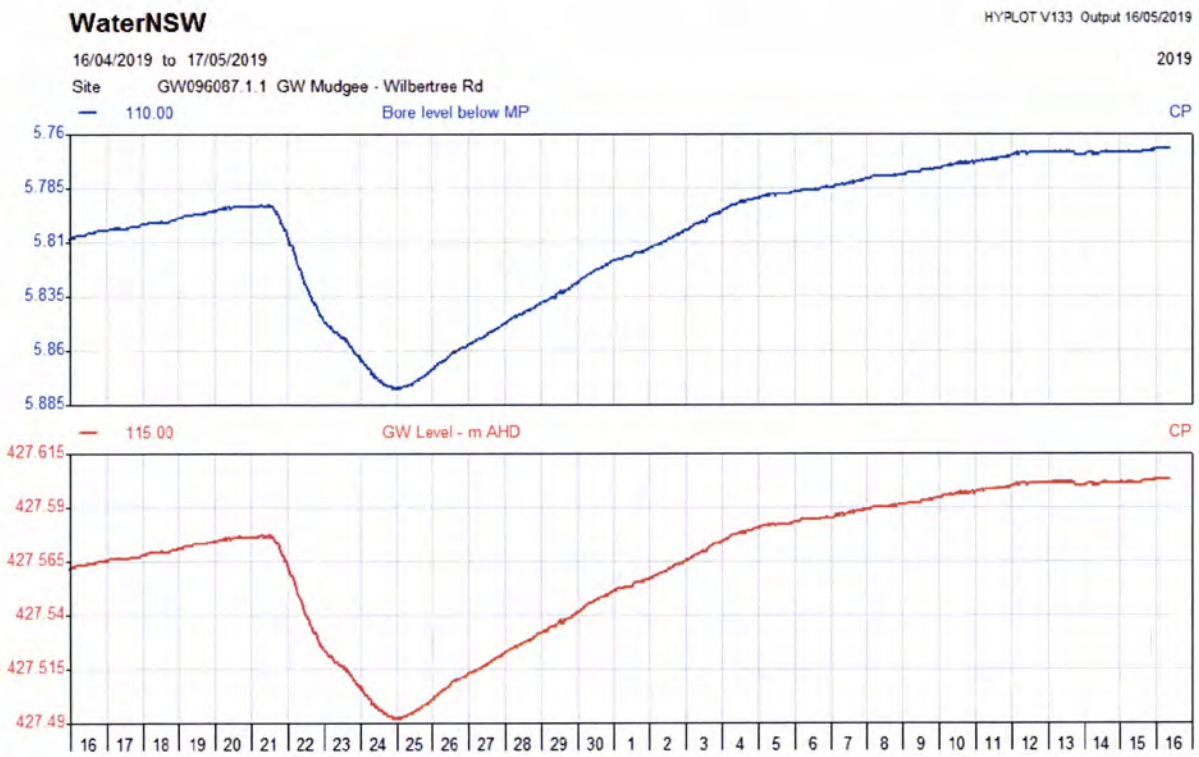

Figure 10: Mudgee - Wilbertree Rd groundwater levels (levels recorded on 16 May 2019)

6.0 POTENTIAL IMPACTS

Although the site is located within an area listed as groundwater vulnerable in accordance with the LEP, proposed on site activity is not expected to materially contribute to any regional groundwater issues particularly those associated with nearby irrigation districts.

Based on the current available information, potential adverse surface water-related impacts to the site include:

- Site accessibility and inundation
- Managing downstream sedimentation.

6.1 Flooding

Flood planning maps refenced by the LEP indicate that site is not within an area likely to flood. However, heavy rainfall during storm events may cause disruption during construction activities or for material suppliers.

As the site is not within a flood prone area and is some distance (2.3 km south) from the nearest water way this is considered to be an unlikely impact. There may be small scale water flows on site draining to the north and west during rainfall events.

6.2 Water quality and erosion

The project has the potential to alter existing water quality conditions within the site. The impervious area of solar facilities is typically only marginally increased owing to associated hardstand and building areas. However, the panels may impact the nature of vegetation/grass coverage on the site, which has the potential to increase surface runoff and peak discharge. Increased flow concentration off the panels also has the potential to erode soil at the base of solar panels (Cook & McCuen, 2013).

Furthermore, as the site has been historically used for grazing there is very little natural ground cover vegetation.

The locality's predominant soil types are based on the non-calcic brown soils (Office of Environment and Heritage, 2017).

There is the potential that site runoff will contain sediments and increase turbidity or other water quality parameters in downstream water ways (however there are no water ways close to the site). With the limited topographic relief of the site, these issues are considered manageable.

7.0 PROPOSED MITIGATION MEASURES

7.1 Site accessibility and inundation

The site accessibility and potential for inundation issues may be managed in the project's risk management register(s) owing to the regional nature of the events and the potential to impact whole of site works. There should be procedures in place to halt construction during heavy rainfall to reduce potential impacts to the project construction activities and also to decrease potential for sedimentation downstream.

7.2 Downstream sedimentation

Impacts associated with erosion and sedimentation resulting from construction activities can be minimised by undertaking works in accordance with provisions of the NSW government's best practice sediment and erosion control series Managing Urban Stormwater: Soils and Construction (DECC, 2008).

Proposed mitigation measures associated with managing downstream actionable nuisance (sedimentation) are outlined in Table 5.

Table 5: Proposed Mitigation Measures

Stage	Measure	Activities/Approach
Design	Site drainage and water quality controls	Design Basis ■ Undertake hydrological assessment of the sites catchment in accordance with relevant methods outlined in Australian Rainfall and Runoff. ■ Determine sediment management targets and drainage control standards in accordance with Managing Urban Stormwater: Soils and Construction Vol 1 (Blue Book) (DECC, 2008). ■ Develop a site erosion and sediment control plan in accordance with the Blue Book. ■ Develop site drainage design incorporating detention basins and sedimentation management structures where relevant. ■ Permanent site drainage should coincide with temporary arrangements where possible.
Construction and/or Demolition	Site drainage and water quality controls	General site works: ■ Catch drains to be located downslope of any proposed road works. ■ Install location appropriate sediment fences or other applicable control measures depending on whether the feature is upstream or downstream of a disturbed part of the site or will need to be trafficable. ■ All stormwater collection points need to have appropriate sedimentation and erosion controls. ■ Undertake ongoing inspections of stormwater facilities and water control measures to assess their effectiveness.

Stage	Measure	Activities/Approach
		■ Vibration grids or wash bays at all construction exits. ■ Level spreaders at locations where concentrated flow is discharged offsite to ensure sheet flow like conditions are maintained. ■ Flat land erosion control options include erosion control blankets, gravelling, mulching, soil binder, turfing and revegetation.
Construction and/or Demolition	Stormwater point source control	In the event of concrete works: ■ Do not undertake works if chance of heavy rain. ■ Store rinsate[2] water, if applicable, separately to other water on site and dispose of offsite as appropriate. ■ Block on site drains in the area of the works and remove any contaminated runoff. In the event that dewatering practices are required: ■ Pump hose intakes for withdrawing water from excavations will be elevated to minimise sediment pumping and directed to a containment area for settling prior to discharge. ■ Limit direct discharge off site (consistent with the design requirements for sediment pond discharge). ■ Stormwater collected on site should be reused where possible. Controls should be inspected and maintained on a regular basis. All water released from sediment basins should be clear or disposed off site by vehicle. ■ Material and waste storage areas should be designed and operated to minimise interaction with surface waters. ■ Vehicle washdown areas should be located away from water courses.

[2] A dilute solution of chemical resulting from washing the container and equipment with water, as defined by NSW EPA accessed 20 December 2018 https://www.epa.nsw.gov.au/licensing-and-regulation/licensing/environment-protection-licences/authorised-officers/glossary#r

8.0 REFERENCES

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Signature Page

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https://golderassociates.sharepoint.com/sites/29921g/deliverables/r-018-gulgong2a-water/rev1/18105488-018-rev1-avisford-sustpark-waterassess.docx

APPENDIX A

Gulgong LEP Maps

Mid-Western Regional Local Environmental Plan 2012

Flood Planning Map
Active Street Frontages Map
Visually Sensitive Land Map
Sheet CL1_006

Flood Planning Land

Flood Planning Area

Active Street Frontage

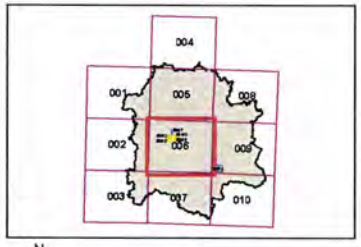
Active Street Frontage

Visually Sensitive Land

Visually Sensitive Land

Cadastre

Cadastre 15/12/2010 Land and Property Information (LPI)



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Projection: GDA 1994
MGA Zone 55

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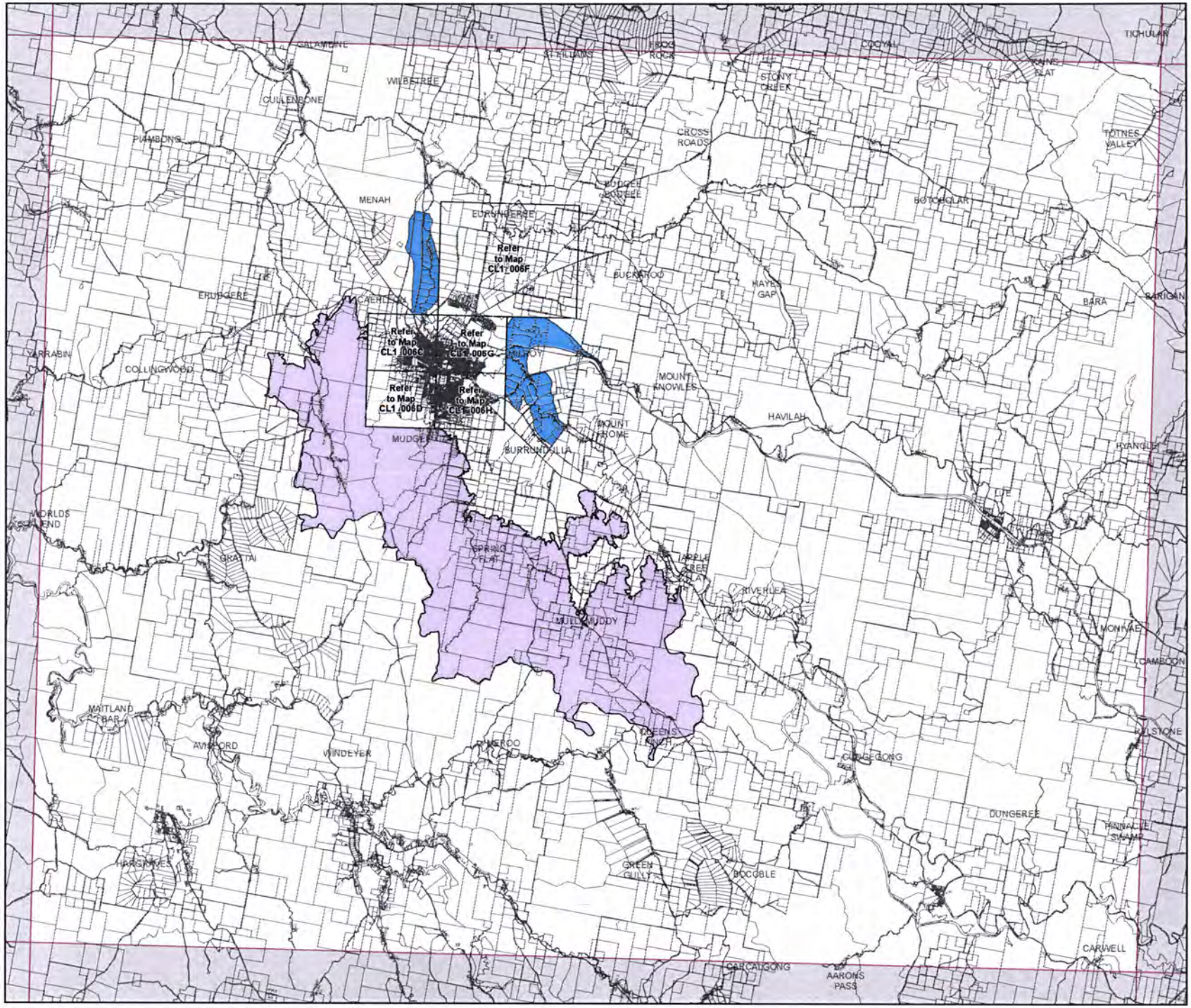
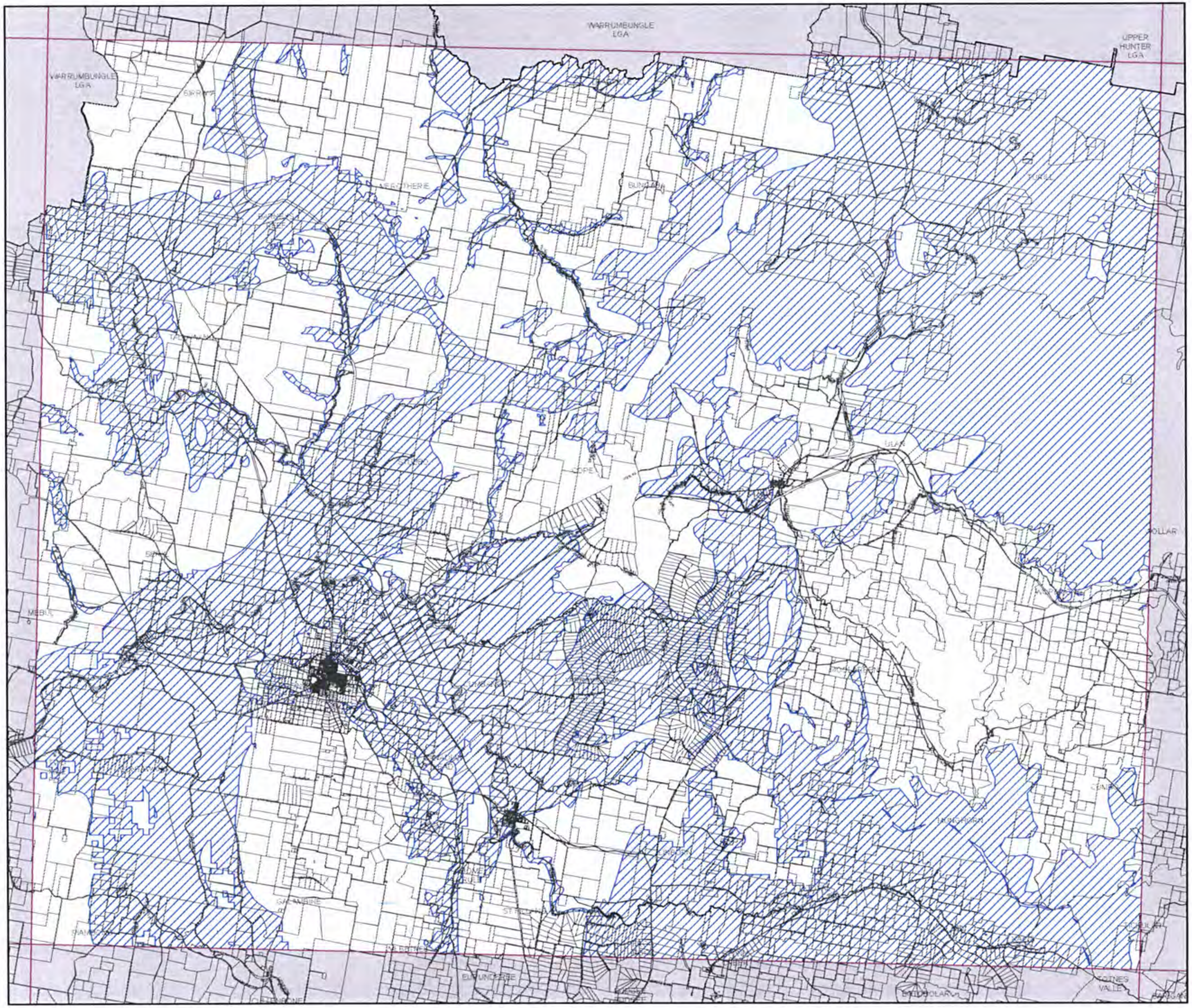


Mid-Western Regional Local Environmental Plan 2012

Groundwater Vulnerability Map - Sheet GRV_005



Groundwater Vulnerable

Cadastre

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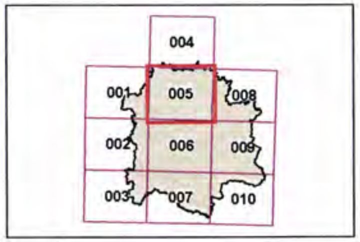

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Projection: GDA 1994 MGA Zone 55

Map identification number: 5270_COM_GRV_005_160_20120618

APPENDIX B

Important Information Relating to this Report

The document ("Report") to which this page is attached and which this page forms a part of, has been issued by Golder Associates Pty Ltd ("Golder") subject to the important limitations and other qualifications set out below.

This Report constitutes or is part of services ("Services") provided by Golder to its client ("Client") under and subject to a contract between Golder and its Client ("Contract"). The contents of this page are not intended to and do not alter Golder's obligations (including any limits on those obligations) to its Client under the Contract.

This Report is provided for use solely by Golder's Client and persons acting on the Client's behalf, such as its professional advisers. Golder is responsible only to its Client for this Report. Golder has no responsibility to any other person who relies or makes decisions based upon this Report or who makes any other use of this Report. Golder accepts no responsibility for any loss or damage suffered by any person other than its Client as a result of any reliance upon any part of this Report, decisions made based upon this Report or any other use of it.

This Report has been prepared in the context of the circumstances and purposes referred to in, or derived from, the Contract and Golder accepts no responsibility for use of the Report, in whole or in part, in any other context or circumstance or for any other purpose.

The scope of Golder's Services and the period of time they relate to are determined by the Contract and are subject to restrictions and limitations set out in the Contract. If a service or other work is not expressly referred to in this Report, do not assume that it has been provided or performed. If a matter is not addressed in this Report, do not assume that any determination has been made by Golder in regards to it.

At any location relevant to the Services conditions may exist which were not detected by Golder, in particular due to the specific scope of the investigation Golder has been engaged to undertake. Conditions can only be verified at the exact location of any tests undertaken. Variations in conditions may occur between tested locations and there may be conditions which have not been revealed by the investigation and which have not therefore been taken into account in this Report.

Golder accepts no responsibility for and makes no representation as to the accuracy or completeness of the information provided to it by or on behalf of the Client or sourced from any third party. Golder has assumed that such information is correct unless otherwise stated and no responsibility is accepted by Golder for incomplete or inaccurate data supplied by its Client or any other person for whom Golder is not responsible. Golder has not taken account of matters that may have existed when the Report was prepared but which were only later disclosed to Golder.

Having regard to the matters referred to in the previous paragraphs on this page in particular, carrying out the Services has allowed Golder to form no more than an opinion as to the actual conditions at any relevant location. That opinion is necessarily constrained by the extent of the information collected by Golder or otherwise made available to Golder. Further, the passage of time may affect the accuracy, applicability or usefulness of the opinions, assessments or other information in this Report. This Report is based upon the information and other circumstances that existed and were known to Golder when the Services were performed and this Report was prepared. Golder has not considered the effect of any possible future developments including physical changes to any relevant location or changes to any laws or regulations relevant to such location.

Where permitted by the Contract, Golder may have retained subconsultants affiliated with Golder to provide some or all of the Services. However, it is Golder which remains solely responsible for the Services and there is no legal recourse against any of Golder's affiliated companies or the employees, officers or directors of any of them.

By date, or revision, the Report supersedes any prior report or other document issued by Golder dealing with any matter that is addressed in the Report.

Any uncertainty as to the extent to which this Report can be used or relied upon in any respect should be referred to Golder for clarification

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1300 874 294

PROVISION OF CONSULTING ENGINEERING SERVICES

AVISFORD MINI SUSTAINABLE ENERGY PARK
129 OLD MILL ROAD, GULGONG

TRAFFIC ASSESSMENT REPORT

24 MAY 2019
REFERENCE: MX10959.00-01.RPT.JD-REV1

Document Control:

Client	ITP Renewables		
Prepared By:	Triaxial Consulting Ltd		
Report Author	Jim Disher		
File Reference:	MX10595.00-01.rpt		
Report Date:	24th May 2019		
Current Revision:	1		
Revision History:	**Report Author**	**Reviewed By**	**Report Date**
0 - Draft	JD	JS	22/05/19
1	JD	JS	24/05/19

INDEX

1 INTRODUCTION

Triaxial have been engaged by ITP Renewables to prepare a traffic assessment report. The purpose of this report is to assess the traffic implications of the development proposal. This report is to be included in the development application lodged with Mid Western Regional Council.

