Barnawartha North Solar Farm

Agricultural Impact Assessment

Bison Energy (BE Pro BWN P/L)

10 January 2023

Project name	Agricultural Impact Assessment						
Document title	Barnawartha North Solar Farm | Agricultural Impact Assessment						
Project number	12584019						
File name	12584019_Barnawartha North Solar Farm_Agriculture.docx						
Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
			Name	**Signature**	**Name**	**Signature**	**Date**
S3	A	P.Dellow	S Hoban S Dahl		S Hoban		07.12.22
S4	0	P.Dellow	S.Hoban		S.Hoban		10.01.23
[Status code]							
[Status code]							
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Contents

Table index

Figure index

Appendices

1. Introduction

1.1 Purpose of this report

BE Pro BWN P/L (Bison Energy) is proposing to develop a 5MW solar energy facility at Council property number 310902 Murray Valley Highway, Barnawartha located in the Wodonga Local Government Area (LGA). As part of the project planning, GHD Pty Ltd was engaged by Bison Energy to consider the elements of the site's agricultural land status and the potential issues surrounding conversion to a solar renewable energy facility. This agricultural impact assessment (AIA) considers the sites agricultural capability, the regional implications of removing agricultural land use from the site and provides commentary on whether the proposed facility can co-locate with other agricultural activities.

1.1.1 Proposal site

The proposal site is located approximately 9.3 kilometres north-east of Barnawartha at the intersection of the Murray Valley Highway and Margerys Road and comprises a rectangular property with a width of 400 metres, a length of 580 metres and a total area of approximately 22 hectares. This area includes a larger footprint than what would be required for the solar facility.

The site is located on private freehold property and contains a single allotment (SPI 10~29\PP2076 Parish of Barnawartha North). There is a second allotment adjacent to the subject site on the eastern boundary with an area of 29 hectares. The proposal site has generally been used for extensive livestock grazing (predominately beef cattle). Surrounding land use to the north and east is similar to the proposal site, while land to the south and west is used for the Wodonga TAFE, a driver training facility and Northern Victoria Livestock Exchange (NVLX) regional livestock saleyards respectively. Further detail of the site is included in later sections of this report.

In this report, there is reference to both the proposal site and the study area. The proposal site refers to the entire property required for the solar renewable energy facility, shown in Figure 1. The study area refers to the Wodonga LGA.

1.1.2 Proposed solar facility development

The proposed site layout includes tracking panels, spanning across approximately 12.5 hectares of the site. Once the panels are outside the range of the sun for the day, they will rest in their evening position of 60 degrees and will not backtrack until just before sunrise. The facility would have 5MW power generation capacity and would include one power station unit and a battery storage unit.

In addition to the proposed solar energy facility, existing native vegetation and farm dams would be retained and vegetative screening would be planted as a screening buffer adjacent to public roads.

The site was selected due to its proximity to two 22kV overhead powerlines and the location of an 11kV to 22kV network switch adjacent to the Murray Valley Highway. This minimises the need for additional transmission infrastructure and associated impacts to connect the project to the power network.

1.1.3 Methodology

GHD was engaged to assess the suitability of the land for the proposed solar facility and to conduct an agricultural impact assessment. This report has been compiled based on information obtained through a desktop investigation and a site inspection which also included photos of the subject site and surrounding land (site photos taken on 21 October 2022). The desktop study has used a range of reports, statistical and mapping data obtained from a number of sources. Knowledge of the site and the broader planning context has also informed the study.

GHD has reviewed and referenced a number of State and local government planning reports and guidelines to inform this assessment. These include:

- *Solar Energy facilities – Design and Development Guidelines,* Department of Environment, Land, Water and Planning (DELWP) (August 2019)

– Wodonga Planning Scheme
– *Australian Guide to Agrisolar for Large-Scale Solar – For Proponents and Farmers*, Clean Energy Council (March 2021)

1.1.4 Scope and limitations

This report: has been prepared by GHD for Bison Energy (BE Pro BWN P/L) and may only be used and relied on by Bison Energy (BE Pro BWN P/L) for the purpose agreed between GHD and Bison Energy (BE Pro BWN P/L) as set out in section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Bison Energy (BE Pro BWN P/L) arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 1 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by BE Group and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The site boundary outlined in the figures within this report is approximate and may be subject to change.

Paper Size ISO A4

0 0.15 0.3 0.45 0.6

Kilometers

Horizontal Datum: GDA 1994
Grid: GCS GDA 1994

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Agricultural Impact Assessment

Barnawartha North
Site Location

Project No. **12584019**
Revision No. **A**
Date **20/10/2022**

FIGURE 1

2. Land zoning

The proposal site contains a single allotment and is zoned as Farming Zone (FZ) under the Wodonga Planning Scheme (clause 35.07) and is subject to the provisions of that zone. The stated purpose and table of uses for land zoned as FZ is shown in Table 1.