The site is currently utilised for grazing and is shown in the photo below:

Figure 1: Existing Site

2 PROPOSAL

2.1 DEVELOPMENT SITE

The site is proposed to be utilised by ITP Renewables for the construction of a 5MW solar farm on an area of 16Ha size located at 129 Old Mill Road, Gulgong.

The proposed development site is located near Gulgong, approximately 1.8km from the Western edge of the Gulgong township, taken as the Caledonian / Old Mill Road intersection. The site is currently zoned as RU1 primary production. The proposed site has not been identified as a possible future residential release area in the Mudgee Urban Release Strategy (2014).

Old Mill Road is constructed with a bitumen sealed pavement width of approximately 6.0 - 6.5m with unsealed shoulders and table drains approximately 0.5m deep either side.

The Western end of the site is located approximately 450m from the intersection of Old Mill Road and the Castlereagh Highway. Old Mill Road to the East of the site travels towards Gulgong and after the intersection with Caledonian Street becomes Rouse Street.

3 DESIGN SERVICE VEHICLES

3.1 CONSTRUCTION PHASE -3 MONTHS

It is proposed that the following vehicles will access the site during the following stages of the project:

Vehicles accessing the site during construction will consist of:

- 45 B-Double trucks (total number of B-Doubles over the construction phase.
- Light vehicles suitable for transporting up to 50 workers.
- Bus service for workers if required.

3.2 TYPICAL USE DURING OPERATIONAL PHASE

The following list depicts the weekly schedule of vehicles required for the facility to operate.

- Maintenance access vehicles (1 light vehicle) access to the site in 3 monthly intervals.

4 EXISTING TRAFFIC CONDITIONS

4.1 ROAD HIERARCHY – SURROUNDING ROAD NETWORK

The NSW administrative road hierarchy comprises the following road classifications, which align with generic road hierarchy as follows:

- **Castlereagh Highway (B55)** is a state highway, managed by Roads and Maritime Services , with primary function of providing vehicular access between Gulgong and Dunedoo.

  The B55 Castlereagh Highway is listed as an approved B-Double Route by RMS as shown in Figure 2.

- **Rouse Street** is nominated in the Gulgong Traffic Study (2007) as a sub-arterial road, managed by Mid Western Regional Council.

  Rouse Street is listed as an approved B-Double Route as shown in Figure 2.

Figure 2: Existing travel conditions. Source: RMS website: http://www.rms.nsw.gov.au/business-industry/heavy-vehicles/maps/restricted-access-vehicles-map/map/

4.2 EXISTING TRAFFIC DATA

At the time of this report the most recent traffic data available from Mid Western Regional Council was unable to be sourced along either the Castlereagh Highway or Rouse Street.

Online traffic data available from RMS did not include any data for this section of the Castlereagh Highway.

5 PROPOSED TRAFFIC MANAGEMENT PLAN

5.1 PROJECTED TRAFFIC GENERATION POTENTIAL – TOTAL DEVELOPMENT

Based on advice from the client and a review of previous Solar Farm installations the proposed traffic generation for the development is separated into the construction and operational phases of the project as shown below. It is proposed to have 50 workers accessing the site during the construction phase, with work carried out between 7am – 4pm Monday to Friday.

Construction equipment is to be delivered to site via heavy vehicles between 10am – 2pm daily, hence not contributing to the AM or PM peak times.

Construction vehicle average trips per hour:

B-Double	2vtph (out of peak times)
Light vehicle access (workers – worst case)	25vtph
Light vehicle acces (workers with bus service)	10vtph
Total Development	**30vtph max.**

Vehicle average trips per day (vtpd) during construction are listed below:

B-Double	4vtpd
Light vehicle access (workers – worst case)	40vtpd
Light vehicle acces (workers with bus service)	10vpd
Total Development	**50vtd max.**

No reduction in these rates has been allowed for with pedestrian and cycle access to the facility. It is assumed that if all workers are accessing the site using light vehicles, there will be at least 2 workers per vehicle. Extra daily trips have been allowed for to access Gulgong during the day if required. No weekend trips are expected.

As previously mentioned, the site will be unmanned during the operational phase and is expected to generate only up to two light vehicle trips in every 3 month period.

It is important to note that the greatest interaction with traffic external to the site will be during the peak PM period, estimated to be between 4pm – 5pm. The AM peak period with traffic heading to the site will not generate as many interactions due to the expected peak arrival time of 6am – 7am by the workers.

5.2 PROPOSED SITE ENTRY

We recommend that the site entry location be constructed in accordance with Triaxial plan MX10595.00-SK01, with a sealed access point from Old Mill Road. The proposed site entrance

has been designed to accommodate the turning path of a B-Double truck, with a sealed entrance a minimum of 26 metres into the site to minimise disruption to Old Mill Road and ensure that a B-Double is able to que off the road if required to when accessing the site.

Refer Appendix B – Triaxial Plan MX10595.00-SK01

The proposed site entry location will have in excess of 250m of sight distance in either direction in accordance with the requirements of Austroads Guide to Road Design and Mid Western Regional Council DCP requirements.

Refer Appendix A – Photos 1 and 2

5.3 IMPACT ON SURROUNDING ROAD NETWORK

We recommend that Old Mill Road be utilised as the main site entrance due to the lower traffic count, complexity and safety issues that constructing an entry directly from the Castlereagh Highway may cause.

Up to date traffic counts along Castlereagh Highway and Old Mill Road were unable to be sourced from Mid Western Regional Council. During a site visit by Triaxial Consulting staff on 15th May 2018 a traffic count of 21 total cars was recorded along Old Mill Road between 8am – 9am with a total of 2 heavy vehicles during this time.

It is not expected that an increase of 25 vehicles per hour in peak times will reduce the level of service of the roadway from Level A as it is well below the limits shown in Table 4.5 of RTA Guide to Traffic Generating Developments as shown in Table 2 below:

PEAK HOUR FLOW ON TWO-LANE RURAL ROADS
(VEHICLES PER HOUR)
(DESIGN SPEED OF 100KM/HR)

Terrain	Level of Service	Proportion of Heavy Vehicles			
		0%	5%	10%	15%
Level	A	<630	<590	<560	<530
	B	630	590	560	530
	C	1030	970	920	870
	D	1630	1550	1480	1410
	E	2630	2500	2390	2290

Source Table 4.5 RTA Guide to Traffic Generating Developments October 2002

Table 2: Carriageway Level of Service limits

The peak vehicle trips as listed in this report will have only a very minor impact on the surrounding road network. It is not envisaged that the development will cause a decrease in the level of service to either the road carriageway along Rouse Street or the Castlereagh Highway.

5.4 CONSTRUCTION WORKER SITE ACCESS

As the site is located on the Western side of Gulgong and easily accessible via Rouse Street or the Castlereagh Highway, the construction worker site access and parking areas should be constructed in accordance with appropriate safe construction site management principles.

Depending on the accommodation arrangements made by the successful building contractor in the construction phase of the project, care should be taken to avoid any impacts on the Gulgong town centre. Possible impacts may be mitigated by sourcing accommodation away from the Gulgong town centre, or the provision of a bus service to convey workers to site.

A bus service would be the preferred method of travel to the site, as it would eliminate the need for anywhere from 30-50 light vehicles accessing the site daily.

6 SUMMARY

In summary, the proposed construction of the solar farm will cause no major long-term effects to the surrounding road network due to the unmanned operation of the site requiring only minimal regular maintenance by a small number of staff.

Construction traffic appropriately managed with a bus service for workers and out of peak hour deliveries to the site, combined with the construction of a new appropriate site entry catering for B-Double access will ensure traffic impacts are minimised during the short construction phase of the project.

APPENDIX A - SITE PHOTOS

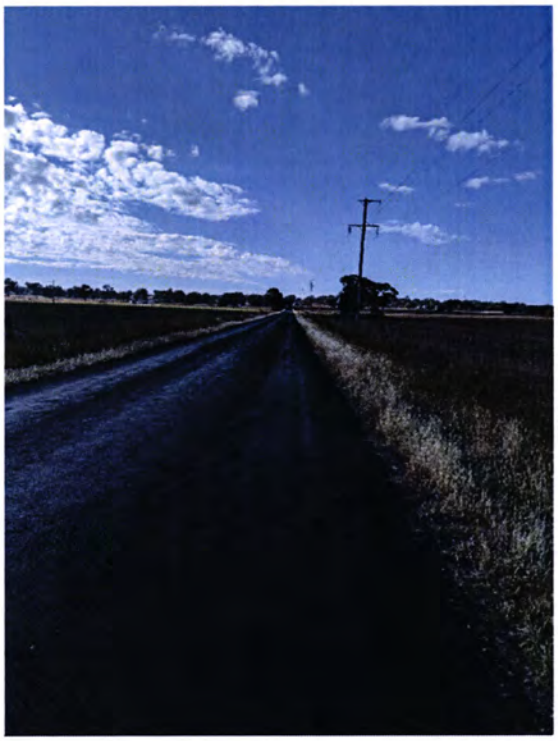
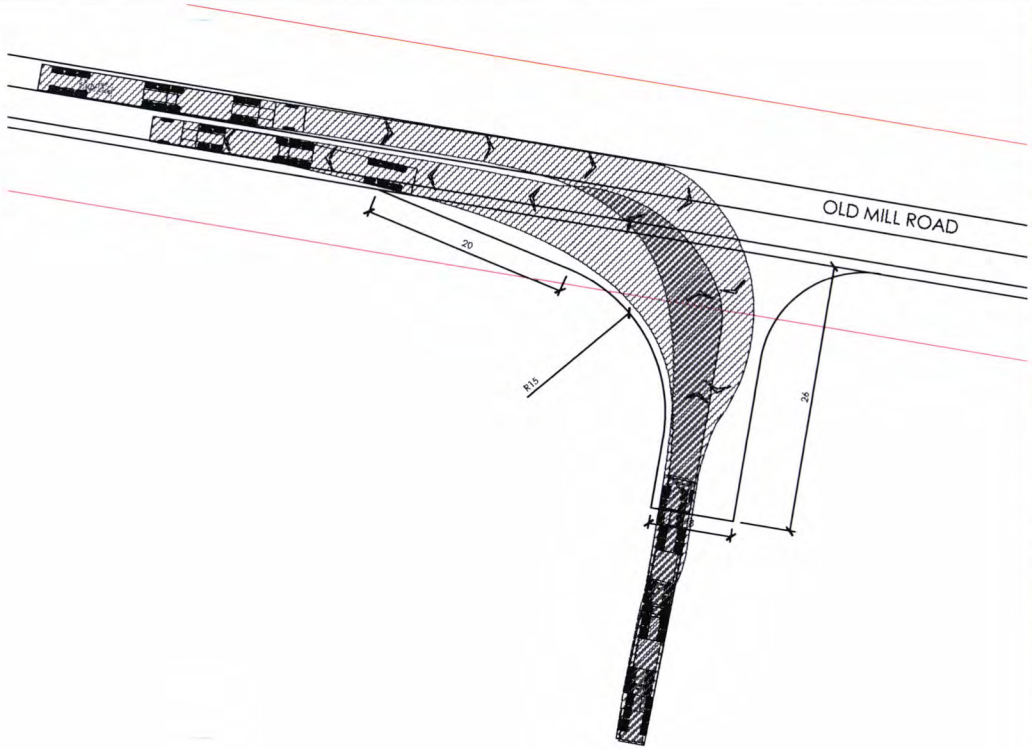


Photo 1
Proposed site entry location off Old Mill Road looking East

Photo 2
Proposed site entry location form Old Mill Road looking West

APPENDIX B – TRIAXIAL PLAN MX10595.00-SK01

SITE PLAN
SCALE 1:5000 AT A1



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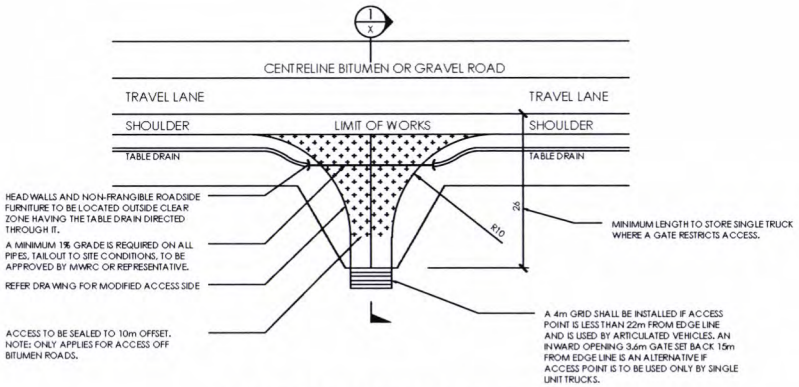

STANDARD VEHICLE ACCESS PLAN
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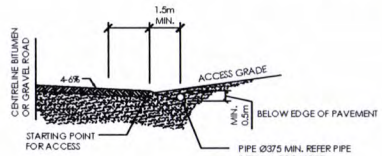

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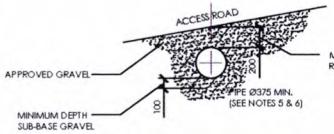
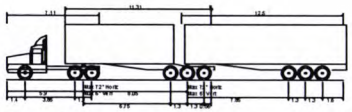


PIPE DETAIL N.T.S. A

NOTE:
1. ACCESS TO BE LOCATED WHERE MINIMUM GAP SIGHT DISTANCE OF 5 SECONDS IS AVAILABLE.
2. HEADWALLS ARE TO BE PRECAST CONCRETE HEADWALLS.
3. ACCESS TO BE CONSTRUCTED IN ACCORDANCE WITH MWRC COUNCIL PLAN M525A. ANY VARIATION TO THIS PLAN MUST BE APPROVED BY COUNCIL.
4. UNDER NO CIRCUMSTANCES MAY ACCESS INTRUDE BEYOND THE OUTER EDGE OF THE ROAD SHOULDER.
5. ANY VARIATION IN PIPE DIAMETER TO BE DETERMINED BY SITE INSPECTION.
6. PIPE LENGTH IS TO BE 4.9m MINIMUM
7. DRIVEWAY TO BE SHAPED TO DIRECT WATER ALONG IT INTO TABLE DRAIN AND NOT ONTO THROUGH ROAD.
8. THIS PLAN SHOULD BE READ IN CONJUNCTION WITH COUNCILS ADOPTED ACCESS TO PROPERTIES POLICY.



B-Double (26.0m)	
Overall Length	26.000m
Overall Width	2.500m
Overall Body Height	4.300m
Min Body Ground Clearance	0.540m
Track Width	2.500m
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	15.000m

VEHICLE PROFILE
N.T.S.

NOTE:
THIS IS A PRELIMINARY OR PLANNING DRAWING ONLY. FOR THE PURPOSE OF CONCEPTUAL DESIGN AND/OR PLANNING. FURTHER DETAILED ENGINEERING DESIGN INCLUDING SPECIFICATIONS, SIZING AND STORMWATER INVERTS TO BE PROVIDED PRIOR TO BUILDING RULES ASSESSMENT AND CONSTRUCTION.

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50.0m 0.0 100.0 200.0 300.0 400.0 500.0m
SCALE 1:5000 AT A1 SHEET | 1:10000 AT A3 SHEET

ARCHITECT

CLIENT
ITP RENEWABLES

PROJECT
VEHICLE SIMULATION
3B SYDNEY ROAD
BURRUNDULLA, NSW, 2850

DESIGNED	DRAWN	DATE	SIZE	CAD REF
JO.M.	JO.M.	MAY '19	A1	MX10595.00 - M C01

TRIAXIAL CONSULTING
COMPLEX PROBLEMS RESOLVED SIMPLY

1300 874 294 | TRIAXIAL.COM.AU
46 MARKET STREET, MUDGEE NSW 2850
PO BOX 1075, MUDGEE NSW 2850

DRAWING TITLE
VEHICLE SIMULATION PLAN

PROJECT No.	DRAWING No.	ISSUE
MX10595.00	-C1.0	A

ISSUED FOR INFORMATION	22.05.19	A	J.L.D.
AMENDMENTS	DATE	ISSUE	BY

NOT FOR CONSTRUCTION

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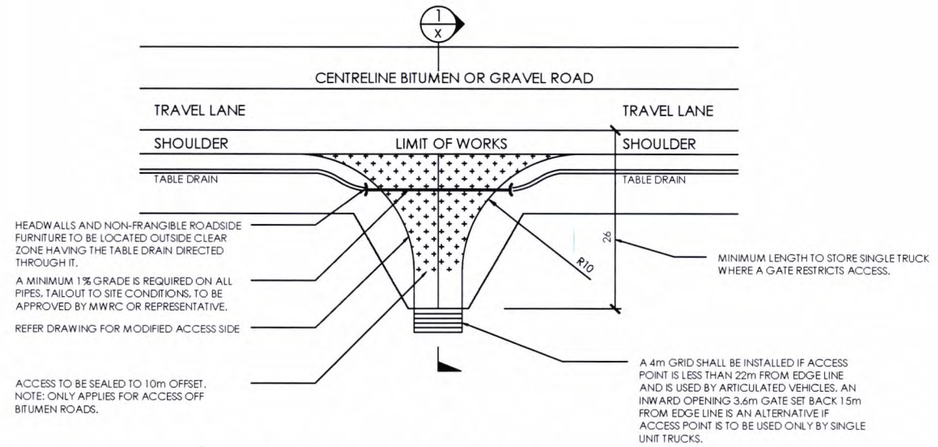

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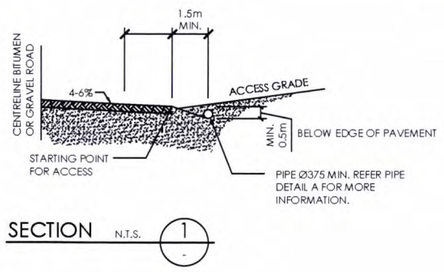

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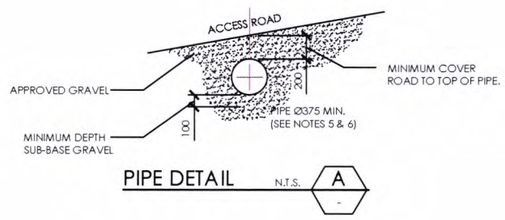

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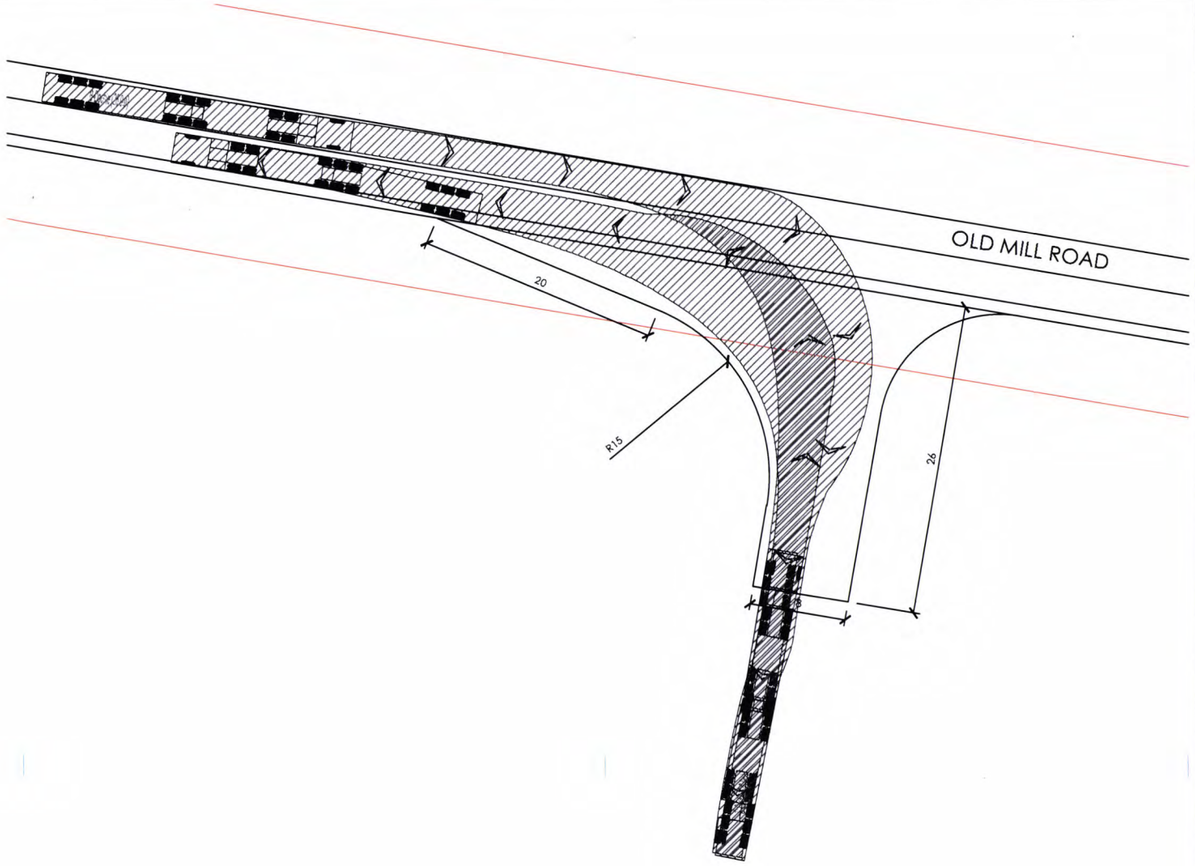

SITE PLAN
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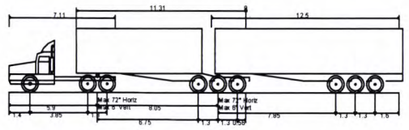

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DESIGNED	DRAWN	DATE	SIZE	CAD REF
JO.M.	JO.M.	MAY'19	A1	MX10595.00 - M C01

ISSUED FOR INFORMATION	22.05.19	A	JLD.
AMENDMENTS	DATE	ISSUE	BY

NOT FOR CONSTRUCTION

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DRAWING TITLE
VEHICLE SIMULATION PLAN

PROJECT No. MX10595.00 -C1.0
DRAWING No.
ISSUE A

Noise Assessment

Avisford Mini Sustainable Energy Park
Gulgong, NSW.