As noted below under clause 53.13 of the Wodonga Planning Scheme, an application is required to use or develop land for a renewable energy facility (other than a wind energy facility) and must meet the requirements of that clause. This clause outlines the requirements which an applicant must undertake, including a site and context analysis to ensure the facility has minimal impact on the amenity of the area. This AIA forms part of the response to the provisions of Clause 53.13.

Table 1 Farming Zone – Wodonga Planning Scheme

Farming Zone	
Purpose	To implement the Municipal Planning Strategy and the Planning Policy Framework. To provide for the use of land for agriculture. To encourage the retention of productive agricultural land. To ensure that non-agricultural uses, including dwellings, do not adversely affect the use of land for agriculture. To encourage the retention of employment and population to support rural communities. To encourage use and development of land based on comprehensive and sustainable land management practices and infrastructure provision. To provide for the use and development of land for the specific purposes identified in a schedule to this zone.
Permit not required (section 1)	Agriculture (other than Animal production, Apiculture, Domestic animal husbandry, Racing dog husbandry, Rice growing and Timber production), Bed and Breakfast, Cattle feedlot, Dependent person's unit, Domestic animal husbandry (other than Domestic animal boarding), Dwelling (other than Bed and breakfast), Grazing animal production, Home based business, Informal outdoor recreation, Poultry farm, Primary produce sales, Racing dog husbandry, Railway, Rural industry (other than Abattoir and Sawmill), Rural store, Rural worker accommodation, Timber production, Tramway, Any use listed in Clause 62.01.
Permit required (section 2)	Abattoir, Animal production (other than Cattle feedlot, Grazing animal production and poultry farm), Broiler farm – if the Section 1 condition to Poultry farm is not met, Camping and caravan park, Car park, Cattle feedlot – if the Section 1 condition is not met, Cemetery, Crematorium, Dependent person's unit – if the Section 1 condition is not met, Domestic animal boarding, Dwelling (other than Bed and breakfast) – if the Section 1 condition is not met, Emergency services facility, Freeway service centre, Group accommodation, Host farm, Industry (other than Rural industry), Landscape gardening supplies, Leisure and recreation (other than informal outdoor recreation), Manufacturing sales, Market, Place of assembly (other than Amusement parlour, Carnival, Cinema based entertainment facility, Circus and Nightclub), Primary school, Racing dog husbandry – if the Section 1 condition is not met, **Renewable energy facility (other than Wind energy facility),** Residential hotel, Restaurant, Rice growing, Rural worker accommodation – if the Section 1 condition is not met, Sawmill, Secondary school, Timber production – if the Section 1 condition is not met, Trade supplies, Utility installation (other than Minor utility installation and Telecommunications facility), Warehouse (other than Rural store), Wind energy facility, Winery, Any other use not in Section 1 or 3.
Prohibited (section 3)	Accommodation (other than Bed and breakfast, Camping and caravan park, Dependent person's unit, Dwelling, Group accommodation, Host farm and Residential hotel), Amusement parlour, Brothel, Cinema based entertainment facility, Education centre (other than Primary school and Secondary school), Nightclub, Office, Retail premises (other than Market, Landscape gardening supplies, Manufacturing sales, Primary produce sales, Restaurant and Trade supplies).

3. Climate, land capability and existing land use

This section has been compiled based on information and data obtained from:

- Photos of the site and surrounding area compiled as part of the site inspection by GHD
- Public sources including spatial data obtained from Victorian Government agencies
- Aerial photographs of the study area and its surrounds, and
- General information regarding the study area known to GHD

This section specifically addresses:

- The agricultural quality of the proposed subject site for the proposed solar facility
- The amount of strategically significant agricultural land in the Council area and the region
- The potential impact of removing this land from agricultural production

3.1 Climate

The Wodonga region experiences hot warm summers with monthly mean maximum temperatures of 30.5°C. Summers are usually hot and clear while the winters are mild and frosts a common occurrence. The region experiences an average annual rainfall of 552.3mm with winter rainfall dominant. Figure 2 provides an overview of site climatic data obtained from two Bureau of Meteorology weather station locations which were selected due to the availability of current and historic climate data and because they represent the range of climatic extents that have an influence on agricultural production at the proposal site.

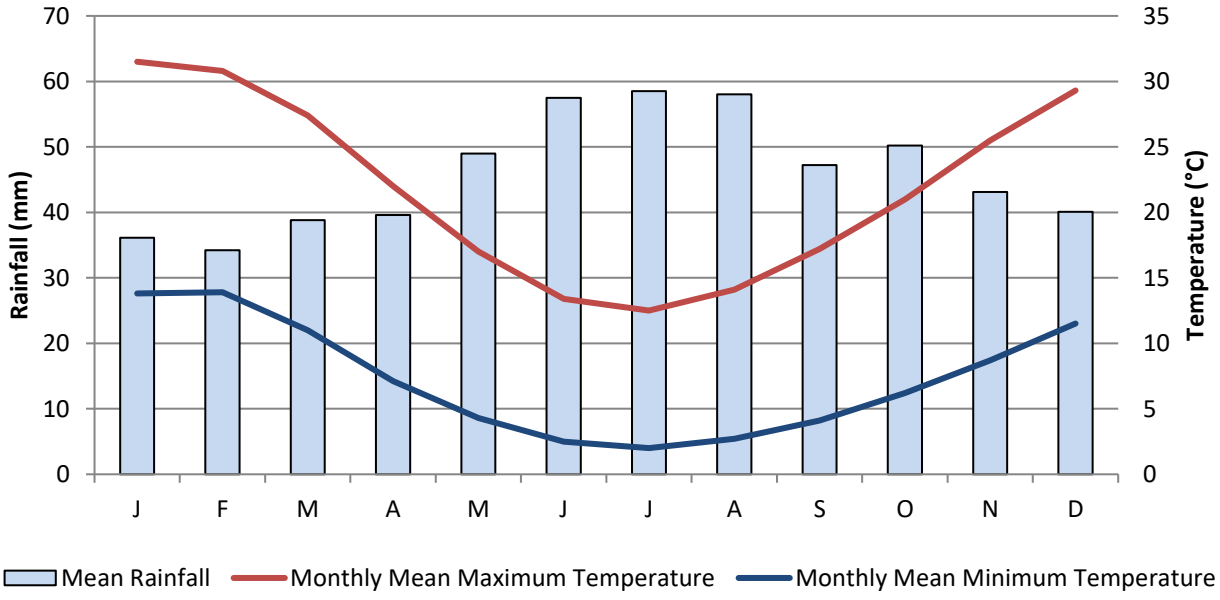


Figure 2 Climatic conditions – Barnawartha North

Source: Bureau of Meteorology (2022) Average rainfall recorded at Barnawartha (Station No. 082000) and average temperature recorded at Rutherglen Research (Station No. 082040)

3.2 Land capability, soils and landform

Most agricultural enterprises depend on the local natural resource base that determines the suitability of a location for a specific enterprise. There are a range of natural resources that need to be considered including soil type, topography, climate and water availability.

The North-East Catchment Management Authority has produced a series of maps of land capability classes for agriculture in the region. Land capability for agricultural production in the regional study area is dependent on a combination of soil, landform and climate attributes. Figure 3 provides an overview of the proposal site and surrounding areas. This site has been classed as 'low' agricultural capability with areas of 'moderate' capability land located to the west around Rutherglen and to the south-east towards Wodonga.

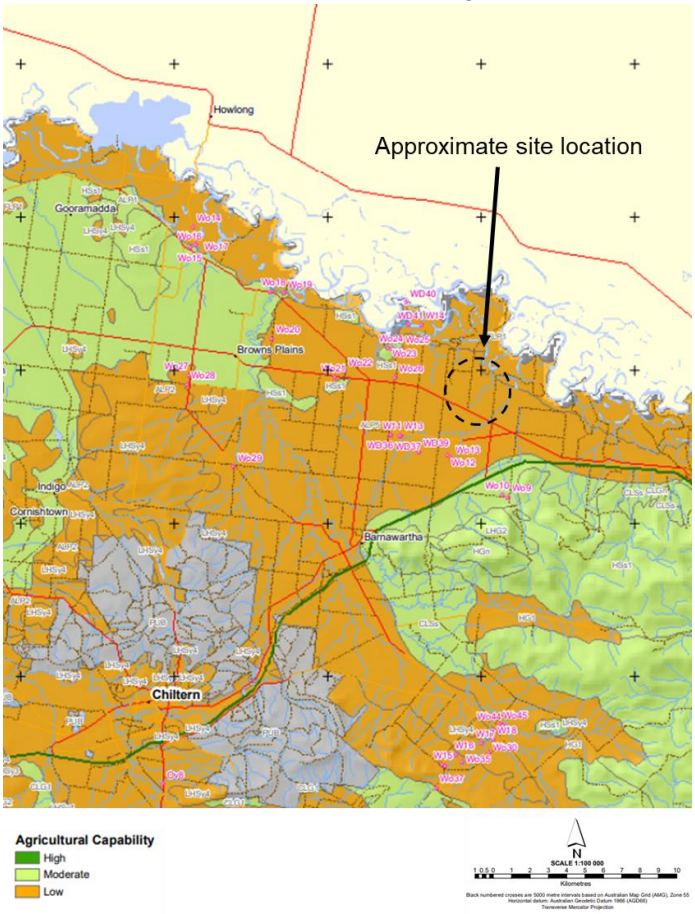


Figure 3 Agricultural land capability

Source: Agriculture Victoria, Victorian Resources Online – North-East Soil/Landform Survey Maps – Albury Map Sheet