Prepared for: IT Power (Australia) Pty Ltd
May 2019
MAC180781-03RP1

MAC
Muller Acoustic Consulting

Document Information

NOISE ASSESSMENT

Avisford Mini Sustainable Energy Park

Gulgong, NSW.

Prepared for: IT Power (Australia) Pty Ltd
Southern Cross House
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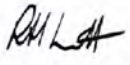
MAC180781-03RP1	Final	22 May 2019	Rod Linnett		Oliver Muller	

CONTENTS

1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been engaged by IT Power (Australia) Pty Ltd (ITP) to complete a Noise Assessment (NA) for the proposed Avisford Mini Sustainable Energy Park near Gulgong, NSW (the 'project'). This report presents the methodology and findings of the NA for the construction and operation of the project.

1.1 Purpose and Objectives

A NA is required as part of the Statement of Environmental Effects (SEE) to be submitted to Mid-Western Regional Council as part of the Development Application (DA). The purpose of the NA is to quantify potential environmental noise emissions associated with the construction and operation of the project. Where impacts are identified, the assessment includes recommendations for potential noise mitigation and management measures.

1.2 Scope of the Assessment

The NA includes the following key tasks:

- review construction and operating activities to identify key noise generating plant, equipment, machinery or activities proposed to be undertaken as part of the project;
- identify the closest and/or potentially most affected receivers situated within the area of influence to the project;
- establish existing noise levels to determine project-specific construction Noise Management Levels (NMLs), and operational noise criteria;
- undertake 3D noise modelling to predict levels that may occur as a result of the construction and operation of the project at the closest and/or potentially most affected receivers;
- provide a comparison of predicted noise levels against relevant construction NMLs and operational criteria;
- assess the potential noise impacts associated with construction and operational aspects of the project; and
- provide feasible and reasonable noise mitigation and management measures, and monitoring options, where NMLs or operational criteria may be exceeded.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A.**

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2 Project Description

2.1 Background

ITP propose to construct and operate a 5 Megawatt (MW) solar farm using photovoltaic (PV) technology at 129 Old Mill Rd, Gulgong, NSW approximately 1.8km north-west of the town.

2.2 Description of Proposed Construction Works

The project includes installation of groups of north facing PV modules (approximately 2m x 1m) on mounting structures up to approximately 2.5m in height. An estimated 16,000 PV panels will be installed using a single axis tracking system, tilted +/- 60° along the north-south axis. The PV mounting structure would comprise steel posts driven up to approximately 3.5m below ground using a small pile driver. Additional support structures would be attached to the piles, which would then support the PV panels.

Earthworks will primarily involve trenching which is required for cabling of each PV array/module to inverters and a substation. Other minor earthworks would be completed for the preparation of the site and in most cases a concrete slab would be required to support the ancillary infrastructure. Most of the infrastructure would be pre-fabricated off-site, delivered and assembled on-site.

It is anticipated that the solar farm would be constructed in one-hectare stages, with up to 10 stages in construction at any one time over a three month period during standard construction hours.

All vehicles would access the project via Castlereagh Highway (B55) to Old Mill Road during construction and operational phases.

During construction, traffic generated by the project would include employee and delivery vehicles. During the peak construction period, the daily traffic volume is expected to be up to four heavy vehicles (semi-trailers or b-doubles) per hour and 20 light commercial vehicles or equivalent mini buses for worker transport during the morning and afternoon peaks.

2.3 Description of Proposed Operation

PV infrastructure on site will comprise of groups of PV panels installed in rows running north to south. Each row of PV modules will rotate to track the sun across the sky from east to west each day. There is approximately 5.7m spacing between each row. The hub height of each tracker is 1.6m with the peak of the modules reaching a height of 2.5m when the array is fully tilted.

Electrical cabling would be attached beneath the modules and would connect the individual PV modules to each other. Inverters will be located centrally to groups of PV panels and connected to each other by underground cables. The PV modules will be on a single axis tracker system which will follow the sun and move in an east to west direction.

The project will be contained solely within the site as shown in **Figure 1** and drwaing GLG2A-G-210.

The project would operate 24 hours a day, 7 days a week, with no permanent staff on site. During operation, the PV panels would generate electricity which would be fed into the power grid via the substation. Key noise emissions from the operation of the project are associated with the inverter and transformer(s). It is noted that emissions from these sources are anticipated to be acoustically insignificant compared to ambient background noise levels at assessed receivers.

When required, maintenance activities will occur during standard working hours (except for emergencies) and are expected to include:

- panel cleaning;
- repairs or replacement of infrastructure, as required; and
- land management including mowing to control vegetation as required.

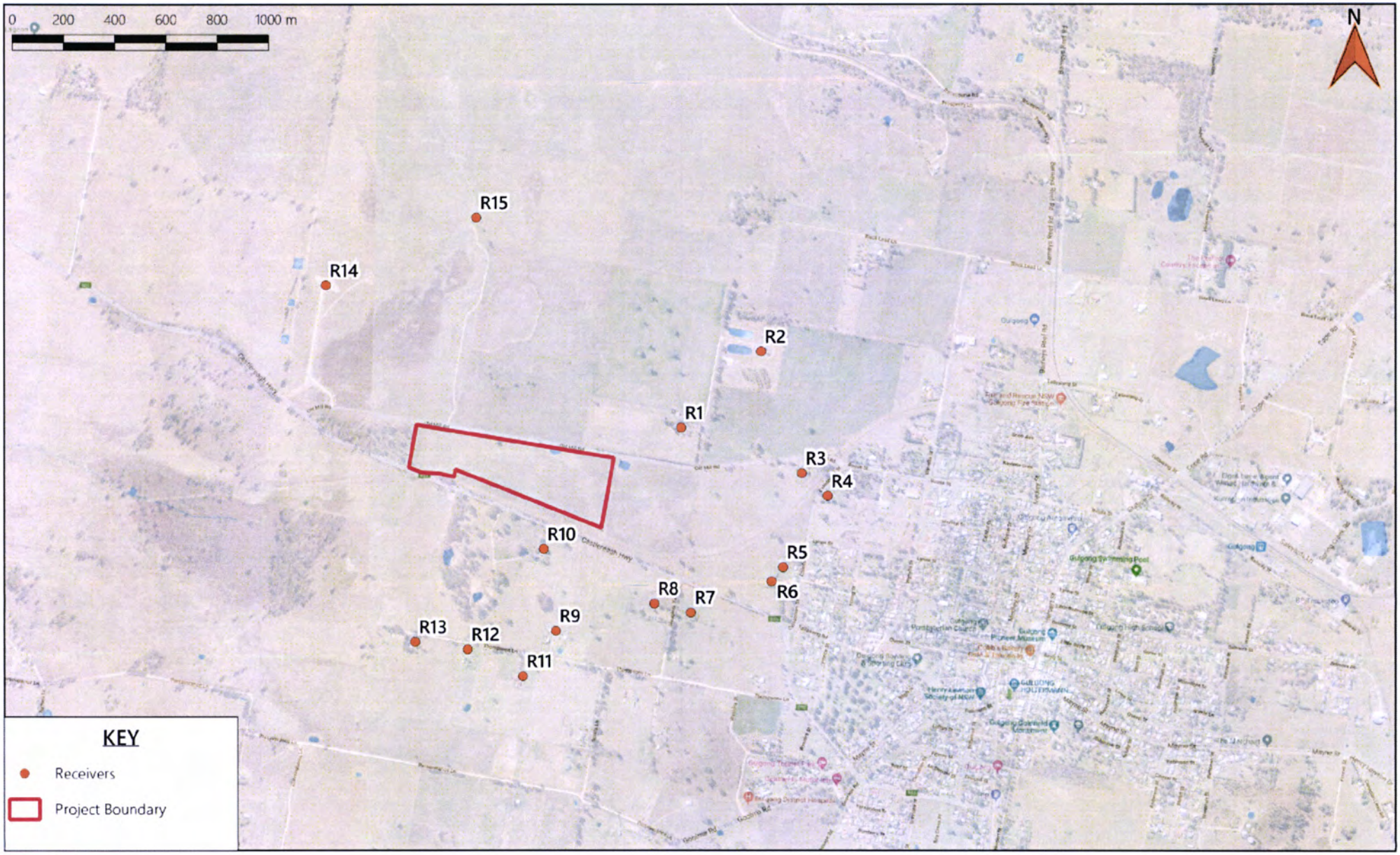
Typical noise sources associated with maintenance activities would include light vehicle movements on site and maintenance of equipment.

2.4 Potentially Sensitive Receivers

Using aerial photography, geospatial information and other project information, MAC has identified the following potentially sensitive receivers that may be affected by noise from operation or construction activities and project related road traffic. **Table 1** presents a summary of receiver identification address and coordinates. These are reproduced graphically in **Figure 1.**

Table 1 Noise Sensitive Receivers

ID	Description/Address	Coordinates (MGA 55)	
		Easting	Northing
R1	13 Shepherds Lane	737026	6417562
R2	52 Shepherds Lane	737338	6417860
R3	11 Old Mill Road	737496	6417385
R4	3 Caledonian Street	737597	6417297
R5	12 Caledonian Street	737422	6417018
R6	12 Caledonian Street	737378	6416962
R7	31 Slaughter Yards Road	737062	6416840
R8	12 Slaughter Yards Road	736918	6416875
R9	78 Thompsons Lane	736531	6416769
R10	105 Castlereagh Highway	736484	6417089
R11	89 Thompsons Lane	736402	6416592
R12	109 Thompsons Lane	736185	6416697
R13	129 Thompsons Lane	735979	6416726
R14	210 Old Mill Road	735632	6418120
R15	164 Old Mill Road	736221	6418385



MAC
Muller Acoustic Consulting

FIGURE 1
PROJECT LAYOUT
REF: MAC180781-03

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3 Noise Policy and Guidelines

This Noise Assessment has been conducted in accordance with the following key policy and guidelines:

- NSW Department of Environment and Climate Change, NSW Interim Construction Noise Guideline (ICNG), 2009;
- Environment Protection Authority's (EPA's), Noise Policy for Industry (NPI), 2017; and
- NSW Department of Environment, Climate Change and Water (DECCW), NSW Road Noise Policy (RNP), 2011.

The assessment has also considered and applied the following additional policy, guidelines and standards where relevant:

- Australian Standard AS 2436–2010 (R2016) (AS 2436) – Guide to Noise and Vibration Control on Construction, Demolition and Maintenance sites;
- Australian Standard AS 1055:2018 – Description and Measurement of Environmental Noise;
- Australian Standard AS/NZS IEC 61672.1–2019 (AS 61672) – Electro Acoustics - Sound Level Meters Specifications Monitoring; and
- Australian Standard AS IEC 60942-2004 (AS 60942) – Electroacoustics – Sound Calibrators.

3.1 Interim Construction Noise Guideline

The assessment and management of noise from construction work is completed with reference to the Interim Construction Noise Guideline (ICNG). The ICNG is specifically aimed at managing noise from construction work regulated by the EPA and is used to assist in setting statutory conditions in licences or other regulatory instruments. The types of construction regulated by the EPA under the POEO Act (1997), include construction, maintenance and renewal activities carried out by a public authority, such as road upgrades as described in Schedule 1 of the POEO Act.

The ICNG sets out procedures to identify and address the impact of construction noise on residences and other sensitive land uses. This section provides a summary of noise objectives that are applicable to the assessment.

The ICNG provides two methodologies for the assessment of construction noise emissions:

- Quantitative, which is suited to major construction projects with typical durations of more than three weeks; or
- Qualitative, which is suited to short term infrastructure maintenance (for projects with a typical duration of less than three weeks).

The methodology for a quantitative assessment requires a more complex approach, involving noise emission predictions from construction activities to the nearest relevant receivers. The qualitative assessment methodology is a more simplified approach that relies more on noise management strategies. This study has adopted a quantitative assessment approach.

The quantitative approach includes identification of potentially affected receivers, description of activities involved in the project, derivation of the construction noise management levels, quantification of potential noise impact at receivers and, provides management and mitigation recommendations. **Table 2** summarises the ICNG recommended standard hours for construction.

Table 2 Recommended Standard Hours for Construction

Period	Preferred Construction Hours
Day (Standard construction hours)	Monday to Friday - 7am to 6pm Saturdays - 8am to 1pm Sundays or Public Holidays - No construction

The recommended hours do not apply in the event of direction from police, or other relevant authorities, for safety reasons or where required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm. Work conducted outside of standard hours are considered out of hours work (OOH). OOH periods are divided into two categories representing evening and night periods and cover the hours listed below:

> **Period 1** (evening/low risk period): Monday to Friday – 6pm to 10pm, Saturdays – 1pm to 6pm, Sundays – 8am to 6pm.
>
> **Period 2** (night/medium to high risk period): Monday to Friday – 10pm to 7am, Saturdays/Sundays – 6pm to 7am (8am on Sunday mornings).

There are no out of hours work proposed for this project.

3.1.1 Construction Noise Management Levels

Section 4 of the ICNG details the quantitative assessment method involving predicting noise levels and comparing them with the Noise Management Level (NML) and are important indicators of the potential level of construction noise impact. **Table 3** provides the ICNG recommended $L_{Aeq(15min)}$ NMLs and how they are to be applied.

Table 3 Noise Management Levels		
Time of Day	Management Level $LA_{eq(15min)}$[1]	How to Apply
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays.	Noise affected RBL + 10dB.	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $LA_{eq(15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of work to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dBA.	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account times identified by the community when they are less sensitive to noise (such as before and after school for work near schools, or mid-morning or mid-afternoon for work near residences; and if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours.	Noise affected RBL + 5dB.	A strong justification would typically be required for work outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dBA above the noise affected level, the proponent should negotiate with the community.
Commercial	70dBA	Offices, retail outlets
Hospital	45dBA (internal) 55dBA (external)	Assuming 10dB loss through open window

Note 1: The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the construction noise management levels for noise assessment purposes and is the median of the ABL's.

3.1.2 Construction Sleep Disturbance

Section 4.3 of the ICNG (DECC, 2009) states that a sleep disturbance assessment is required where construction activities are planned to occur for more than two consecutive nights. Given that construction activities are anticipated to occur during standard construction hours, sleep disturbance has not been considered in this assessment.

3.2 Noise Policy for Industry

The EPA released the Noise Policy for Industry (NPI) in October 2017 which provides a process for establishing operational noise criteria for development consents and/or licenses where the EPA regulate noise emissions from scheduled premises under the Protection of the Environment Operations Act 1997. The objectives of the NPI are to:

- provide noise criteria to assess the change in both short term and long term noise levels;
- provide a clear and consistent framework for assessing environmental noise impacts from industrial premises and industrial development proposals;
- promote the use of best-practice noise mitigation measures that are feasible and reasonable where potential impacts have been identified; and
- support a process to guide the determination of achievable noise limits for planning approvals and/or licences, considering the matters under the relevant legislation (such as the economic and social benefits and impacts of industrial development).

The policy sets out a process for industrial noise management during operation, including:

1. Determine the Project Noise Trigger Levels (PNTLs) (ie criteria) for a development. These are the levels, above which noise management measures are required to be considered. They are derived by considering two factors: shorter-term intrusiveness due to changes in the noise environment; and maintaining the noise amenity of an area.
2. Predict or measure the noise levels produced by the development with regard to the presence of annoying noise characteristics and meteorological effects such as temperature inversions and wind.
3. Compare the predicted or measured noise level with the PNTLs, assessing impacts and the need for noise mitigation and management measures.
4. Consider residual noise impacts, where noise levels exceed the PNTLs after the application of feasible and reasonable noise mitigation measures. This may involve balancing economic, social and environmental costs and benefits from the proposed development against the noise impacts, including consultation with the affected community where impacts are expected to be significant.

5. Set statutory compliance levels that reflect the best achievable and agreed noise limits for the development.

6. Monitor and report environmental noise levels from the development.

3.2.1 Project Noise Trigger Levels

The policy sets out the procedure to determine the PNTLs for an industrial development. The PNTL is the lower (ie, the more stringent) value of the **Project Intrusiveness Noise Level** (PINL) and **Project Amenity Noise Level** (PANL) determined in accordance with Section 2.3 and Section 2.4 of the NPI.

3.2.2 Project Intrusiveness Noise Level

The PINL ($L_{Aeq(15min)}$) is the RBL + 5dB and seeks to limit the degree of change a new noise source introduces to an existing environment. When assessing intrusiveness, background noise levels needs to be measured, from which RBLs are determined.

3.2.3 Project Amenity Noise Level

PANL is relevant to a specific land use or locality. To limit continuing increases in intrusiveness levels, the ambient noise level within an area from all combined industrial sources should remain below the recommended amenity noise levels specified in Table 2.2 (of the NPI) and are reproduced in **Table 4**. The NPI defines two categories of amenity noise levels:

- **Amenity Noise Levels (ANL)** – are determined considering all current and future industrial noise within a receiver area.
- **Project Amenity Noise Levels (PANL)** – is the recommended levels for a receiver area, specifically focusing the project being assessed.

Additionally, Section 2.4 of the NPI states: "*to ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise levels applies for each new source of industrial noise as follows*":

- areas with high traffic noise levels;
- proposed developments in major industrial clusters;
- existing industrial noise and cumulative industrial noise effects; and
- greenfield sites.

Notwithstanding, where the PANL is applicable and can be satisfied, the assessment of cumulative industrial noise is not required.

Table 4 Amenity Criteria

Receiver Type	Noise Amenity Area	Time of day	Recommended amenity noise level dB LAeq
Residential	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	See column 4	See column 4	5dBA above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School classroom – internal	All	Noisiest 1-hour period when in use	35
Hospital ward - internal - external	All	 Noisiest 1 hour Noisiest 1 hour	 35 50
Place of worship – internal	All	When in use	40
Area specifically reserved for passive recreation (e.g. national park)	All	When in use	50
Active recreation area (e.g. school playground, golf course)	All	When in use	55
Commercial premises	All	When in use	65
Industrial premises	All	When in use	70
Industrial interface (applicable only to residential noise amenity areas)	All	All	Add 5dBA to recommended noise amenity area

Notes: The recommended amenity noise levels refer only to noise from industrial noise sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The levels represent outdoor levels except where otherwise stated.

Types of receivers are defined as rural residential; suburban residential; urban residential; industrial interface; commercial; industrial – see Table 2.3 and Section 2.7.

Time of day is defined as follows: (These periods may be varied where appropriate, for example, see A3 in Fact Sheet A.)

- day – the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays;
- evening – the period from 6pm to 10pm;
- night – the remaining periods.

In the case where existing schools are affected by noise from existing industrial noise sources, the acceptable LAeq noise level may be increased to 40dB LAeq(1hr).

3.2.4 Maximum Noise Level Assessment

The potential for sleep disturbance from maximum noise level events from a project during the night-time period needs to be considered. The NPI considers sleep disturbance to be both awakenings and disturbance to sleep stages.

Where night-time noise levels from a development/premises at a residential location exceed:

- $L_{Aeq(15min)}$ 40dBA or the prevailing RBL plus 5dB, whichever is the greater, and/or
- L_{Amax} 52dBA or the prevailing RBL plus 15dB, whichever is the greater,

a detailed maximum noise level event assessment should be undertaken.

A detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

Other factors that may be important in assessing the impacts on sleep disturbance include:

- how often the events would occur;
- the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the development;
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods); and
- current understanding of effects of maximum noise level events at night.

3.3 Road Noise Policy

The road traffic noise criteria are provided in the Department of Environment, Climate Change and Water NSW (DECCW), Road Noise Policy (RNP), 2011. The policy sets out noise criteria applicable to different road classifications for the purpose of quantifying traffic noise impacts. Road noise criteria relevant to this assessment are presented in detail in **Section 6**.

4 Assessment Criteria

Background noise monitoring has not been conducted for this project and hence, the minimum applicable Rating Background Levels (RBL) of 35dBA for the daytime period and 30dBA for the evening and night time periods have been adopted in accordance with NPI methodology.

4.1 Construction Noise Management Levels

Noise Management Levels (NMLs) for construction activities at all residential receivers are 45dB LAeq(15min) (RBL +10dB). Construction activities are planned for standard hours, however the relevant NML standard construction hours and out of hours periods are summarised in **Table 5**.

Table 5 Construction Noise Management Levels

Location	Assessment Period[1]	RBL, dBA	NML dB LAeq(15min)
All Residential Receivers	Day (Standard Hours)	35	45 (RBL+10dBA)
	Evening (OOH Period 1)	30	35 (RBL+5dBA)
	Night (OOH Period 2)	30	35 (RBL+5dBA)
Commercial	When in Use	N/A	70
Hospital	When in Use	N/A	55

Note 1: See table 2 for Recommended Standard Hours for Construction.

4.2 Operational Noise Criteria

4.2.1 Project Intrusiveness Noise Levels

The PINLs for the project are presented in **Table 6** and have been determined based on the RBLs +5dBA.

Table 6 Project Intrusiveness Noise Levels

Receiver	Period[1]	Adopted RBL dB LA90	PINL dB LAeq(15min)
All Residential Receivers	Day	35	40
	Evening	30	35
	Night	30	35

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.2.2 Project Amenity Noise Levels

The PANLs for receivers potentially affected by the project are presented in **Table 7.**

Table 7 Project Amenity Noise Levels

Receiver Type	Noise Amenity Area	Assessment Period[1]	Recommended ANL dB LAeq(period)[2]	PANL dB LAeq(period)[3]	PANL dB LAeq(15min)[4]
Residential	Rural	Day	50	50	53
		Evening	45	45	48
		Night	40	40	43
Industrial		When In Use	70	70	73

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Note 2: Recommended amenity noise levels as per Table 2.2 of the NPI.

Note 3: Project Amenity Noise Level equals the amenity noise level as there is no other industry in the area.

Note 4: Includes a +3dB adjustment to the amenity period level to convert to a fifteen-minute assessment period as per Section 2.2 of the NPI.

4.2.3 Project Noise Trigger Levels

The PNTLs are the lower of either the PINLs or the PANLs. **Table 8** presents the derivation of the PNTLs in accordance with the methodologies outlined in the NPI. For this assessment the night time PNTL of 35dB LAeq(15min) is the limiting criteria for residential receivers.

Table 8 Project Noise Trigger Levels

Catchment	Assessment Period[1]	PINL dB LAeq(15min)	PANL dB LAeq(15min)	PNTL dB LAeq(15min)
Residential Receivers (Rural)	Day	40	53	40
	Evening	35	48	35
	Night	35	43	35
Industrial	When In Use	N/A	73	73

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.2.4 Maximum Noise Level Screening Criterion

The maximum noise level screening criterion shown in **Table 9** is based on night time RBLs and trigger values as per Section 2.5 of the NPI.

Table 9 Maximum Noise Assessment Trigger Levels

Residential Receivers			
LAeq(15min)		LAmax	
40dB LAeq(15min) or RBL + 5dB		52dB LAmax or RBL + 15dB	
Trigger	40	Trigger	52
RBL +5dB	35	RBL +15dB	45
Highest	**40**	**Highest**	**52**

Note: As per Section 2.5 of the NPI, the highest of the two criteria are adopted as the screening criteria.

4.3 Road Traffic Noise Criteria

The road traffic noise criteria are provided in the RNP and are presented in **Table 10** for residential receivers.

Table 10 Road Traffic Noise Assessment Criteria for Residential Land Uses

Road category	Road Name	Type of Project/Development	Assessment Criteria - dBA	
			Day (7am to 10pm)	Night (10pm to 7am)
Freeway/arterial/sub -arterial road	Castlereagh Highway	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	60dBA LAeq(15hr) external	55dBA LAeq(9hr) external

Note: For road noise assessments, the day period is from 7am to 10pm (ie there is no evening assessment period as there is with operational noise). Night is from 10pm to 7am

Additionally, the RNP states where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2dB, which is generally accepted as the threshold of perceptibility to a change in noise level.

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5 Modelling Methodology

A computer model was developed to quantify project noise emissions to neighbouring receivers for typical construction activities and operations. DGMR's iNoise (Version 2019) noise modelling software was used to assess potential noise impacts associated with the project. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. Additionally, the model uses relevant noise source data, ground type, shielding such as barriers and/or adjacent buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers. Plant and equipment were modelled at various locations and heights, representative of realistic construction and operational conditions for assessed scenarios.

The model calculation method used to predict noise levels was in accordance with ISO 9613-1 'Acoustics - Attenuation of sound during propagation outdoors. Part 1: Calculation of the absorption of sound by the atmosphere' and ISO 9613-2 'Acoustics - Attenuation of sound during propagation outdoors. Part 2: General method of calculation'.

5.1 Construction Assessment Methodology

Construction activities are proposed to be progressive (trenching, piling and assembly) and will occur at several locations simultaneously. Noise emissions were modelled for the following four scenarios:

- earthworks for internal road and compound construction including the stripping of topsoil and unsuitable soil and the placement and compaction of road base;
- earthworks involving trenching for cabling;
- piling of panel supports; and
- assembly of the panels.

It is envisaged that all four construction scenarios have the potential to occur simultaneously at up to two locations across the site. Noise emission data and assumptions used in this assessment are summarised in **Table 11**. All significant noise generating construction activities will be limited to standard construction hours. Where low intensity construction activities are required to be undertaken outside standard construction hours, such as cabling, minor assembly, use of hand tools etc, they will be managed such that they are not audible at any residential receivers.

Table 11 Construction Equipment Sound Power Levels, Lw dBA re 10^{-12} W				
Noise Source/Item	Utilisation %	Quantity	Lw/Item	Total Lw
Trenching & Earthworks				
Backhoe	80	1	104	103
Light vehicle	25	2	76	73
Total – Trenching & Earthworks				**103**
Piling				
Piling Rig (hydraulic)	80	1	113	112
Tele-handler	75	1	106	105
Light vehicle	25	2	76	73
Total – Piling				**113**
Assembly				
Mobile Crane/HIAB	75	1	104	103
Tele-handler	75	1	106	105
Light vehicle	25	2	76	73
Hand tools/Power tools	50	1	102	99
Welder	50	1	105	102
Total – Assembly				**109**
Transport (on site)				
Heavy vehicle	40	1	104	101
Tele-handler	50	1	106	103
Total – Transport				**105**

5.2 Operational Assessment Methodology

5.2.1 Operational Noise Modelling Scenarios

For this assessment, noise predictions were modelled for a typical worst-case operational scenario over a 15-minute assessment period based on the assumptions and sound power levels in **Table 12.** Plant noise emission data used in modelling for this assessment were obtained from manufacturers data or the MAC database. Where relevant, modifying factors in accordance with Section 3.3 and Fact Sheet D of the NPI have been applied to calculations.

Table 12 Operational Equipment Sound Power Levels, Lw dBA re 10^{-12} W				
Noise Source/Item	Activity	Quantity	Lw/Item	Total Lw
PV Panel Tracking Motor[1, 2]	All tracking motors in operation 1 minute per 15-minute period	150-200	78	84
2.5MW Inverter[2]	Constant	2	81	94
5MVA Transformer[2]	Constant	1	77	87

Note 1: Tracking motor is situated underneath the PV panel, -5dB attenuation applied to account for shielding provided by the panel.

Note 2: Modifying factor penalty of +5dB added for low frequency and +5dB added for tonality.

5.2.2 Meteorological Analysis

Noise emissions from industry can be significantly influenced by prevailing weather conditions. Light stable winds (<3m/s) and temperature inversions have the potential to increase noise at a receiver.

Fact Sheet D of the NPI provide two options when considering meteorological effects:

- adopt the noise enhancing conditions for all assessment periods without an assessment of how often the conditions occur, this is a conservative approach that considers a source to receiver winds for all receivers and F class temperature inversions with wind speeds up to 2m/s at night; or
- determine the significance of noise enhancing conditions. This requires assessing the significance of temperature inversions (F and G Class stability categories) for the night time period and the significance of light winds up to 3m/s for all assessment periods during stability categories other than E, F or G.

This assessment has adopted default noise enhancing conditions with the meteorological conditions adopted in the noise modelling assessment summarised in **Table 13**.

Table 13 Modelled Site Specific Meteorological Parameters				
Assessment Condition[1]	Temperature	Wind Speed / Direction	Relative Humidity	Stability Class
Day - Calm	20°C	3m/s all directions	50%	D
Evening - Calm	10°C	3m/s all directions	50%	D
Night - Calm	10°C	2m/s all directions	50%	F

Note 1: Day 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening 6pm to 10pm; Night - the remaining periods.

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6 Results

6.1 Construction Noise Results

Noise levels were predicted to each assessed receptor assuming receiver heights of 1.5m above ground level for typical construction activities during noise enhancing meteorological conditions. **Table 14** summarises the maximum predicted noise level from each of the construction scenarios (trenching, piling and assembly) at identified residential receivers.

Table 14 Predicted Construction Noise Levels

Receiver ID	Description/Address	Predicted Noise Level Range dB $L_{Aeq(15min)}$[1]	Highest Predicted Noise Level dB $L_{Aeq(15min)}$	NML Standard Hours dB $L_{Aeq(15min)}$	Compliance
R1	13 Shepherds Lane	31-50	**50**	45	No[2]
R2	52 Shepherds Lane	27-43	43	45	Yes
R3	11 Old Mill Road	25-43	43	45	Yes
R4	3 Caledonian Street	24-41	41	45	Yes
R5	12 Caledonian Street	25-43	43	45	Yes
R6	12 Caledonian Street	25-43	43	45	Yes
R7	31 Slaughter Yards Road	27-45	45	45	Yes
R8	12 Slaughter Yards Road	29-47	**47**	45	No[2]
R9	78 Thompsons Lane	30-44	44	45	Yes
R10	105 Castlereagh Highway	36-53	**53**	45	No[2]
R11	89 Thompsons Lane	28-42	42	45	Yes
R12	109 Thompsons Lane	31-43	43	45	Yes
R13	129 Thompsons Lane	31-43	43	45	Yes
R14	210 Old Mill Road	33-45	45	45	Yes
R15	164 Old Mill Road	31-44	44	45	Yes

Note 1: Noise levels from construction activities vary due to their location across the project site.

Note 2: Noise levels exceed NMLs when construction activities are at their nearest point to receivers.

6.2 Operational Noise Results

Noise levels were predicted at each assessed receptor assuming receiver heights of 1.5m above ground level during worst case noise enhancing meteorological conditions. **Table 15** summarises the predicted operational noise levels which are demonstrated to comply with the PNTLs at all residential receivers.

Table 15 Predicted Operational Noise Levels

Receiver ID	Address	Predicted Noise Level dB $L_{Aeq(15min)}$	Limiting Night PNTL dB $L_{Aeq(15min)}$	Compliance
R1	13 Shepherds Lane	21	35	Yes
R2	52 Shepherds Lane	<20	35	Yes
R3	11 Old Mill Road	<20	35	Yes
R4	3 Caledonian Street	<20	35	Yes
R5	12 Caledonian Street	<20	35	Yes
R6	12 Caledonian Street	<20	35	Yes
R7	31 Slaughter Yards Road	<20	35	Yes
R8	12 Slaughter Yards Road	20	35	Yes
R9	78 Thompsons Lane	<20	35	Yes
R10	105 Castlereagh Highway	26	35	Yes
R11	89 Thompsons Lane	<20	35	Yes
R12	109 Thompsons Lane	<20	35	Yes
R13	129 Thompsons Lane	<20	35	Yes
R14	210 Old Mill Road	<20	35	Yes
R15	164 Old Mill Road	<20	35	Yes

6.3 Maximum Noise Level Assessment - Operations

A detailed maximum noise level assessment is not required as predicted noise levels for night time operations do not exceed the maximum noise level screening criterion of 40dB $L_{Aeq(15min)}$ and/or 52dB L_{Amax}.

6.4 Road Traffic Noise Assessment

The route via Castlereagh Highway to Old Mill Road would be the major transport route for all vehicles to the project site. During construction, traffic generated by the project include employee/subcontractor and delivery vehicles. The traffic volume over a typical day for standard construction hours is expected to be up to four heavy vehicles (semi-trailers or B-doubles) per hour and 20 light commercial vehicles or equivalent mini buses for worker transport during the morning and afternoon peak hour periods.

Predicted $L_{Aeq(1hr)}$ noise levels from project related construction traffic at the closest receiver (80m from the road) situated along the Castlereagh Highway to the site access has been completed using the United States (US) Environment Protection Agency's road traffic calculation method is presented in **Table 16**.

Table 16 Predicted Construction Road Traffic Noise Levels

Road Name	Nearest Offset Distance to Receiver	Predicted Noise Level	RTN Criteria	Comply
Castlereagh Highway	80m	<40dB $L_{Aeq(15hr)}$	60dB $L_{Aeq(15hr)}$	Yes

Results demonstrate that project construction traffic noise levels would comply with the relevant RNP criteria.

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7 Recommendations

7.1 Construction Noise Recommendations

It is noted that construction noise emissions are expected to exceed the relevant NMLs depending on proximity of activities to receivers. Recommendations for consideration during construction activities to reduce emissions to the surrounding community for this project may include:

- a construction noise management protocol to minimise noise emissions, manage out of hours (minor) works to be inaudible, and to respond to potential concerns from the community;
- where possible use localised mobile screens or construction hoarding around plant to act as barriers between construction works and receivers, particularly where equipment is near the site boundary and/or a residential receiver including areas in constant or regular use (eg unloading and laydown areas);
- operating plant in a conservative manner (no over-revving), shutdown when not in use, and be parked/started at farthest point from relevant assessment locations;
- selection of the quietest suitable machinery available for each activity;
- avoidance of noisy plant/machinery working simultaneously where practicable;
- minimise impact noise wherever possible;
- utilise a broadband reverse alarm in lieu of the traditional high frequency type reverse alarm;
- provide toolbox meetings, training and education to drivers and contractors visiting the site during construction so they are aware of the location of noise sensitive receivers and to be cognisant of any noise generating activities;
- signage is to be placed at the front entrance advising truck drivers of their requirement to minimise noise both on and off-site; and
- utilise project related community consultation forums to notify residences within close proximity of the site with project progress, proposed/upcoming potentially noise generating works, its duration and nature and complaint procedure.

7.2 Operational Noise Recommendations

Operational noise predictions identify that relevant noise criteria would be satisfied at all receivers. Notwithstanding, it is recommended that the proponent actively minimise potential noise emissions from the project. To assist in noise management for the project it is recommended that a one-off noise validation monitoring assessment be completed to quantify emissions from site and to confirm emissions meet relevant criteria.

8 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has been engaged by IT Power (Australia) Pty Ltd (ITP) to complete a Noise Assessment (NA) for the proposed Avisford Mini Sustainable Energy Park near Gulgong, NSW. The assessment has quantified potential noise emissions associated with the construction and operation of the project.

The results of the NA demonstrate that construction noise levels have potential to exceed relevant construction NMLs at three receiver locations depending on their proximity to construction activities. Recommendations have been provided to minimise the potential noise impacts from construction, albeit of a temporary nature during the daytime over a six week construction period.

Operational noise levels satisfy the NPI PNTLs for assessed receivers. However, recommendations to ensure noise levels are verified have been provided in this report.

Additionally, the NA demonstrates that the road noise criteria as specified in the RNP will be satisfied at all receivers on the proposed transport route.

Based on the NA results, there are no noise related issues which would prevent the approval of the project. The results of the assessment shows compliance with the relevant operational and road noise criteria. Accordingly, no additional ameliorative measures will be required.

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Appendix A – Glossary of Terms

A number of technical terms have been used in this report and are explained in Table A1.

Table A1 Glossary of Terms

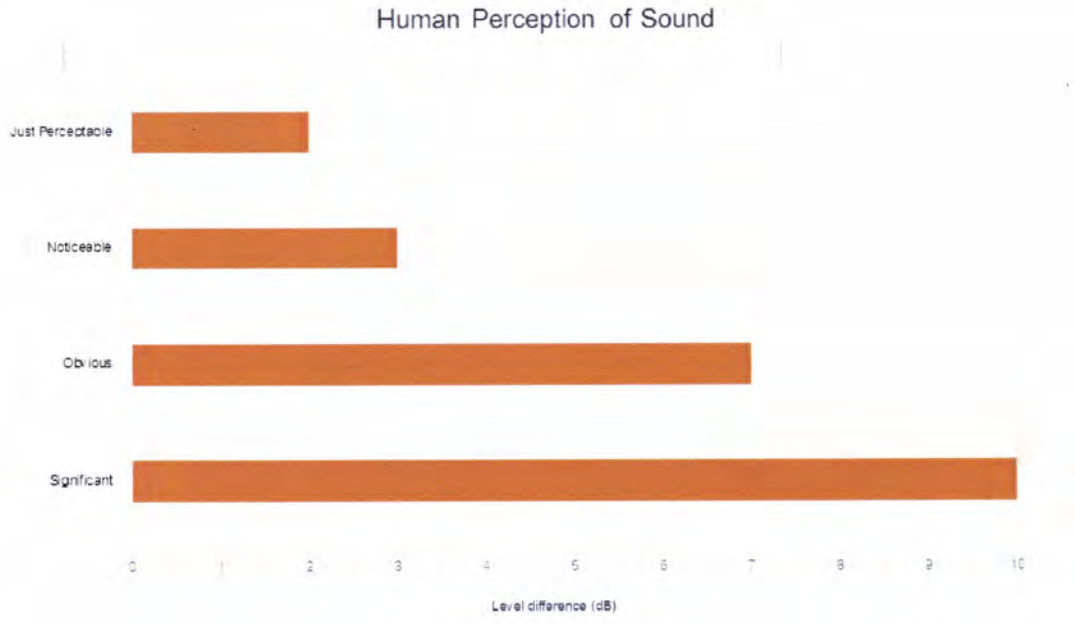
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L90 statistical noise levels.
Ambient Noise	The noise associated with a given environment. Typically, a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source and is the equivalent continuous sound pressure level over a given period.
LAmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by: = 10.log10 (W/Wo) Where: W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA

Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



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MAC
Muller Acoustic Consulting

Zenith
TOWN PLANNING PTY LTD

with Compliments

The General Manager
Mid-Western Regional Council
PO Box 156
Mudgee NSW 2850

27 September 2019

Dear Sir

DEVELOPMENT APPLICATION DA0283/2019 - Electricity Generating Works and Associated Infrastructure, Lots 460-464 DP 755434 'Arocka' 129 Old Mill Road, Gulgong NSW 2850

Please find below and attached a response to each of the matters raised in Council's request for additional information dated 27 June 2019 and relating to the above development application.