The Victorian Geomorphology Framework (VGF) is a three-tier hierarchical system of land unit descriptions. This framework describes and defines details of Victoria's landscapes and provides a hierarchy to align past and future soil and land information. The system incorporates information from geomorphology, pedology and ecology fields, and provides and assessment of both soil and vegetation distribution. The VGF was used to analyse the soils for proposal site and to compare them against the data for the Wodonga LGA (see Table 2). The majority of soils across the Wodonga LGA are classed as either 'Moderately dissected ridge and valley landscapes' (34.54%) or 'Alluvial fans and aprons' (34.67%).

The Alluvial fans and aprons unit (GMU 4.3) covers the entire proposal site. This landscape occurs along the edge of the uplands and is generally higher in the landscape than the older alluvial plains. There are a variety of soils that occur throughout these alluvial fans and aprons and include grey Vertosols, brown Sodosols and Yellow and brown Kandosols. These soils are often considered less suitable for crop production due to being less friable and poorly drained. This correlates to land use across the LGA, with the majority of agricultural land (greater than 70%) being used solely for livestock production and the remaining land use a combination of mixed farming and grazing

(refer to section 3.4). There is very limited cropping land across the Wodonga LGA with the majority of the gross value of agricultural production being derived from livestock-based agriculture (refer to section 3.6).

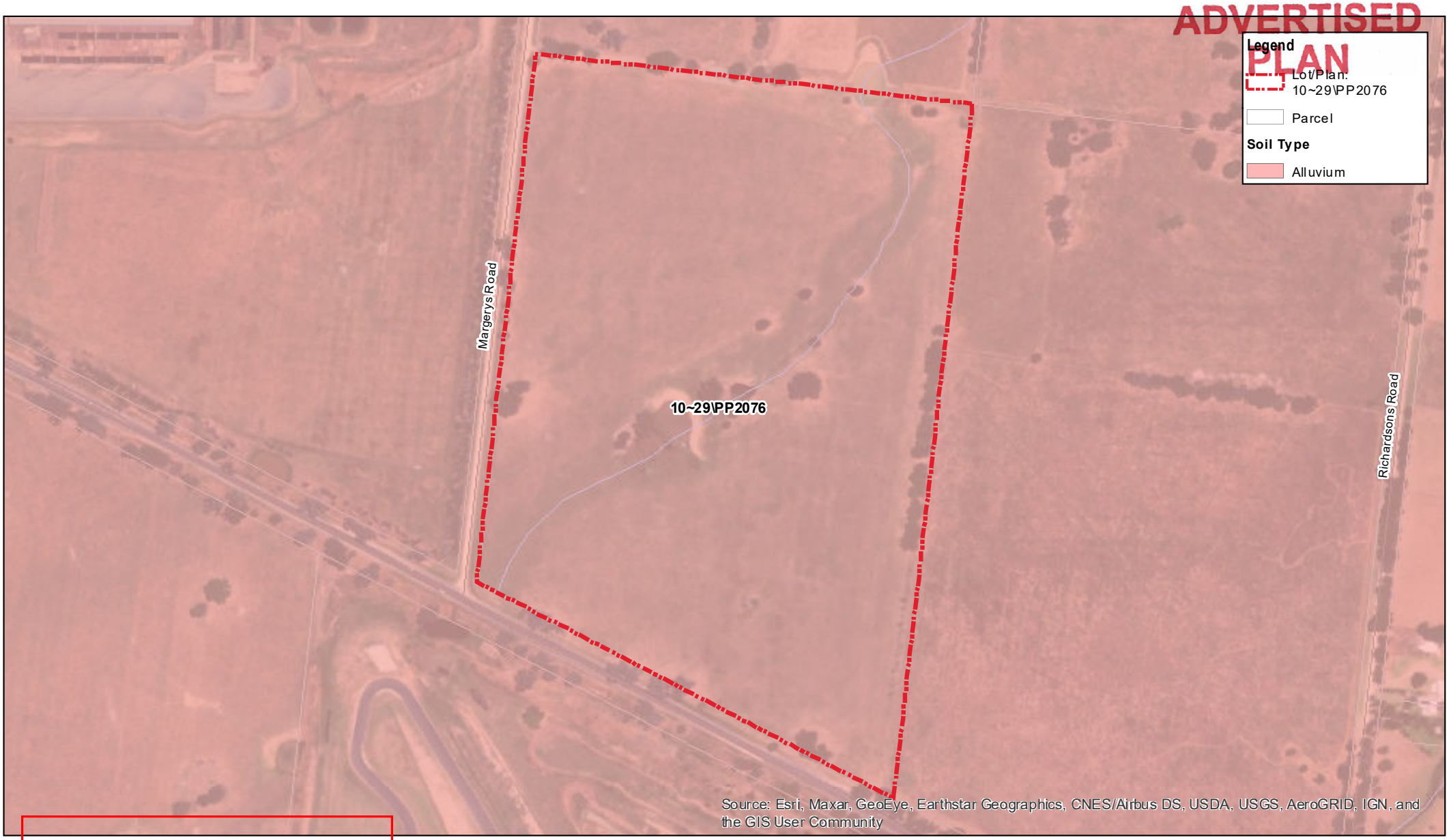
Moderately dissected ridge and valley landscapes (GMU 1.4.5) is the second largest group across the LGA and is characterised by low ridges and isolated hills, with shallow valleys, and some low-level plateaus. The waterways are of a relatively stable grade and alluvial fans have accumulated at the base of some slopes. Ridge tops are rounded and the elevations within this landscape are generally lower at 700m. The most common soils in the northern areas are poorly structured gradational soils.

The site was assessed as comprising of heavy clay soils in drainage lines, while elevated areas were considered to include red loam material. Soil properties are anticipated to limit some primary production such as cropping on the site and therefore extensive livestock grazing has been the dominant land use on the site.

Table 2 Soils and land formation

Geomorphological Unit	Proposal site		Wodonga LGA	
	Area (ha)	Percent	Area (ha)	Percent
1.2.1 - Plateaux and broad ridges			398.57	0.92
1.3.1 - Low relief landscapes at low elevation			2,445.08	5.66
1.3.3 - Terraces, fans and floodplains			522.24	1.21
1.4.3 - Escarpments, gorges			511.80	1.19
1.4.4 - Deeply dissected ridge and valley landscapes			450.61	1.04
1.4.5 - Moderately dissected ridge and valley landscapes			14,913.08	34.54
1.4.6 - Outlying ridges and hills			337.51	0.78
4.1.1 - Meander belt below plain level, sometimes source-bordering dunes			8,625.08	19.98
4.3 - Alluvial fans and aprons	22.06	100	14,970.55	34.67
Total	**22.06**	**100**	**43,174.52**	**100**

Source: Victorian Geomorphological Framework (VGF) (2007) Available [Online]:
http://vro.agriculture.vic.gov.au/dpi/vro/vrosite.nsf/pages/landform_geomorphological_framework



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Kilometers

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
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Barnawartha North
Soil Type

Project No. **12584019**
Revision No. **A**
Date **20/10/2022**

FIGURE 4

3.3 Strategically significant agricultural land

The Hume Regional Growth Plan (Vic Government, 2014) provides broad direction for land use and development in the Hume Region. Through the region, a number of areas have been defined as strategic agricultural areas because they have versatility in production, are of significant scale, are located in proximity to value-adding processing and have access to secure water supplies.

Land capability for agricultural production in the regional study area is dependent on a combination of soil, landform and climate attributes. Figure 3 above provides an overview of the proposal site and surrounding areas. This site has been classed as 'low' agricultural capability with areas of 'moderate' capability land located to the west around Rutherglen. The Rutherglen area has been mapped as one of Victoria's most important wine producing regions. There are a number of vineyards, wineries and olive groves further to the west of the proposal site, however as outlined in the following sections, the proposal site does not impact on any of these agricultural enterprises and given the local scale of this map as opposed to the regional scale, it would be considered to be lower capability land.

The high scale of the map in the Plan (Figure 5) makes it is difficult to ascertain the exact location of the proposal site with the boundary of strategic agricultural land of national, state, regional or sub-regional significance however it is likely the proposal site would not be classified as strategically significant agriculture land due to the site specific agronomic characteristics defined below in Section 3.4.ch

The *Upper Hume Sub Regional Plan - The Hume Strategy for sustainable communities 2010-2020* (Vic Govt, 2010) connects the four district sub regions and sets out the vision for the region under five key themes of environment, community, economy, transport and land use. The goals for these themes are articulated and developed further through a set of key directions. Underpinning each key direction is a series of recommendations for action at the sub-regional level. The following key directions from the Upper Hume Sub Regional Plan are relevant to this solar facility:

– Key direction 4 - Harnessing renewable energy sources, reducing greenhouse gas emissions and pursuing innovative waste management approaches
– Key direction 10 - Adapting and diversifying agriculture in an environment of change