Please note also that I, as the author of the Statement of Environmental Effects and this additional information, am a qualified planner, having graduated with a Bachelor of Arts (Honours) degree majoring in geography from the University of New South Wales in 1983 and a Master of Urban and Regional Planning degree from the University of Sydney in 1996.

I am qualified to prepare heritage impact statements, visual impact assessments and social and economic impact assessments, and have prepared many of these assessments over the 27 years that I have been either in private practice or employed as a local government planner. I am a Registered Planner with the Planning Institute of Australia and regularly attend professional conferences in Australia and the United States. For further information about my expertise and capacities please visit my website www.zenithplan.com.au.

- Mid-Western Regional DCP 2013

It is hereby nominated in accordance Section 1.4 Transition Provision of Mid-Western Regional Development Control Plan 2013 that the applicant seeks the application to be assessed against the provisions of Amendment 3 of the Mid-Western Regional DCP 2013, being the DCP in force at the time of lodgement of DA0283/2019.

- Site suitability

Council's Rural Residential Industrial and Residential Strategy contains a policy objective to *Discourage developments which will adversely affect the long distance views of Mudgee and Gulgong that are not visually compatible with the rural landscape along the approaches to each town* and specifically *any further development is sympathetic to the existing town character of Gulgong.*

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ACN 624 467 349 ABN 11 624 467 349

An assessment of site suitability in the context of the township of Gulgong its community and the surrounding rural landscape is provided in the attached Heritage Impact Statement

- Statement of Heritage Impact

A Statement of Heritage Impact that addresses the potential impact on Item 222 that is listed in Mid-Western Regional Local Environmental Plan 2012 is attached.

- Provision of essential services

The supply of reticulated water and sewerage services is not required for the proposed development. However, portaloos for wastewater disposal (see https://www.kennards.com.au/site-equipment/showers-toilets.html) and water supply by way of a portable tank or cart (see https://www.kennards.com.au/site-equipment/water-tank.html) are proposed to be installed during the construction phase. Electrical services are available to the site. Stormwater management is proposed to be addressed by controls recommended in this Statement with full details to be provided with the application for a construction certificate. Adequate vehicular access is proposed by way of an existing entrance to the site off Old Mill Road.

- Maintenance of landscaping

The planting of acacias and grevilleas endemic to the area along property boundaries will be carried out whilst construction takes place to enable use of the hired portable tank or cart that will provide water supply to the site. Construction will take approximately 3 months so regular watering during that period would ensure the establishment of plants. The use of native plants endemic to the area means that watering requirements once established would be minimal and would be done during regular maintenance inspections, i.e. every 2 or 3 months. There would be nil impact on Council's infrastructure and no augmentation of services would be required.

- Site maintenance – bushfire risk and weed control

Regular inspections, i.e. every 2 or 3 months, of the site will be carried out to ensure that grassland is managed to reduce the risk of bushfire to surrounding land and to control weeds. Mowing or slashing between rows of PV panels and in the area immediately surrounding the arrays would be carried out as required to reduce bushfire hazard. Removal of weeds will be either by hand or through the application of an approved herbicide.

- Visual impact assessment

An assessment of the potential impacts on visual and scenic amenity has been carried out by Zenith Town Planning Pty Ltd and is included in the Statement of Environmental Effects. The assessment has been carried out using the RMS guideline *Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment* (EIA-N04 Version 2-0 released on 28 March 2013). The RMS methodology has been validated by the Land and Environment Court in the case of Houghton V Shoalhaven City Council [2016] NSWLEC 1195. A visual assessment was prepared using this methodology during assessment of a development application and cited during court proceedings. The commissioner upheld an appeal by the applicant and agreed with the findings of the visual assessment in terms of its application to assessing views to a development site from surrounding properties.

The RMS methodology which is based on an determining the sensitivity of the landscape to physical change and the magnitude, or relative size and scale, of the proposed works has also been accepted by the Western Regional Planning Panel when determining applications for development of solar farms at Hay and Griffith.

In the visual assessment given in the SEE, the visual catchment, the context of the site of the proposed works and viewpoints are identified. Land uses and characteristics of the environment such as topography, vegetation, architecture of neighbouring buildings and any heritage values of any significant sites in the vicinity of the proposed solar farm are noted and the capacity of the area to absorb physical change is assessed. Development plans for the solar farm are reviewed and the likely impacts on landscape character identified. The visual significance of the site to viewpoints and receivers within the visual catchment is described in terms of proximity to the site, landscape character, the composition of views and the sensitivity to change that will affect scenic values. The visual impacts that will be experienced by each receiver are identified and evaluated in terms of the sensitivity of each receiver to change and the magnitude of that change in terms of the proposed works. The impacts are ranked according to negligible, low, moderate or high impact. The visual catchment of the development site is defined by an area within 500 metres of the boundaries of the development site from which the works may be clearly visible. This 500 metres radius area coincides with the new development control in Mid-Western DCP 2013 Amendment No 4 (which does not apply to DA0283/2019) that restricts the development of solar farms to a distance of greater than 500 metres from a dwelling. The ability to distinguish the type of land use and the actual composition of materials diminishes with distance. The potential visual impact on view points within the public domain and within the visual catchment are assessed and include both eastern and western approaches along the Castlereagh Highway and old Mill Road. The visual catchment also includes five dwellings and what is erroneously referred to as an operating extractive industry located to the south of the site on the southern side of the Castlereagh Highway. It is now known that the extractive industry no longer operates although it is uncertain as to when operations ceased. A quarry that is operating on a site located over 5.2 kilometres to the south-west of the development site is not within the visual catchment and is not considered in the assessment.

Visual elements of the proposed Avisford Mini Sustainable Energy Park once operational comprise the arrays of PV panels, two inverters and internal roads. The development area (the solar farm facility) is to be surrounded by security fencing that is 1.8 metres high and topped with three rows of barbed wire to bring the total height to a maximum of 2.1 metres. It is unfortunate that security fencing is required, however, this is preferable to the potential ongoing and unlimited costs associated with vandalism and theft of private and valuable property that is associated with the solar farm equipment. It is advised that security lighting is not proposed and that there would be no impact due to lighting on night sky visibility or on residences in the vicinity of the site.

Landscaping is proposed around the eastern, northern and southern perimeter of the site to be planted during the three-month construction period. This will provide a visual screen for the occupants of nearby rural dwellings as well as motorists travelling along Old Mill Road and the Castlereagh Highway. The western boundary adjoins existing bushland. It is proposed to plant native shrubs endemic to the Gulgong locality that will grow to a maximum height of 2 to 3 metres and to provide 5 metres separation between each plant. Typical plants would be evergreen natives such as acacia and grevilleas.

The security fencing is to be setback 3 metres from the property boundaries and the arrays will be setback a further 7 metres inside the fence. Landscaping is to be placed within the 3 metre space between the property boundaries and the security fencing. Growth is anticipated to be relatively fast due to the planting taking place during construction with the ability to water the plants on a daily or as-necessary basis.

Plants should be well established at the end of the three-month construction period. The plants would be purchased in 20 litre pots with a height of approximately 30 centimetres. It is expected that plants in this size pot would be around 1 metre tall and would reach 2 metres within a year. The proponent is also prepared to place shade cloth on the security fence to screen the facility until such time as the plants reach a height of 2 metres or maturity.

The visual assessment in the SEE contains a description of landscape character near Gulgong as well as structures and land uses in the vicinity of the development site. Impacts on landscape character and the visual receptors located within the visual catchment are assessed in terms of the magnitude of the development and sensitivity to change. In summary, the impact of the proposed solar farm on landscape character has been assessed to be moderate. The solar farm would be highly visible to motorists travelling along Old Mill Road in either direction. The works would also be visible to motorists travelling along the Castlereagh Highway, however, given the character of the proximity to the urban area, the speed limit and scattered trees within the road reserve on the approaches towards and away from town it is expected that acceptance of and adaptation to change will occur within a relatively short space of time following completion of works. The visual impact of the proposed works are assessed to be low to moderate for the residential viewpoints identified in this assessment. Vegetation along the highway, proposed vegetation and fencing measures along the Old Mill Road frontage, and existing vegetation within private properties would serve to screen and distract visual interest away from the development. Impacts on the character of the township of Gulgong would be minimal as the facility would not be visible to the majority of the urban area including the historic town centre. Outside of the immediate area of the town centre development is of mixed character and modern dwellings and industrial development stand in contrast to heritage buildings.

Additional photomontages have been prepared to demonstrate the visibility of the solar farm during the various stages of growth of the vegetation screening. These photomontages are provided in the attached Heritage Impact Statement. Views from the public domain of Old Mill Road and private property are shown. Given the proposed landscaping of three boundaries and the presence of existing vegetation along the western boundary, the screening demonstrated in the photomontages would also apply to the Castlereagh Highway and private property in the vicinity of the development site.

In summary, all development is visible. Visual impacts are unavoidable and are the reality of growth and development of any land use. In this case the visibility of the facility will decrease over time as vegetation grows and as solar farms become a necessary part of the rural landscape in the same way as fences, stock yards and farm buildings are now.The impacts of the proposed solar farm on character and scenic values are assessed to be acceptable given that it is in the wider regional, national and global public interest to contribute to renewable energy generation. The visual impacts of alternative unrenewable sources of energy are far greater and less desirable in terms of rehabilitation of the land after limited resources have been fully consumed.

- Decommissioning

It is confirmed that all infrastructure, that is PV panels, mounting frames including footings, inverters, piles, cabling and any other sub-surface materials would be disassembled and removed from the site to enable the site to be re-cultivated for cropping or grazing purposes. All gravel surfacing of accessways would be removed unless required for a future use by the land owner.

A decision has not been made to use the site for agricultural purposes whilst the solar farm is in operation. This would be a decision of the land owner based on security considerations and for business reasons.

- Social and Economic Impact Assessment

A Social and Economic Impact Assessment that addresses accommodation needs of construction workers and the impact on the community and local economy generally is attached.

- Emergency access

The General Arrangement plan (Drawing No. GLG2A-G-210) has been amended and is submitted with this document to address access issues.

In addition to the additional information requested by Council two other matters are addressed below. These are consideration of State Environmental Planning Policy (Primary Production and Rural Development) 2019 and the site survey carried out by Mudgee Local Aboriginal Lands Council.

- SEPP (Primary Production and Rural Development) 2019

This policy replaces four other SEPPs that apply to rural land including SEPP (Rural Lands) 2008. The purpose of providing this section is to update the Statement of Environmental Effects in relation to the legislative and policy framework applying to the development site and the proposed development.

The aims of *SEPP (Primary Production and Rural Development) 2019* are:

(a) *to facilitate the orderly economic use and development of lands for primary production,*
(b) *to reduce land use conflict and sterilisation of rural land by balancing primary production, residential development and the protection of native vegetation, biodiversity and water resources,*
(c) *to identify State significant agricultural land for the purpose of ensuring the ongoing viability of agriculture on that land, having regard to social, economic and environmental considerations,*
(d) *to simplify the regulatory process for smaller-scale low risk artificial waterbodies, and routine maintenance of artificial water supply or drainage, in irrigation areas and districts, and for routine and emergency work in irrigation areas and districts,*
(e) *to encourage sustainable agriculture, including sustainable aquaculture,*
(f) *to require consideration of the effects of all proposed development in the State on oyster aquaculture,*
(g) *to identify aquaculture that is to be treated as designated development using a well-defined and concise development assessment regime based on environment risks associated with site and operational factors.*

The policy applies to *State significant agricultural land,* farm dams and other artificial waterbodies, livestock industries and aquaculture. There is no *State significant agricultural land* listed in the schedule to the policy. It is noted that, separately, the Department of Primary Industries are in the process of preparing mapping of *Important Agricultural Land* in NSW to assist decision-making.

- Mudgee LALC Clearance Letter

The generic due diligence process outlined in the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* was carried out to ensure that Aboriginal cultural heritage issues have been considered. The findings of that assessment, presented in the Statement of Environmental Effects, are that there are no places or items of Aboriginal significance recorded on the development site.

It was noted in the Statement that Mudgee Local Aboriginal Lands Council had been advised of the plans to develop the Avisford Mini Sustainable Energy Park and that a representative carried out a ground survey on Friday 24 May 2019. The clearance letter has since been received that advised that whilst there are Aboriginal sites recorded near the development site there are none identified as being potentially impacted by the development. Mudgee LALC has no problem with the development proceeding. The clearance letter is attached for Council's information.

Yours faithfully,

Allen Grimwood RPIA
Director
Zenith Town Planning Pty Ltd

Encl:

- Statement of Heritage Impact
- Social and Economic Impact Assessment
- Mudgee LALC Clearance Letter

SOCIAL AND ECONOMIC IMPACT ASSESSMENT

Lots 460-464 DP 755434, 129 Old Mill Road, Gulgong, NSW

Avisford Mini Sustainable Energy Park

Zenith
TOWN PLANNING

sustainable thinking

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TABLE OF CONTENTS

Document Details & History

Project number	0619
Project title	Avisford Mini Sustainable Energy Park
Document title	Social and economic impact assessment
Client	IT Power (Australia) Pty Ltd
Author	Allen Grimwood
ABN	11 624 467 349
Version	Draft 16 August 2019
	Final 12 September 2019
	Final 11 October 2019 Rev A

The report has been prepared using information supplied by the client and other stakeholders. All care is taken to ensure the accuracy and veracity of this information, however, no responsibility is accepted for the interpretation of that information by end users.

1. INTRODUCTION

1.1 Purpose

The purpose of this Social and Economic impact Assessment is to support an application to Mid-Western Regional Council to develop a solar farm at Lots 460-464 DP 755434, No 129 Old Mill Road, Gulgong, referred to as the Avisford Mini Sustainable Energy Park. The application is for regionally significant development that needs consent and is to be determined by the Western Regional Planning Panel.

The purpose of this report is to assist Council's assessment of the proposal against the matters for consideration listed in section 4.15 of the *Environmental Planning and Assessment Act 1979*.

This Assessment has been prepared to expand upon details of the effects of the proposed development on the community and economy that has been provided in the Statement of Environmental Effects prepared by Zenith Town Planning Pty Ltd and submitted with the development application.

All information referenced in this Assessment has been sourced from publicly available documents or websites and from expert reports produced to support the application.

1.2 Scope of the report

Mid-Western Regional Council have requested additional information during assessment of the application in particular to address the issue of accommodation arrangements for workers involved in the construction of the facility and the impacts on the township of Gulgong.

Council's request for a Social and Economic Impact Assessment is as follows:

The Traffic Assessment Report prepared by Triaxial Consulting refers to the Construction Worker Site Access on page 9 and states that 'Depending upon accommodation arrangements made by the successful building contractor in the construction phase of the project, care should be taken to avoid any impacts on the Gulgong town centre'. Mitigation measures suggested including sourcing accommodation away from the Gulgong town centre or provision of a bus service to convey workers to the site. Whilst the Statement of Environmental Effects suggests that a bus will be used to convey the proposed 50 workers to and from the site over the construction phase and labour will be sourced from the Midwestern LGA wherever possible, there are no alternative solutions provided or assessed in the documentation as to where the labour workforce for the construction phase is to be accommodated. Accommodation options are significantly limited in the area and therefore further justification shall be provided to Council as to where accommodation would be secured and furthermore how this would impact the Gulgong township. This

information shall be comprehensively assessed and demonstrated within a Social and Economic Impact Assessment prepared by a suitably qualified Consultant. This shall also clarify the anticipated construction phase of the project as the documentation currently provides conflicting information.

The scope of this Assessment is to describe the existing social and economic environment in Mid-Western local government area and to identify any potential impacts of the proposed solar farm on the community and local economy. The potential social impacts addressed in this Assessment are the effects on accommodation, social cohesion and amenity. The potential economic impacts addressed are employment, change of use of agricultural land to an alternative type of primary production, the likely flow-on effects for business and industry, and impacts on land values.

2. THE PROPOSED DEVELOPMENT

2.1 Explanation of solar energy

Solar energy is energy created by the heat and light of the sun. Solar power is produced when this energy is converted into electricity or used to heat air, water, or other substances. Australia has the highest average solar radiation per square metre of any continent in the world. Despite uncertainty regarding energy policy, the Commonwealth and NSW Governments have recognized the need to supplement energy derived from fossil fuels with energy generated from renewable sources. Alternative energy supply may be sourced from solar photovoltaic, geo-thermal, solar thermal, wave and tidal action, and wind.

Australia has the highest average solar radiation per square metre of all continents and the NSW Government is committed to supporting the national Renewable Energy Target of 33,000 gigawatt hours by 2020.The NSW Government's Renewable Energy Action Plan notes that solar farms provide a range of social and economic benefits to the wider community and help to drive growth in regional communities through increased business during construction and operation. The plan states that additional benefits include:

- *Employment opportunities during construction, including engagement of local contractors and materials and service providers*
- *Long term local employment opportunities over the life of the project*
- *Contributions to local infrastructure improvements*
- *Education and training of contractors and local residents*
- *Reduced greenhouse gas emissions*
- *Increased energy security through a more diverse energy mix*
- *Rent received by local landowners from the developer.*

The development of solar photovoltaic power is well underway in NSW and across Australia. This growth in the local solar PV sector continues to provide a significant boost for Australia's regional economy with renewable infrastructure development estimated to create upwards of 2,300 direct jobs plus indirect employment.

According to the Australian Renewable Energy Agency (ARENA), the deployment of household solar PV that generates about 5kW is expected to continue and at the same time an increase in rooftop solar PV installations on commercial premises generating around (10-100 kW) is expected. Large scale solar PV is also rapidly expanding in Australia with several solar farms being constructed that will have the capacity to generate over 50MW.

The proposed Avisford Mini Sustainable Energy Park aims to fill the gap in the mid-sized plants. It will generate 5MW of AC power and contribute to renewable energy supply to supplement electricity generation from coal, oil and gas and assist to reduce reliance on these unrenewable sources of energy.

2.2 Description of the facility

The proposed Avisford Mini Sustainable Energy Park is a solar farm with a DC array capacity of 6.1MW and an AC output of 5MW to be located at Lots 460-464 DP 755434, 129 Old Mill Road, west of the town of Gulgong. The site is approximately 16 hectares in area and is used for an agricultural purposes.

The Avisford Mini Sustainable Energy Park is designed to generate in excess of 12.7 GWh of energy annually with the system offsetting almost 8.5 thousand tonnes of CO^2 equivalent emissions (Sources: *National Greenhouse and Energy Reporting (Measurement) Determination 2008 (Schedule 1)* and Department of the Environment and Energy). It will provide enough energy to power about 2,150 NSW homes. The solar farm is to connect to the 22kV which feeds into the Gulgong Zone Substation. Any power not consumed by the town would flow up stream to the Beryl substation.

During construction there is expected to be 50 personnel on site working from 7.00 am – 4.00 pm Monday to Friday. The construction is expected to take approximately three months. Once operational the site will be unmanned. Maintenance is expected to be carried out quarterly by a crew of two to three people.

The array is proposed to be placed along the five allotments that comprise the development site and would occupy most of these allotments. Power is to be distributed to the grid maintained by Essential Energy. The life of the solar farm is expected to be around 25 years. All components will be removed and the site will be rehabilitated in accordance with a decommissioning plan.

Further details of the proposed development are contained in the Statement of Environmental Effects and drawings submitted to Council with the development application.

3. THE COMMUNITY AND ECONOMY

3.1 The people

At the time of the 2016 Census of Population and Housing and based on a person's usual place of residence on Census night, there were 2,521 persons living in the state suburb of Gulgong. A state suburb is an approximation of the officially recognised boundary of localities outside of cities and larger towns. A map of the state suburb of Gulgong is given below. Gulgong is a centre within the local government area of Mid-Western Regional area which had a population of 24,076 persons in 2016. The population of the LGA is increased by 0.9% between 2011 and 2016 and is projected to increase by 8.1% to 26,000 in 2036.

Figure 1: The state suburb of Gulgong. Source: ABS

The median age was 41 years and the population was evenly split male and female. Almost 8% of residents were Aboriginal and/or Torres Strait Islander people. One third of residents possess tertiary educational attainment. Over 80% were born in Australia, with the same proportion being a couple family with or without children. The median weekly income for a family was $1,343, for a household was $1,086 and for an individual was $523. These figures are substantially less than for NSW and Australia, for example, the median income for a household in NSW was $1,780 and Australia was $1,734. Cultural diversity is limited in Gulgong with 37.4% of residents being of Australian ancestry, 30% English and 8.5% Irish.