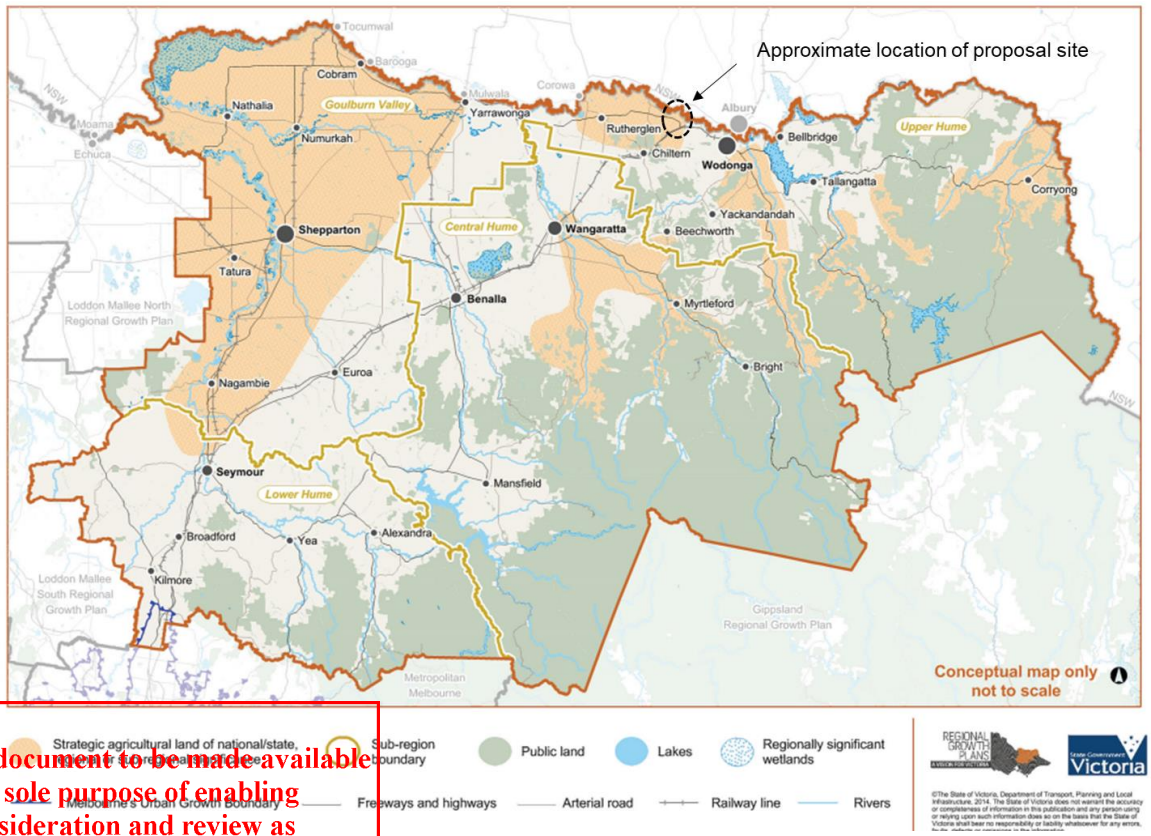


Figure 5 Hume Regional Growth Plan

3.4 Land use in the study area

Agricultural land covers approximately 62% of all land within the Wodonga LGA. The proposal site accounts for approximately 0.1% of land utilised for Domestic Livestock Grazing, and only 0.05% of overall land in the Wodonga LGA. Although Domestic Livestock Grazing (predominately beef cattle grazing) is a large contributor to overall agricultural production in the Wodonga LGA (68.9%), the small contribution of this site would not significantly impact the region's agricultural output.

Table 3 Agricultural land use in the Wodonga LGA

Land use	Area (ha)	Percent of total Agriculture land	Site land use	% of site's land type in Wodonga
Domestic Livestock Grazing	17,785.9	68.9%	22.0	0.1%
Livestock Grazing	428.7	1.7%		
Livestock Production - Dairy Cattle	261.4	1.0%		
Mixed Farming and Grazing	3,175.8	12.3%		
Mixed farming and grazing (generally more than 20 ha)	4,153.2	16.1%		
Grand Total Agriculture	25,805.0	100%		
Grand total all land Wodonga LGA	41,599.7			

Source: Department Environment, Land, Water and Planning

3.5 Land use at the proposal site

The proposal site covers approximately 22 ha and is part of a larger agricultural amalgamation with frontage to Murray-Valley Highway and bordered by Margerys Road (western boundary) and Richardsons Road (eastern boundary). The eastern portion of the block (not required for the solar energy facility) also adjoins the Old Barnawartha Road, which will also be used for site access to the proposal site. Access would need to be upgraded to ensure all-weather access to the proposal site.

The proposal site is currently used for livestock grazing with cows and calves grazing at the time of the site inspection. The proposal site is fenced into two main paddocks with a laneway adjacent to the northern boundary of the proposal site which leads into a set of steel livestock handling yards for cattle. These cattle yards are nearing the end of their useful life and would not be suitable should the proponent wish to graze sheep within the proposal site. Internal fences are considered to be in poor condition and are nearing the end of their useful life and would likely require replacement. The boundary fencing adjacent to Murray Valley Highway and Margerys Road was assessed as being of a good standard.