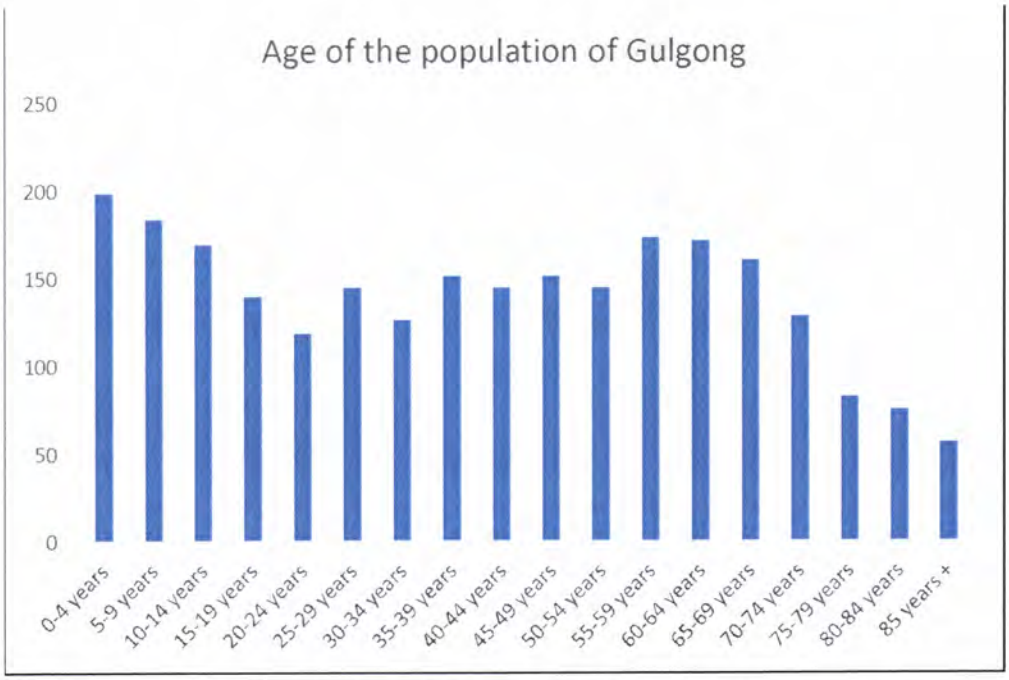

Figure 2: The age distribution of Gulgong. Source: ABS

3.2 Housing

There are a total of 1,025 private dwellings in the state suburb of Gulgong, comprising mainly separate houses at 90.3%. Medium density represents only 5% of dwellings. Just under 90% of private dwellings were occupied at the time of the Census leaving 109 dwellings unoccupied. Houses are generally large with around three-quarters of occupied private dwellings having three or more bedrooms.

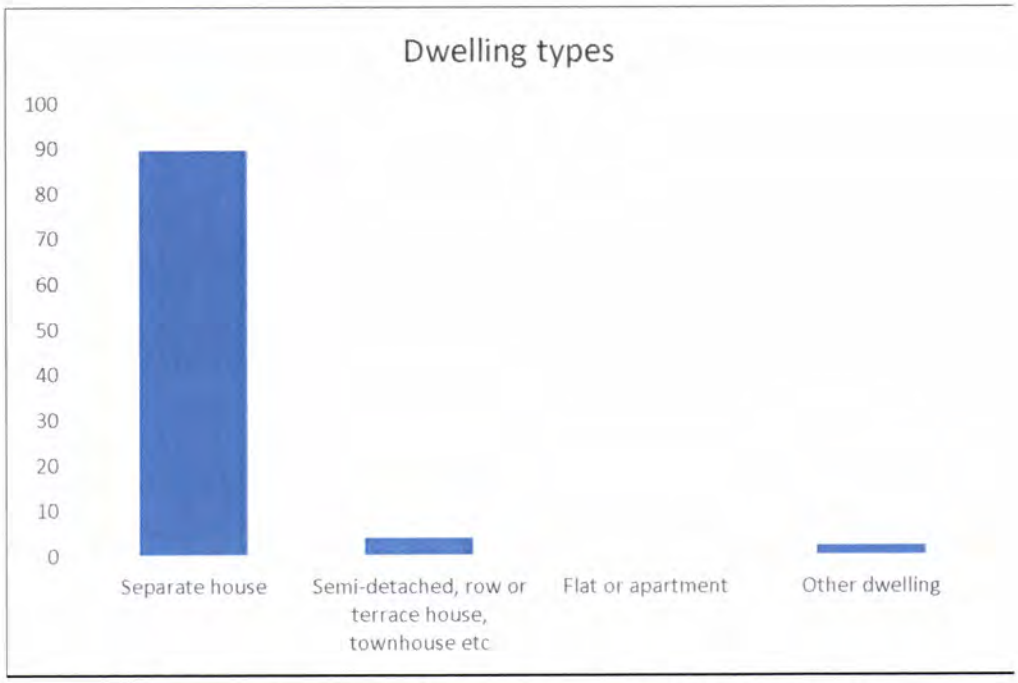

Figure 3: Dwelling types in the state suburb of Gulgong. Source: ABS

One-third of occupied private dwellings were owned outright and just under one-third were under mortgage. A total of 256 occupied private dwellings were rented.

Figure 4: Housing tenure in the state suburb of Gulgong. Source: ABS

The average number of people per household was 2.4 persons and two-thirds were family households with one-third single persons households. The median rent was $250 per week. The percentage of households suffering housing stress, i.e. where rental payments are greater than or equal to 30% of household income, was reported to be 12.4%. Median mortgage repayments were $1,517 per month and 5.2% of households make mortgage repayments greater than or equal to 30% of household income. Housing stress for renters is marginally less than for NSW at 12.9% but compares favourably for owners with a mortgage with NSW at 7.4%. The ABS notes that these estimates of housing stress may be overstated due to the means of determining an inputed income measure.

According to the website www.yourinevstmentpropertymag.com.au as at April 2019, the median house price for the urban area of Gulgong is $321,000 and weekly median adverted rent is $320.00. Gross rental yields are 5.07% and 5.91%.

3.3 Industry and employment

Over 44% of employed people aged 15 years and over worked 40 hours or more per week at the time of the 2016 Census. Under-employment or casual employment is high with nearly a quarter of the labour force working less than 24 hours per week. 53.8% of the labour force worked full time and 32.5% part time. Unemployment was high at 8.7% of the labour force.

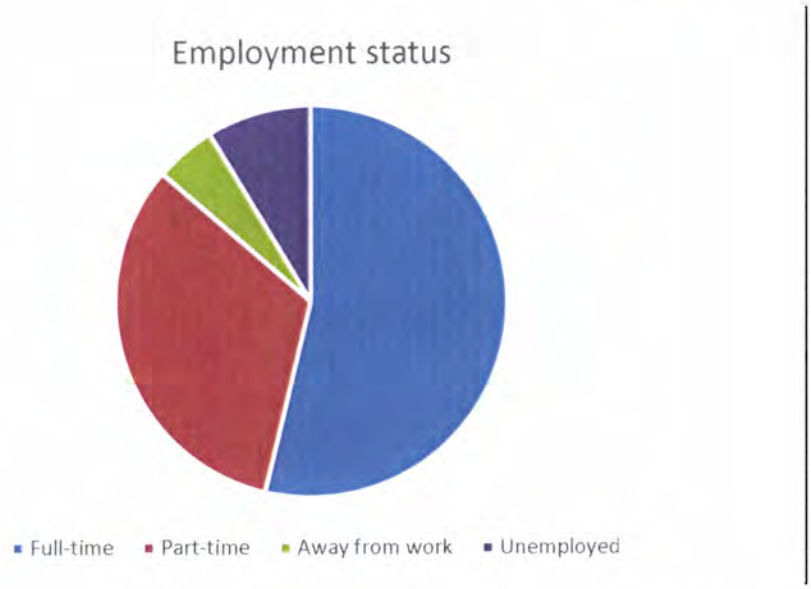

Figure 5: Employment status in the state suburb of Gulgong. Source: ABS

The main occupation of employed people in Gulgong was technicians and trades workers at 19.0%, followed by machinery operators and drivers at 17.0% and labourers representing 13.5% of employment.

Figure 6: Top responses to occupation in the state suburb of Gulgong. Source: ABS

The top response to industry of employment in the Census was coal mining with 19.2% of employed people.

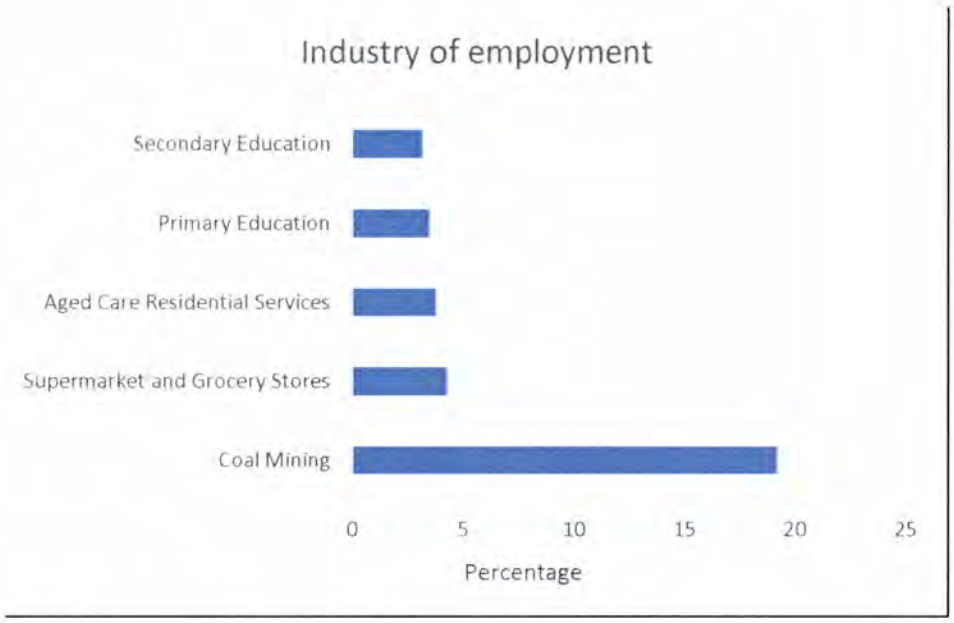

Figure 7: Top responses to industry of employment in the state suburb of Gulgong. Source: ABS

3.4 Short-term accommodation

Tourism is an important industry in the Central West region of NSW. Domestic visitors spent nearly 8 million nights in the region for the year ending December 2018, representing 10.2% of all visitor nights in regional NSW. Friends or relatives' property was the most popular accommodation type at 33.2% followed by a standard hotel or motor inn at 20.8% then caravan or camping at 9.6%. International visitors spent 915,000 nights in the Central West region or 6.1% of nights in regional NSW. Friends or relatives' property was the most popular accommodation type for international visitors to the region at 49.2% followed by rented house, apartment, flat or unit at 16.3%

The tourism website www.visitmudgeeregion.com.au contains details of visitor accommodation available in the Gulgong area. There is one bed and breakfast establishment, one holiday park, one hotel resort, three motels and one pub that are listed on this website giving a total of seven places offering short term accommodation. This data is for the town of Gulgong and does not include visitor accommodation in neighbouring rural localities or townships. In addition, there are accommodation places being offered through alternative means such as AirBnB and StayZ as well as establishments that do not advertise through the website.

Destination NSW issues a Tourist Accommodation Profile for regions which contains data for large-scale short-term accommodation establishments comprising hotels, motels and serviced apartments with 15 rooms or more. Data for the year ending Jun 2016 for Mid-Western Regional LGA indicates that there 10 establishments offering a total of 293 rooms operating during the 2015-16 financial year. The average occupancy rate for these establishments was 62.3% during that year, ranging from a low of 57.7% in the March quarter to 67.3% in the June quarter.

4. SOCIAL IMPACTS

The proposed Avisford Mini Sustainable Energy Park has the potential to affect on the availability of accommodation in the Mid-Western Regional area, the cohesion of the local community and on amenity such as through impacts on scenic quality and air quality, noise emissions and electromagnetic radiation, and traffic movements. Each of these is considered below.

4.1 Accommodation

If available, workers to assist with construction of the Avisford Mini Sustainable Energy Park are to be sourced locally from within the Mid-Western LGA. Local workers would come from the townships of Mudgee, Gulgong, Kandos and Rylstone as well as surrounding localities and be domiciled locally.

Should a worst case scenario eventuate where all 50 workers were sourced from outside Mid-Western LGA, short-term accommodation would need to be made found for the three month construction period. In this case 50 rooms or places would need to be provided.

Assuming the recorded occupancy rate of large-scale accommodation establishments during 2015-16 applies, there would be 197 rooms available during the most in-demand quarter of the year across the LGA. In addition there are seven places offering accommodation on the tourism website within the township of Gulgong.

If the occupancy rate is assumed to be similar to that for large-scale establishments, there would be an additional 4 vacant accommodation places available during the June quarter potentially offering multiple rooms.

Accommodation is limited in Gulgong, however, it is not unreasonable to expect workers to be accommodated in other towns such as Mudgee where visitor accommodation is plentiful. Travel time between Mudgee and Gulgong is only 25 minutes for those workers that do not utilise the bus transport to be offered to workers.

It is considered that the impact on available short-term accommodation would be modest and welcomed by tourism accommodation operators. It is noteworthy that there are also 256 occupied private dwellings being rented some of which may be available for a lease period of three months. The 109 unoccupied private dwellings recorded in the Census may also provide short-term accommodation through the unregulated disruptive market exemplified by AirBnB and StayZ.

The development is likely to also bring benefits to local retailers and cafes/restaurants through increased demand generated by additional employment opportunities and income. This would include outlets that are associated with visitor accommodation.

4.2 Social cohesion

New development, particularly of a type that involves renewable energy as a response to climate change, is likely to be divisive within any community in Australia today, in particular one that is highly reliant on the coal industry for employment.

There have been two surveys of attitudes towards the development of renewable energy in Australia both carried out in 2015 by the Office of Environment & Heritage in 2015 and the Australian Renewable Energy Agency. The OEH survey found that 92% of people surveyed in regional NSW support the use of renewable energy to generate electricity and 85% support more energy to be generated by renewable sources. These findings were consistent across all age groups and educational levels but support decreased to 84% if the solar farm is within the local region and to 78% if the solar farm is within 1 to 2 kilometres from where the respondent lived. Environmental benefits were identified but there are mixed views about the costs, reliability and efficiency of renewable energy. A small number of respondents objected to solar farms on the basis of environmental and visual impacts.

The ARENA survey found that three-quarters of persons surveyed felt that solar energy could be a significant source of power for Australia and assist to reduce greenhouse gas emissions. There was also high recognition of the contribution to local economies but disagreement about the visual impacts with an equal proportion believing that the solar farms have nil or a negative visual impact. Attitudes towards solar farms is variable and dependent on the availability of information.

Division in the Gulgong community has been evident since lodgement of the DA for the Avisford Mini Sustainable Energy Park through submissions to Council and media reports. This reflects the general range of attitudes across Australia towards this type of development and regarding ways to respond to changes brought about by climate change. Other reasons for objecting are visual impacts, loss of agricultural land and impacts on property values.

The impacts on visual and scenic amenity and on agricultural potential are addressed elsewhere in this report or the Statement of Environmental Effects. It is considered that, once constructed and operational, division will subside and the cohesion of the community of Gulgong will be restored after the contribution to the local economy is realised.

4.3 Amenity

Impacts of the proposed development on amenity are measurable through assessment on visual and scenic amenity, traffic generation, and noise, air quality and electromagnetic radiation emissions. Each of these has been considered in the Statement of Environmental Effects with the following findings:

Visual and scenic amenity

The character of the landscape near Gulgong is predominantly an open modified agricultural landscape that has been shaped by farming. It is gently undulating country with large expanses of flat land. There is relatively little extant native vegetation. The development site is cleared rural land on the western edge of the township of Gulgong. Structures within the vicinity of the site comprise rural farm dwellings set within primary production land uses.

The impact of the proposed Avisford Mini Sustainable Energy Park on landscape character has been assessed to be moderate. Screening is proposed comprising the planting of native shrubs endemic to the locality that will grow to approximately 2 to 2.5 metres in height. Until that vegetation reaches maturity, the works would be visible to motorists travelling along Old Mill Road in either direction. The works would also be visible to motorists travelling along the Castlereagh Highway, however, given proximity to the urban area, the speed limit and scattered trees within the road reserve on the approaches towards and away from town it is expected that acceptance of and adaptation to change will occur within a relatively short space of time following completion of works.

Traffic

The findings of the traffic assessment are that the proposed construction of the solar farm will not cause major long-term effects to the surrounding road network due to the need for minimal regular maintenance by a small number of staff. Construction traffic appropriately managed with a bus service for workers and out of peak hour deliveries to the site, combined with the construction of an appropriate site entry catering for B-Double access will ensure traffic impacts are minimised during the construction phase of the project.

Noise

The findings of the noise assessment are that construction noise levels have the potential to exceed relevant construction NMLs at some receptor locations depending on their proximity to construction activities and that operational noise levels satisfy the criteria for assessed receptors.

Operational noise predictions identify that relevant noise criteria would be satisfied at all receivers. The noise assessment demonstrates that road noise criteria will be satisfied at all receivers on the proposed transport route. Recommendations have been provided to minimise the potential noise impacts from construction, albeit of a temporary nature during the daytime construction period.

Air quality

Activities that disturb the earth's surface and that are carried out with the use of machinery have the potential to generate dust emissions. This may be exacerbated by wind exposure to an exposed ground

surface. The previous use of the land for farming may have involved regular tilling, sowing and harvesting that may create dust and impact on air quality. The current condition of the land is modified with pasture growth with some exposed soil surfaces.

The construction of the solar farm will not involve extensive earthworks and only excavation for footings for the array framework and ancillary structures will be carried out. Along with the delivery of materials using heavy vehicles, construction works may generate dust, however, once operational the change of use of the land from agricultural to solar photovoltaic electricity generation is expected to reduce particulate emissions and lead to an improvement in local air quality. Vehicle movements would be restricted to internal access roads and the majority of the site would be revegetated with grasses.

Electromagnetic radiation

According to the Australian Radiation Protection and Nuclear Safety Agency, which maintains continual oversight of emerging research into the potential health effects of the EMF exposure, there is no established evidence of health effects from exposure to electric and magnetic fields from powerlines, substations, transformers or other electrical sources, regardless of the proximity, causes any health effects. The location of the solar farm and the distance separation between nearby dwellings and the site mean that any impacts on health are mitigated.

5. ECONOMIC IMPACTS

5.1 Employment and expenditure

The Avisford Mini Sustainable Energy Park has a capital investment value of $6.6 million. It is anticipated that there will be 50 personnel directly involved in construction on site which is expected to take approximately three months. Varying levels of expertise will be required ranging from labourers to qualified electricians and project managers. Employment generation would assist to address local unemployment which is high at 8.7% of the workforce and the moderate level of underemployment experienced in Gulgong. As well as the construction phase, the proponent engages local professional services where available to assist in preparing studies and reports for the development application. Once operational, two to three personnel will be necessary to carry out maintenance every quarter or as required.

The development will bring direct economic benefits to the local economy through wages and salaries and indirect benefits through the need for accommodation and sustenance in the area for non-local employees. Flow-on effects would include rent payed for short-term or rental lease accommodation of construction workers, heavy vehicle firms with staff to load and deliver materials to the development site, and food and drink premises to provide sustenance to workers.

The skills required to be involved in the construction and ongoing maintenance of Avisford Mini Sustainable Energy Park may require some personnel to undergo further training and education, leading to an upskilling of the local workforce and enhanced employment opportunities generally. Another benefit to the community will be through an understanding of sustainable development and by gaining a commitment to greater reliance on renewable energy.

The solar farm may also be attractive to the tourism industry, particularly for visitors from metropolitan areas that are not able to view a solar farm. Viewing platforms and tours of windfarms are popular amongst urban visitors to rural areas as well as local schools. Innovative marketing may capitalize on the development and use it to attract visitors the region. Similarly, the clustering of solar power generation with the existing Beryl solar farm would bring regional economic development benefits as the Central West area gains a reputation as a suitable location for renewable energy and linked industries.