There are two main dams on site for stock watering purposes (the storage capacity and condition of these assets were not assessed) and there is a watercourse running through the property in a north-eastern direction which follows the internal fence line. The land adjacent to the central dam includes a series of localised depressions which were inundated at the time of the site inspection . The two dams are adequate for providing water for stock purposes but would be considered too small for the supply of water for irrigation of broadacre crops. The property has not been configured for this purpose.

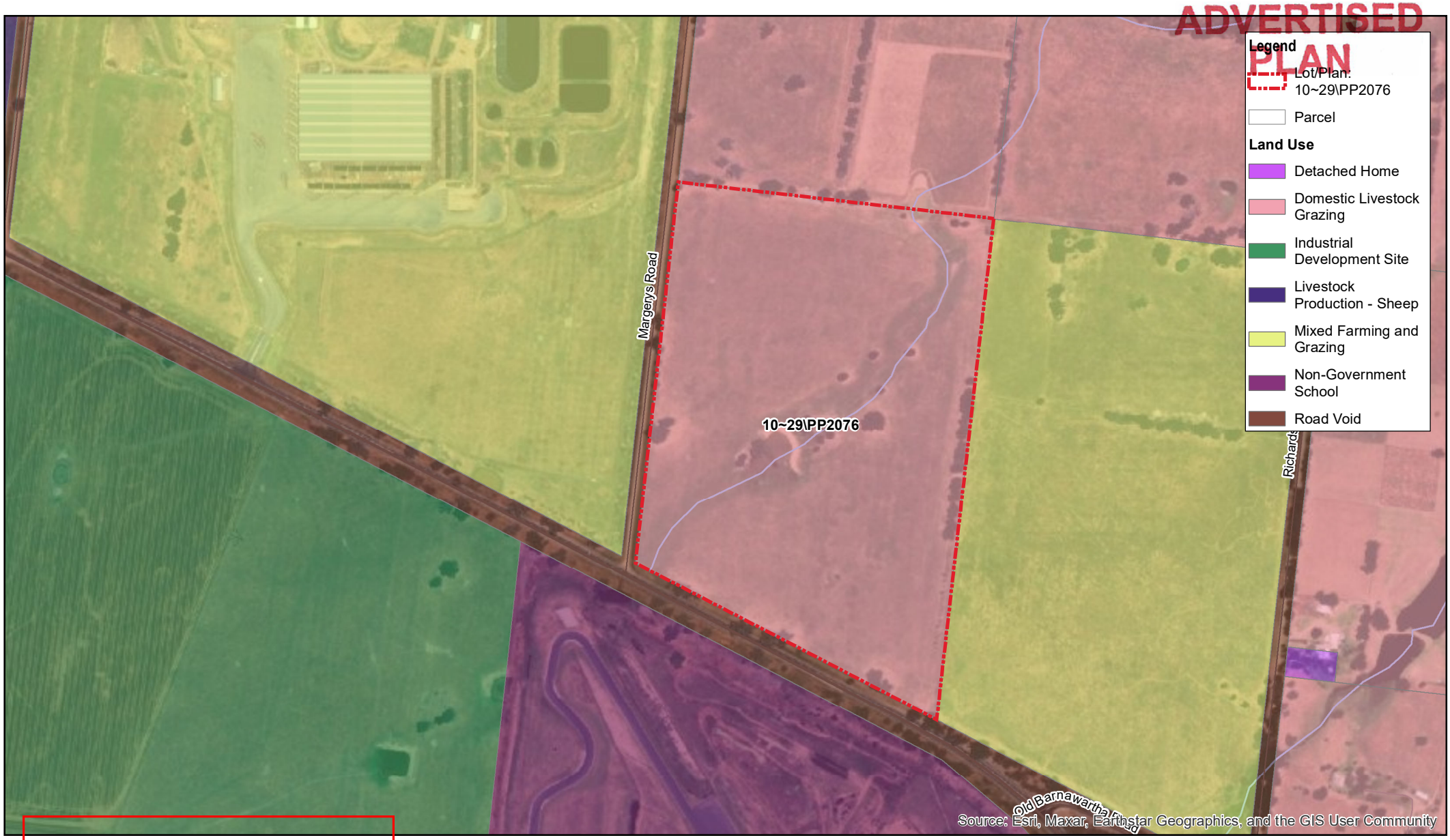
The proposal site is largely cleared of native vegetation with the exception of some red gums located along the central watercourse. The solar energy facility has been designed to avoid the removal of any of these live trees. A shelter belt has been planted adjacent to the eastern boundary of the proposal site and contains a mixture of eucalypt species (red gums, red box and yellow box). A landscape buffer would be established along the southern and western boundary adjacent to the Murray-Valley Highway and Margerys Road. A further landscape vegetative buffer would also be established along the north-eastern boundary.