Multipliers are used to estimate the direct and indirect flow-on effects of income and employment generated by a development. However, generalized multipliers are no longer provided by the Australian Bureau of Statistics. The issue of multipliers has been discontinued because they were based on limiting assumptions that resulted in a biased estimation of the benefits or costs of a development project. These assumptions relate to the capacity of the local economy, ratios for inputs and production, response to changes such as pricing and household budget constraints. ABS considers the published multipliers unsuitable for small regions as they tend to overlook the need to import goods into the region and can overstate the impacts of a particular project. However, the flow-on effects to local business though income and employment will be

considerable. There will also be public benefits attributable to development contributions payable by the proponent that will be allocated towards upgrading and maintaining public services such as community facilities and local roads.

5.2 Change of use

According to the *Mid-Western Regional Comprehensive Land Use Strategy*, approximately 61% of land in the LGA is used for agriculture, comprising 2% for cropping, 57% for grazing, less than 1% for horticulture and less than 1% for intensive animal production. Power generation occupies less than 1% of rural land. The development site has a land capability class of 3. This indicates high capability land – land that has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive, readily available and widely accepted land management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental degradation (*The land and soil capability assessment scheme – A general rural land evaluation scheme for NSW, 2nd Approximation*, OEH). This land capability classification is reflected in the current use of the development site for livestock grazing rather than for cropping or viticulture.

Any reduction in the productivity or availability of agricultural land due to the solar farm would be minimal and temporary. It would be offset by the contribution that the solar farm will make to the local economy through direct and indirect employment and expenditure over the short term and through the benefits that renewable energy power supply will bring to the nation. The income derived by the land owner through leasing a portion of land for energy production can be put to improvements elsewhere that serve to increase agricultural production, or other land holdings. This is particularly important during times of drought and the rising costs of farm supplies. The lease income of the land holder may support the ongoing viability of farm operations elsewhere.

If necessary and practical in terms of security, the land surrounding panel arrays can continue to be used for farming purposes such as the cultivation of vegetables or the grazing of sheep during the operation of the solar farm. The grazing of sheep is to be trialled at a solar farm to be developed by IT Power (Australia) in Yoogali near Griffith that was granted consent by the Western Regional Planning Panel on 14 August 2019. An existing solar farm on the opposite of Irrigation Way at Yoogali is currently being used for the sheep grazing.

It is considered that the impact in terms of loss of productive agricultural land should be seen in the context of the impacts on farmland of other forms of power generation, for example, fracking for coal seam gas, and mining for coal and uranium as well as the infrastructure to support the processing of coal and gas. The arrays of solar panels and all above-ground and underground infrastructure can be removed once the facility is decommissioned and the land can be returned to full agricultural use. The development of a solar farm will create a new market for local contractors and diversify income for the land holder.

5.3 Land values

Property values are subject to prevailing market conditions at any point in time as well as location, amenity, lifestyle opportunities, and zoning and the range of land uses permitted. The impact of solar farm development on land values is a common point of objection. However, a recent study carried out by the LBJ School of Public Affairs at the University of Texas at Austin in May 2018 which involved a survey of land owners living in close proximity to solar farms found that the majority of respondents believed that proximity to a solar farm has either no impact or a positive impact on home values. There was some variation depending on the size of the facility and distance from the dwelling. Some features were also found to be associated with positive impacts, including where the land had previously been used for an unattractive or unappealing use, and where there are trees or other visual barriers around the array. The research concludes that incorporating vegetation to screen the visibility of solar panels helps to minimize any perceived negative impacts on property values.

Cohn Reznick, an American property valuation advisory service, have conducted several studies during 2018 into the effects of solar farms on the values of adjacent properties for facilities in the mid-west region of the US. Solar farms with a variety of output capacities and with residential dwellings in close proximity have been examined. The sale prices of these dwellings are compared with value trends in similar locations adjacent agricultural or residential uses. The basic premises of the analysis is that if there is any impact on property value due to proximity to a solar farm then this would be reflected in sale prices, conditions of sale and marketability. The studies have consistently found that there is no measurable difference in property values for properties adjacent solar farms compared to similar properties adjacent alternative land uses. The findings have been verified through consultation with real estate agents who claim there is not difference in price, marketing periods or demand for dwellings adjacent solar farms or adjacent an alternative use. The firm concludes that for proximity to a solar farm does not adversely affect property value in either the short or long term subject to compliance of the solar farm with regulatory standards that ensure nil affect on amenity due to noise, air quality, visibility and the like.

Prior to these studies being conducted the U.S. Department of Energy, National Renewable Energy Laboratory issued a statement to dispel myths regarding solar farms. The agency made the following statement regarding impacts on property values: *While the impacts of a solar farm on neighbouring property values have not been studied in-depth, numerous studies have found the impact of wind energy generation on neighbouring property values to be negligible. As solar farms do not have the same impacts as wind farms (i.e., PV facilities do not cast a shadow on neighbouring properties, cause light flicker, or have the same visual impact as wind farms), the impacts on property values caused by solar farms are anticipated to be less than the impacts of wind farms. Some communities have opted for mitigation measures to reduce visual impacts of solar farms through the use of vegetative screening or decorative fencing, since PV modules are usually mounted close to the ground.* (U.S. Department of Energy, National Renewable Energy Laboratory, www.nrel.gov/state-local-tribal/blog/top-five-large-scale-solar-myths.html)

6. CONCLUSION

6.1 Findings

The findings of this analysis of the potential social and economic effects of the proposed Avisford Mini Sustainable Energy Park are as follows:

Accommodation

Based on an occupancy rate of 67.3% the impact on available short-term accommodation, as listed in a tourism profile issued by Destination NSW and on a tourism website for the Mid-Western region, would be modest and welcomed by tourism accommodation operators. There are 256 occupied private dwellings being rented some of which may be available for a lease period of three to six months. The 109 unoccupied private dwellings recorded in the Census may also provide short-term accommodation through the unregulated market exemplified by AirBnB and StayZ. There would also be additional business generated by incoming workers for local retailers, food and drink premises and entertainment providers.

Amenity

The impact of the proposed Avisford Mini Sustainable Energy Park on landscape character has been assessed to be moderate. Given the character of the area, proposed screening of the facility with native vegetation, proximity to the urban area of Gulgong and the high speed limit for vehicles on the approach to town, it is expected that acceptance of the solar farm will occur within a relatively short space of time following completion of works.

Construction of the solar farm is not expected to cause any major long-term effects to the surrounding road network due to the need for minimal regular maintenance by a small number of staff. Construction traffic appropriately managed with a bus service for workers and out of peak hour deliveries to the site, combined with the construction of an appropriate site entry will ensure traffic impacts are minimised during the construction phase of the project.

It is expected that construction noise levels have the potential to exceed relevant construction noise management levels at some receptor locations when works are nearest to those locations. The exceedance would be temporary and of short duration. Construction noise will be reduced or possibly inaudible due to the masking noise from the Castlereagh Highway at some of these receptors. Operational noise predictions identify that relevant noise criteria would be satisfied at all receivers. The noise assessment demonstrates that road noise criteria will be satisfied at all receivers on the proposed transport route.

The use of machinery during construction has the potential to generate dust emissions which may be exacerbated by wind over an exposed ground surface. However, the construction of the solar farm will not

involve extensive earthworks and only excavation for footings for the array framework, cabling and ancillary structures will be carried out. Along with the delivery of materials using heavy vehicles, construction works may generate dust, however, once operational the change of use of the land from agricultural to solar photovoltaic electricity generation is expected to reduce particulate emissions and lead to an improvement in local air quality. Vehicle movements would be restricted to internal access roads and the majority of the site would be revegetated with grasses.

According to ARPANSA, there is no established evidence of health effects from exposure to electric and magnetic fields from powerlines, substations, transformers or other electrical sources, regardless of the proximity, causes any health effects. The location of the solar farm and the distance separation between nearby dwellings and the site mean that any impacts on health are mitigated.

Social cohesion

There may be short-term social impacts as the development of a source of renewable energy can be a divisive issue within the community, reflecting diverse attitudes about the broader issue of responding to climate change across the nation. However, resilient communities demonstrate adaption to and acceptance of change. It is expected that over the longer term the Gulgong community will embrace the positive contribution of the solar farm to the local economy.

Employment and expenditure

50 personnel are expected to be directly involved in construction on site which is expected to take approximately three months. Varying levels of expertise will be required ranging from labourers to qualified electricians and project managers. The development will bring direct economic benefits to the local economy through wages and salaries and indirect benefits through the need for accommodation, retail goods and sustenance in the area for non-local employees. Flow-on effects would include rent payed for short-term or rental lease accommodation of construction workers, heavy vehicle firms with staff to load and deliver materials to the development site, and food and drink premises to provide sustenance to workers. Once operational the site will be unmanned, however, two to three personnel will be necessary to carry out maintenance every quarter or as required. Technicians, tradesmen, machinery operators and labourers make up almost half of the workforce of Gulgong (49.5%) enabling most if not all workers to be sourced locally.

Change of use

Any loss of agricultural land would be minimal and temporary. Alternatively, the land may be used for ongoing agricultural operations including the grazing of sheep or the production of crops or flowers amongst panel arrays. The income derived by the land owner through leasing a portion of land for energy production can be put to improvements elsewhere that serve to increase agricultural production.

Land values

Comparative analysis studies carried out in the US have concluded that there is no measurable difference in sales values, demand or marketing periods for dwellings located in close proximity to solar farms when compared to dwellings located in similar locations adjacent alternative uses such as agriculture or residential. Subject to compliance with recommended measures to mitigate adverse impacts on local amenity there is not expected to be any negative effects on the values of properties located adjacent or in close proximity to the Avisford Mini Sustainable Energy Park.

In summary, the development of Avisford Mini Sustainable Energy Park will contribute to the local and regional economy and the community through direct and indirect employment and expenditure over the short term and through the benefits that renewable energy power supply will bring to the nation.

The solar farm will contribute to the electricity grid in a sustainable manner that reduces greenhouse gas emissions and will assist the transition of our economy from reliance on fossil fuels to renewable sources to decarbonise electricity production in line with Commonwealth and NSW Government targets.

6.2 Recommendations

The following recommendations are made to mitigate any adverse social and economic impacts:

- Labour to construct and operate the solar farm be sourced from within Mid-Western Regional area wherever possible. Advertisements should be placed in local print media to gauge interest in employment,
- Goods and services, such as oils, portable water and effluent facilities, and transport of equipment, required to construct and operate the solar farm should be sourced locally wherever possible,
- Construction be carried out during the off-peak or shoulder tourist season to prevent any potential shortage in short term accommodation,
- Information about the benefits of renewable energy, and in particular solar farms, be disseminated in Mid-Western Regional area through print media,
- Opportunities to continue livestock grazing of the development area once the solar farm is operational be investigated, and
- Mitigation measures identified in the Statement of Environmental Effects in relation to amenity impacts be implemented.

STATEMENT OF HERITAGE IMPACT

Residence, Caledonian Street

Proposed works: Avisford Sustainable Energy Park

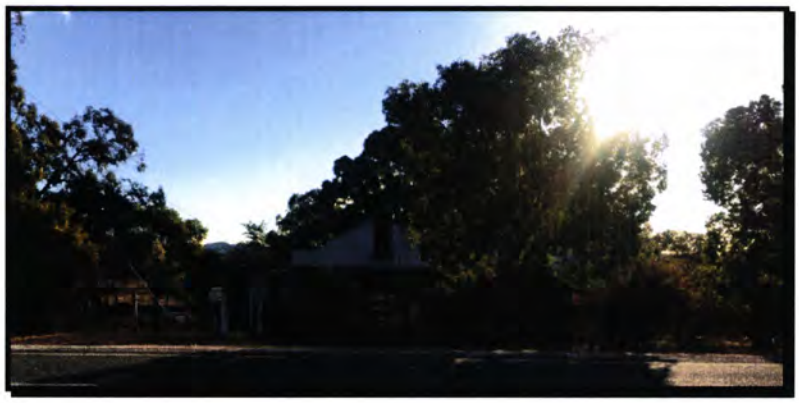

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TABLE OF CONTENTS

Document Details & History

Project number	0619
Project title	Proposed works – Avisford Sustainable Energy Park
Document title	Statement of Heritage Impact
Client	IT Power (Australia) Pty Ltd
Author	Allen Grimwood, Director
Qualifications	Bachelor of Arts (Honours) UNSW Master of Urban & Regional Planning, USyd
ABN	Zenith Town Planning Pty Ltd 11 624 467 349
Version	Draft 16 August 2019
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The report has been prepared using information supplied by the client and other stakeholders. All care is taken to ensure the accuracy and veracity of this information, however, no responsibility is accepted for the interpretation of that information by end users.

1. INTRODUCTION

1.1 Purpose and scope

This statement has been prepared to assess the impact of works proposed by IT Power (Australia) Pty Ltd on the heritage values of a residence located in Caledonian Street, Gulgong. The works comprise the Avisford Sustainable Energy Park at Old Mill Road, Gulgong. The statement responds to a request for additional information by Mid-Western Regional Council dated 27 June 2019 regarding DA 0283/2019. It also contains an assessment of the potential impact of the proposed development on the heritage significance of the character of Gulgong generally.

Council's request for a heritage impact assessment is as follows:

A Heritage Management Document, in the form of a Heritage Impact Assessment, shall be prepared by a suitably qualified Heritage Consultant and submitted to Council which shall comprehensively address and consider Clause 5.10 and Schedule 5 of the Mid-Western Regional Local Environmental Plan 2012. The Assessment should specifically assess the extent to which the carrying out of the proposed development (including the 2.1 m high chain and barbed wire fencing proposed at the boundary of the site) would affect the heritage significance of the Local Heritage Item - 1222 located within the vicinity of the subject site.

The statement has been prepared having regard to the principles of *The Australia ICOMOS charter for the conservation of places of cultural significance*. Otherwise known as *The Burra Charter*, the charter includes principles to guide the conservation, maintenance, restoration and adaptation of heritage items.

All information referenced in this Statement has been sourced from publicly available documents or websites. The findings of this report are based on the information contained in those documents and websites.

1.2 The property

The site of the proposed Avisford Mini Sustainable Energy Park is described as Lots 460-464 DP 755434, No 129 Old Mill Road, Gulgong, NSW. It is located approximately 1.8 kilometres west of the town centre of Gulgong at the nearest point.

The site has been fully cleared in the past for agricultural use other than a single eucalypt tree straddling the boundary of Lots 461 and 462 adjacent Old Mill Road and a farm dam. The topography is flat and there are no structures on the site other than two small dams.

The site and surrounding countryside is generally flat with gentle undulations and is predominantly agricultural with scattered farm dwellings. An unused rail cutting runs parallel to the southern boundary between the development site and the Castlereagh Highway. This rail corridor is known as the 'Sandy Hollow – Maryvale Railway' and was commenced during a job creation scheme during the Great Depression. A vegetation restoration project has commenced on Crown land to the west of the development site.

1.3 Legislative and policy framework

1.3.1 Australian Heritage Places Inventory

The Caledonian Street residence is not listed on the *Australian Heritage Places Inventory* of the National Estate maintained by the Commonwealth Department of the Environment. One property within the township of Gulgong is listed on the inventory. This is the former Gulgong Opera House at 99 Mayne Street.

Gulgong Conservation Area is also listed in the *Australian Heritage Places Inventory*. The conservation area encompasses an area of 39 hectares surrounding the town centre bounded by Lynne Street to the north Nandoura Street to the east, Fitzroy Street to the south, north end of Bligh Street and Wynella Street to the west. The western boundary of the conservation area at the intersection of Wynella Street and Lynne Street is approximately 885 metres from the eastern edge of the development site.

1.3.2 National Trust Register

The Gulgong Conservation Area was listed in the *National Trust Register (NSW)* in 1981. The conservation area extends to an approximate radius of 950 metres from the centre of the town and is within the area bounded by the railway lines to the north, Caledonian Street to the west, a line running east-west near the cemetery on Medley Street and the road on the east of Flirtation Hill. Although the listing on the *National Trust Register (NSW)* is not statutory, it validates the heritage values of the township and its significance to the people of NSW and Australia.

1.3.3 Mid-Western Local Environmental Plan 2012

There are 172 properties in and around the historic town of Gulgong listed as heritage items in *Schedule 5 Environmental heritage* of *Mid-Western Local Environmental Plan 2012*. All of these properties are listed with local heritage significance other than the former 'Railway Station and stationmaster's house group' (item 349) located in Saleyards Lane and "Hobsons Shops Golden West Trading Post" and house (item 242) located in Herbert Street which are listed with state significance. Two further items are of state significance and listed in the State Heritage Register. These are 'The Greatest Wonder of the World and American Tobacco Warehouse and Fancy Goods Emporium' in Mayne Street and the 'Gulgong railway bridge over Wialdra Creek'. *Mid-Western LEP 2012* has yet to be amended to change the level of

significance from local to state for properties in Mayne Street. The Gulgong railway bridge does not appear to be listed in Schedule 5.

The residence at Caledonian Street is listed as Item No. 122 in Schedule 5. This item in Caledonian Street is located approximately 775 metres east of the development site.

The Gulgong Heritage Conservation Area is also listed with local significance in *Schedule 5*. The nearest point of the conservation area to the development site is over 900 metres east along Queen Street.

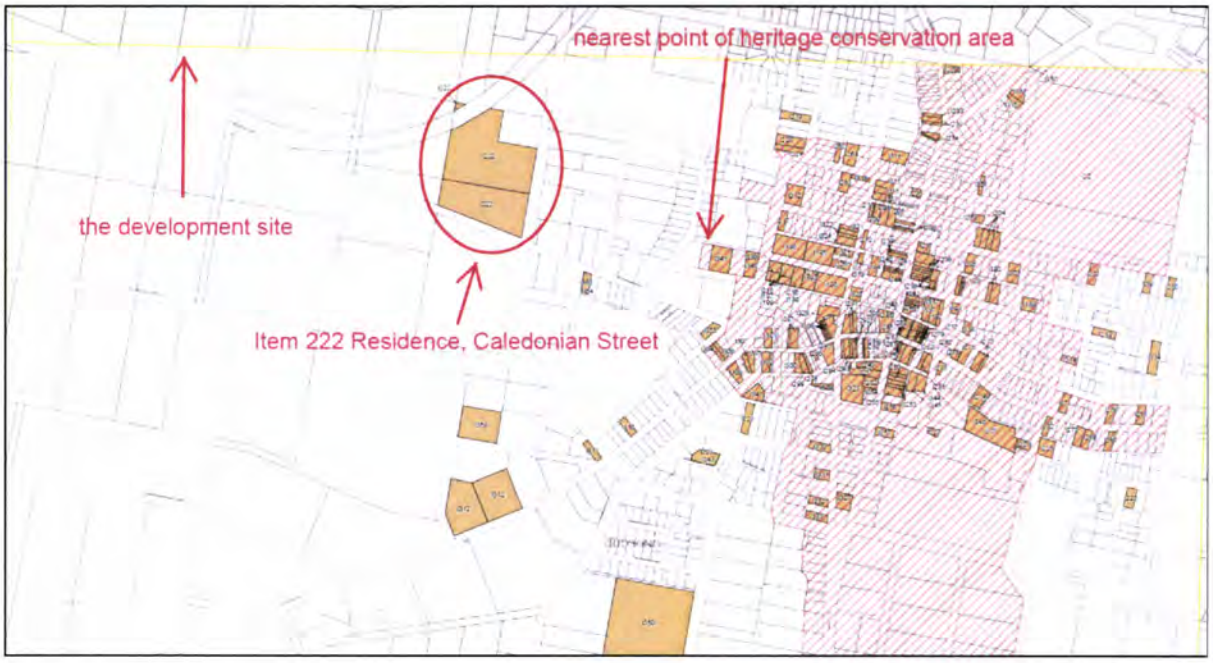

Figure 1: Extract from Heritage Map Sheet HER_005C showing properties listed as heritage items in Mid-Western LEP 2012 and the heritage conservation area hatched red

Clause 5.10 Heritage conservation of *Mid-Western LEP 2012* applies to these items, buildings and structures within the conservation area and to development within the vicinity of a heritage item. The relevant objective of clause 5.10 is *to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views.*

Clause 5.10 (5) enables a consent authority to require that a heritage management document be prepared for development in the vicinity of a heritage item or heritage conservation area, that assesses the extent of effects on heritage significance. As requested by Council, this statement has been prepared in accordance with clause 5.10(5) to assess the extent to which the proposed development would affect the heritage significance of the residence in Caledonian Street.

2. HERITAGE SIGNIFICANCE

2.1 Brief history of Gulgong

Below is a brief history of the settlement of Gulgong. This is based on information contained in the *Gulgong Conservation Study* by Perumal, Wrathall & Murphy Pty Ltd dated October 1982.

The First Nation people of the Mudgee-Gulgong area belonged to the Wiradjuri Nation, which extended from the Blue Mountains in the east to the Lachlan and Murrumbidgee rivers in the west, with the Murray River forming the southern border and the Wellington plains and hills the northern border. The Mowgee clan extended over a 50km radius and settled around the Cudgegong River which provided food, and water. Local districts were named after the Wiradjuri tribal areas, including Mudgee which means *nest in the hills* and Gulgong meaning either *a gully* or *deep waterhole*.

The first European to arrive in the Mudgee area was James Blackman who crossed the Cudgegong River in 1821. The first land grant in the area was to Richard Rouse in 1825 and his two sons established cattle stations. William Lawson also took up 6,000 acres along the Cudgegong River, followed by George and Henry Cox who established the 'Menah' run, 3 km north-west of the present township of Mudgee. Sir Thomas Mitchell surveyed the area in 1831. Following the discovery of gold at Hargraves in 1851, prospectors arrived and settled in the Gulgong area. A further discovery at Red Hill in 1870 lead to the establishment of the settlement of Gulgong. Of note is that the famous poet and novelist, Henry Lawson, lived in the town for a short time during the late 1800s.

The population rose and fell during the gold prospecting times. The majority of buildings erected during this time were of slab construction with pine board and bark facings. Permanent occupants turned to agriculture following the gold rush and built dwellings and commercial buildings of timber or brick. The railway arrived in 1909, electricity was provided in 1923 and town water was supplied in 1933.The town went from being characterised by wooded buildings to fibre-cement in the mid-20th century to brick veneer and tile. It is now reliant upon tourism, agriculture and employment at nearby coal mines at Ulan, Moolarben and Wilpinjong.

2.2 The character of Gulgong

According to Perumal, Wrathall and Murphy, there are eight basic styles of architecture in Gulgong most of which are contained with the relatively dense and unified town centre. These are:

- Australian Georgian workers' and miners' cottages and weatherboard houses,
- Australian Georgian brick and stone houses,
- Federation style weatherboard cottages,
- Federation style brick and stone houses,
- Hotel architecture,
- Early commercial buildings,

- Civic buildings, and
- Ecclesiastic buildings.

Various elements of the town such as building groups and spaces between buildings, contribute to the views and vistas across the surrounding countryside. In addition, street furnishings, fences, hoardings, paving, hitching posts and verandahs contribute to the streetscape of the inner area.

The historic part of Gulgong has developed a pattern based on topography with roads following contours. Older urban areas respect landform and take advantage of vistas and views with landmark buildings that contribute to character. It is this historic urban core that is listed as a conservation area in the Australian Heritage Places Inventory and Mid-Western LEP 2012.

More recent development is in contrast to the character of the inner core with residential subdivisions having being developed along a grid pattern and the scattered development of recreational, institutional and industrial uses. This has compromised the character of the town outside the historic centre which now includes a mix of residential architectural styles on varying allotment sizes, and industrial development typical of many NSW country towns on the northern side with little remaining vegetation and scattered signage, hard stand and utilitarian structures.

Rural land surrounding the periphery of Gulgong township is characterised as predominantly an open modified agricultural landscape that has been shaped by farming. It is gently undulating country with large expanses of flat land. There is relatively little extant native vegetation. There are a mix of rural uses in addition to agriculture including extractive industries, the Beryl solar farm and infrastructure such as the arterial road and electrical power lines.

2.3 The significance of the residence, Caledonian Street

A description and statement of significance is provided below for the residence located in Caledonian Street, Gulgong (Item 222). Information has been sourced from the State Heritage Inventory sheet for database number 2070222 which in turn has been sourced from the *Gulgong Conservation Study* by Perumal, Wrathall & Murphy Pty Ltd.

The building is described as an early 20th century brick house and outbuilding. Modifications are a new machinery storage shed for which a construction certificate was issued in 2001. The study recommends that the building be maintained and the corrugated iron roof be restored, citing that an old iron roof is probably under the new roof. A photograph of the building taken in 1980 showed that the roofing had been replaced with tiles, however, that roof has since been replaced with corrugated iron.

The inventory sheet contains a condition assessment of elements of the building which were either good or very good at the time the study was prepared.

The inventory sheet is generally scant on detail but does contain a description of the residence as being of interesting architecture with aesthetic details including finials, decorative air vents, decorative woodwork on verandah posts, door and windows detail such as fanlights, and interesting brickwork or stone construction. Reference to the grounds is simply the *scale and quality of planting; suggested improvements*.

The inventory sheet does not contain a statement of significance, however, the residence can be described as being significant to the township of Gulgong as a remaining example of Australian Georgian architecture, albeit with elements of other stylistic categories, in a rural setting.

The residence is located on Lot 2 DP 607166 although aerial image on SIX Maps indicates that it may straddle the boundary of Lot 3 DP 1107097. Both Lots 2 and 3 comprise a rural property and are mapped as heritage item 222 in Schedule 5 of Mid-Western LEP 2012. There are six other buildings on the property, all located on Lot 3.

The aerial image below shows the positioning of buildings on the property and the approximate curtilage of the residence which comprises a one hectare area within which the garden and tree plantings are located. Fencing encloses a small area that immediately surrounds the residence within the larger curtilage. Unusually, the entrance to the residence is off a south-facing verandah with the eastern side wall facing and parallel to Caledonian Street.

Figure 2: The residence, curtilage and property boundary of Item 222. Source: SIX Maps

3. HERITAGE IMPACT ASSESSMENT

3.1 Proposed works

The proposed Avisford Mini Sustainable Energy Park is to be located at 129 Old Mill Road, west of the town of Gulgong. The site is approximately 16 hectares in area and has been used for an agricultural purpose. It is now vacant. The solar farm with a DC array capacity of 6.1MW and an AC output of 5MW. It would be capable of generating 12,700MWh annually.

Visible above-ground elements of the proposed Avisford Mini Sustainable Energy Park comprise the panels and supporting frames, two invertor stations, the internal site access track, security fencing and landscaping. Each of these elements is described below.

a) The panels and supporting frames

There are proposed to be approximately 16,000 solar modules installed in rows comprising 84 modules of 88.6 metres long and 2 metres wide, and 56 modules being 60 metres long and 2 metres wide. There is approximately 5.7 metres spacing between each row. Each row of PV modules will rotate to track the sun across the sky from east to west each day. The hub height of each tracker is 1.6 metres with the peak of the modules reaching an approximate height of 2.5 metres when the array is fully tilted to 60 degrees from horizontal, i.e. in the early morning and late evening.

b) Two invertor stations

Two 2.5 MW AC inverter stations will be installed at the solar farm. These inverters are to be located within the array and are each mounted on a 6 metre long skid.

c) The internal site access track

Vehicle access to the site would be by way of the existing driveway entrance located at the centre of Lot 461 off Old Mill Road adjacent the existing dam. A 5 metre wide unsealed track would run around the perimeter and through the centre of the arrays to enable access within the development for construction and ongoing servicing. Internal access ways would not be sealed but would be layered with gravel sourced locally.

d) Security fencing

The panel arrays are to be enclosed within a 1.8 metre high security fence set within the boundaries and 3 metres from each boundary. The arrays would be setback a further 7 metres from the security fence. The proposed fence is to be green coated chain mesh steel topped with three rows of barbed wire giving a total

height of 2.1 metres. All landscaping is proposed to be carried out on the outer side of the fence, i.e. between the security fencing and the property boundaries. Consideration has also been given to placing shade cloth on the fence to provide additional screening.

e) Landscaping

Landscaping is proposed around the eastern, northern and southern perimeter of the site after installation of the panel arrays to provide a visual screen for the occupants of nearby rural dwellings as well as motorists travelling along Old Mill Road and the Castlereagh Highway. Landscaping is not proposed along the western boundary as the adjoining allotment is existing bushland. An existing native eucalypt tree and dam that are located alongside the main vehicle access are to be preserved.

It is proposed to plant native shrubs endemic to the Gulgong locality that will grow to a maximum height of 2 to 2.5 metres and to provide 5 metres separation between each plant. Land that is disturbed during construction of the solar farm and not to be used for access or other maintenance purposes will be sown with native grasses following completion of construction. Planting will also assist to minimise site disturbance and contribute to the rural landscape and character of the Gulgong area.

3.2 Potential impacts

Visual

The visual impact of the proposed Avisford Mini Sustainable Energy Park on the character of the rural landscape surrounding Gulgong has been assessed in the visual assessment prepared for the proposed development. The impact was found to be moderate based on the magnitude of works and the sensitivity to change of surrounding properties including the public domain.

Components of the solar farm, including the panels, invertors and security fencing, would be temporarily visible to motorists travelling along Old Mill Road in either direction until such time as the landscaping plantings have reached maturity.

The works would also be temporarily visible to motorists travelling along the Castlereagh Highway, however, given the 100 kilometre per hour vehicle speed limit and scattered trees within the road reserve on the approaches towards and away from town it is expected that acceptance of and adaptation to change will occur within a relatively short space of time following completion of works.

The growth of native shrubs to a maximum height of 2.5 metres will completely screen all components of the solar farm. It is considered that any impacts on the public domain and rural landscape would be temporary and nil after landscape plantings reach maturity.

The development site and proposed solar farm would not be visible to the buildings and structures within the Gulgong Conservation Area as listed in Schedule 5 of Mid-Western LEP 2012 which extends west to include properties along Queen Street, the nearest of which is approximately 900 metres from the nearest points of each property.

Again, the landscape plantings along the eastern boundary of the development site will reach 2.5 metres at maturity completely screening elements of the solar farm, including the security fence, from the nearest buildings and places within the urban area. It is considered that there would be negligible to nil impact on the character of the township as the development would add to the diversity of surrounding area and the proposed landscaping would contribute to the rural setting.

The photomontages below indicate the gradual screening of the development as vegetation plantings reach maturity. The photomontages indicate views towards the solar farm when heading towards the town of Gulgong along Old Mill Road. This is indicative of all viewing angles towards the solar farm as screening is proposed on three sides – north, east and south.

A photomontage has not been prepared to indicate the impact of shade screen placed on the security fence as this not proposed as part of the development. It has been suggested in the Statement of Environmental Effects that Council may consider this as an effective screening mechanism and impose a condition of consent requiring that shade screening be placed on the fence until such time as plants reach maturity.

Plate 1: The solar farm and security fencing before screen planting

Plate 2: The solar farm and security fencing after initial screen planting

Plate 3: The solar farm and security fencing with screen planting approaching fence height

Plate 4: The solar farm and security fencing with mature screen planting

The Caledonian Street dwelling

The heritage-listed residence on Caledonian Street is surrounded by mature vegetation comprising a mix of native and exotic trees and shrubs. This vegetation is shown in the following photographs that have been taken from the western, northern, southern sides of the building.

The development site is approximately 770 metres from the residence at the nearest point. The site is approximately 565 metres from the north-western corner of Lot 2 and about 715 metres from the curtilage of the residence being the extent of surrounding vegetation. The photographs demonstrate that there is no visual connection between the heritage item and the development site. The proposed solar farm would therefore not impact adversely on the heritage significance of this property due to visual impact.

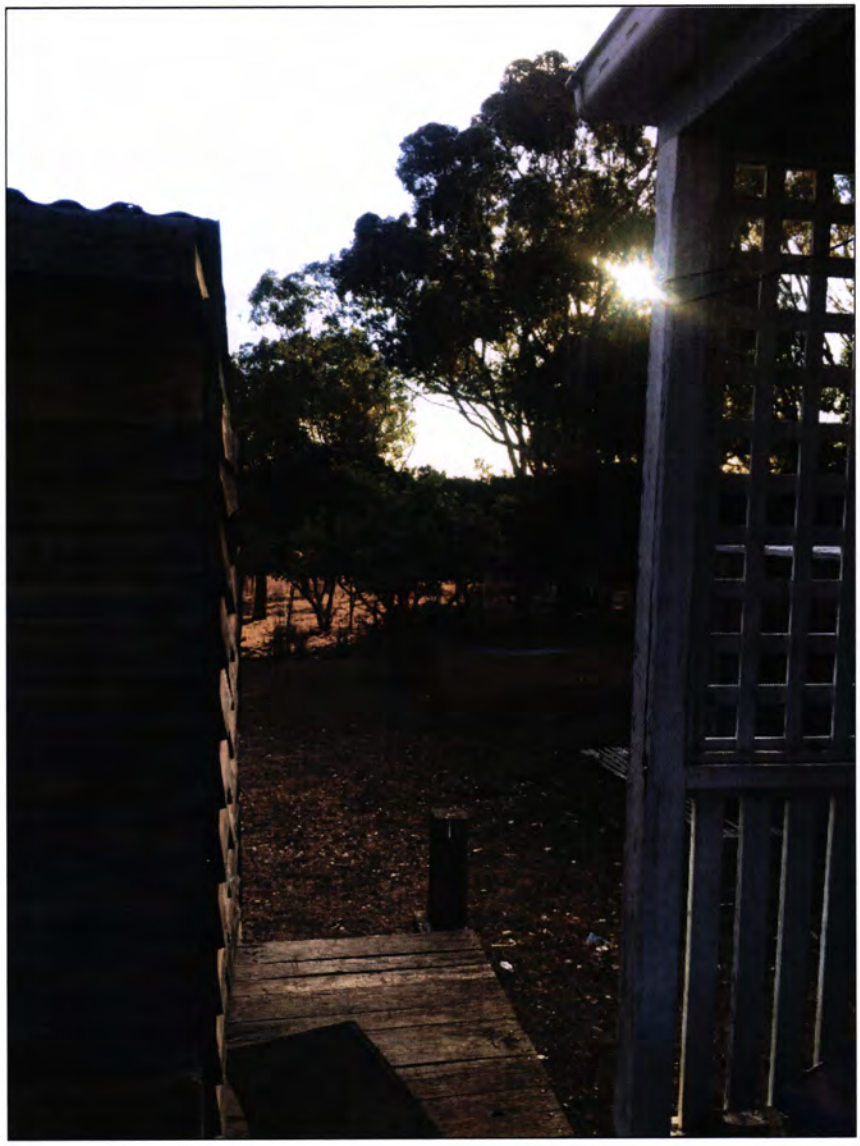

Plate 5: Looking west from the residence in Caledonian Street towards the development site

Plate 6: Looking south from the residence in Caledonian Street towards the Castlereagh Highway

Plate 7: Looking north from the residence in Caledonian Street towards Old Mill Road

Design

Components of the solar farm have been carefully selected to be efficient, non-reflective and visually acceptable. The panels and security fencing are the most apparent elements. Internal access ways will have the appearance of farm tracks. Inverters will be located within the arrays of panels and not be easily seen from the perimeter of the site. The layout of components is designed to optimize absorption of solar radiation. Generous setbacks to the fencing and landscaping are intended to maximise security and screening. There will be impacts on Old Mill Road and the Castlereagh Highway due to the temporary visibility of the components. Visibility will fade over time as the vegetated screening reaches a mature height of 2.5 metres at which time the visibility will be minimised.

The size, bulk and scale of components of the proposed solar farm and the impact of the land use for renewable energy generation would not impact on the heritage significance of the residence in Caledonian Street due to distance separation. The layout and the size, mass and bulk of components of the solar farm would not be visible to the residence from the commencement of construction through to the operational phase with mature vegetative screening.

It is not recommended that any alteration to the design of Avisford Mini Sustainable Energy Park be made to reduce impacts on heritage values.

3.3 Conclusion

The findings of this Heritage Impact Statement are that the proposed Avisford Mini Sustainable Energy Park will not detract from the character of the township of Gulgong or the surrounding rural landscape. Nor will the solar farm impact on the nearest heritage-listed building being the residence in Caledonian Street (Item 222 in Schedule 5 of *Mid-Western LEP 2012*).

It is acknowledged that components of the solar farm would be able to be seen from Old Mill Road, the Castlereagh Highway and neighbouring rural properties during construction and up until vegetation screening reaches maturity albeit to a decreasing degree. All new development is visible and inevitably has a level of visual impact. In this case the impact is considered acceptable.

Given the proposed landscaping with native shrubs to grow to a height of 2.5 metres to screen all components of the development, there would be negligible impact of the completed and operational solar farm on the rural landscape surrounding the western edge of Gulgong when viewed from the approaches to the township. Once shrubs have reached maturity the only impact would be that the development site appears to have been returned to a vegetated property. This would not adversely affect the heritage significance of the township of Gulgong or its rural setting and would be consistent with *Article 8 Setting* of the conservation principles of *The Burra Charter* which states *conservation requires the retention of an appropriate visual setting and other relationships that contribute to the cultural significance of the place.*

New construction, demolition, intrusions or other changes which would adversely affect the setting or relationships are not appropriate.

The nearest items to the site other than Item 222 are a dwelling located at 2 Cainbil Street (item 218) within the urban area of Gulgong that is some 1.4 kilometres to the east at the nearest point to the site, and "The Lagoon" Homestead (item 391) located on the Castlereagh Highway 1.2 kilometres to the north-west of the development site. Neither of these properties are considered to be 'in the vicinity' of the development site and subsequently their heritage significance will not be impacted by the development.

Section *6 General Recommendations* of the *Gulgong Conservation Study* includes the following recommendations regarding energy conservation:

1. *Efforts should be made to actively promote and display energy conservation measures to highlight the benefits and reasons for conservation*
2. *Support should be given to existing community initiatives in energy conservation and new initiatives encouraged*
3. *An energy statement or energy design concept should be required to accompany all major development and subdivision applications*
4. *Council staff should be versed in the principles and practice of energy efficient planning and design*
5. *A local energy policy should be developed, promulgated and implemented. Development of an energy-efficient town would have many local benefits as well as setting an example for other towns to follow*
6. *Building renovation advice on energy conservation measures should be provided to those seeking assistance. Care must also be taken to ensure that energy saving proposals (e.g. solar roof heaters) do not undermine the historic and architectural integrity of existing buildings*

Although drafted in 1982, these recommendations are all the more relevant today given that climate change is already impacting upon rainfall and hence the arability of agricultural areas and diminishing supplies of potable water for townships. It is noted that these recommendations have been taken up by a number of households within the township where property owners have installed PV panels on roofs to reduce energy costs and greenhouse emissions. The development of the Beryl solar farm also implements these recommendations. It is considered that the proposed Avisford Sustainable Energy Park clearly implements these recommendations but not at the expense of heritage significance. Being a working energy farm it will serve to promote and display an alternative means of energy production at a town scale powering up to 2,150 homes and set an example of the progressive attitudes of Gulgong township.

Zenith
TOWN PLANNING

REFERENCES

Australian Heritage Places Inventory, Commonwealth Department of Environment & Energy, http://www.environment.gov.au/apps/ahpi/about.html

National Trust Register, National Trust (NSW), https://www.nationaltrust.org.au/nsw/

Gulgong Conservation Study, Perumal, Wrathall and Murphy Pty Ltd, October 1982

Mid-Western Local Environmental Plan 2012, https://www.legislation.nsw.gov.au/#/view/EPI/2012/374

State Heritage Inventory, NSW Office of Environment & Heritage, https://www.environment.nsw.gov.au/

The Burra Charter, Australia ICOMOS Inc, 2000

MUDGEE
LOCAL ABORIGINAL LAND COUNCIL

Allen Grimwood
PO BOX 591
Moruya NSW 2537

5/8/19

RE: Clearance Letter – 129 Old Mill Road Gulgong, NSW 2852

Dear Allen,

On behalf of the Mudgee LALC I would like to thank you for consulting with us regarding your proposed development of a Solar farm on 129 Old Mill Road Gulgong NSW 2850.
Lot 460-464 DP 755434

Following a review of the Aboriginal Cultural Heritage Assessments previously conducted in the vicinity we can advise you that whilst there are Aboriginal sites recorded nearby there are none identified as being potentially impacted by your development.

The Mudgee Local Aboriginal Land Council has no problem with the development proceeding.

If you have any queries or require any further assistance please do not hesitate to contact our office.

Yours Sincerely,

T. Lonsdale

Tony Lonsdale
CEO
Mudgee LALC

Mudgee Local Aboriginal Land Council
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