Pastures throughout the proposal site include ryegrass, sub-clover, barley grass and would require renovation and soil amelioration to maximise production. There are also patches of dock and capeweed interspersed across the

site. The site contains *Juncus spp*. rush throughout, indicating that the drainage of surface water is impeded and subject to periodic waterlogging in some areas.

There is no infrastructure on the site which is considered to be critical to agricultural production within the LGA. In addition to the boundary and internal fencing, there is a storage container and hay shed located in the laneway adjacent to the northern boundary of the proposal site. A windmill and water tank is located in the north-east corner, and while not in operation at the time of the site inspection, it is understood they could be either replaced or refurbished.

Extensive cattle grazing was occurring on the proposal site and on adjoining agricultural land to the east. Adjoining land to the north and east consists of improved pastures with extensive cattle grazing as the predominant land use. The property to the west forms part of the Northern Victoria Livestock Exchange (NVLX), while the property the south across the Murray Valley Highway is used for commercial and education purposes as part of the Wodonga TAFE Driver Training Centre.



Paper Size ISO A4

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Kilometers

Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
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Agricultural Impact Assessment

Barnawartha North Landuse

Project No. **12584019**
Revision No. **A**
Date **20/10/2022**

FIGURE 6

3.6 Agricultural production

The importance of agriculture to the region can be demonstrated by considering the gross value of agricultural production from the most recent Agricultural Census (ABS, 2022b). The annual gross value of agricultural production across the Wodonga LGA was almost $15 million annually. Agricultural production within the Wodonga LGA is dominated by extensive livestock grazing, with the disposal of cattle (beef and dairy) and sheep and lambs representing over three-quarters of the value of agricultural production. Other agricultural production relates to livestock products (milk and wool, 4.6% and 3.8% of the total production respectively) and hay cut for livestock fodder. Outside of livestock production, nursery production (outdoor and undercover) accounts for 6% of gross value of agricultural production and broadacre crops only 0.1% (mainly oats).

Table 4 Gross value of agricultural production Wodonga LGA

Commodity	Gross value Wodonga LGA ($)	% of total
Broadacre crops	$13,915	0.1
Hay	$439,291	2.9
Nurseries, cut flowers or cultivated turf	$904,678	6.0
Livestock products - Wool	$570,825	3.8
Livestock products - Milk	$686,567	4.6
Livestock slaughtered and other disposals - Sheep and lambs	$965,589	6.5
Livestock slaughtered and other disposals - Cattle and calves	$10,558,689	70.6
Livestock slaughtered and other disposals - Other	$826,412	5.5
Total	**$14,965,966**	**100**

Source: ABS (2022b) Agricultural Commodities Produced, Australia, 2021-22, Value of Agricultural Commodities Produced, Australia, 2020-21

3.6.1 Agricultural production – livestock

As outlined above, livestock enterprises are an important component of the local agricultural economy. The cattle industry (beef and dairy cattle) comprises 14,610 head of cattle across 60 establishments (approximately 98% beef enterprises). Table 5 provides a summary of the livestock numbers and the number of agricultural businesses within the Wodonga LGA in 2020-21. The adjacent NVLX is the second largest saleyard in Victoria – with 111,688 cattle transacted in 2021/22 accounting for 12.6% of Victorian cattle saleyard throughput (MLA 2022). The NVLX draws in cattle from all locations within northern Victoria and southern NSW.

Table 5 Number of Agricultural livestock and businesses in Wodonga LGA 2020-21

Commodity	Wodonga LGA	Number of businesses
Beef cattle	14,309	58
Dairy cattle	301	2
Sheep and lambs	12,228	14
All other livestock	777	4

Source: ABS (2022c) Agricultural Commodities Produced, Australia, 2020-21, Estimates by Local Government Areas

3.6.2 Value of agricultural production at the project site

In order to provide an indicative value of agriculture at the site, an estimate of the value of production was derived using publicly available data from the Livestock Farm Monitor Project Victoria 2020-21 undertaken by Agriculture Victoria (2021). The Livestock Farm Monitor Project is the primary source of farm level information for sheep and beef production across Victoria. Based on a sample of 30 dryland mixed farming (livestock and cropping) properties in Northern Victoria, the 2020-21 annual gross margin (gross income minus variable costs) for beef cattle was $525 per ha (real), and the long-term average annual gross margin was $392 per ha (real). Applying these indicative returns to the 22ha site, suggest a gross margin range of $8,624 to $11,550 per annum (Table 6). Similarly, the gross income from the site would be in the range of $12,452 to $22,594 per annum when comparing the long-term average to the current 2020-21 returns.

These estimates of agricultural returns from the site may be considered optimistic. It assumed the site is run as a commercial agricultural entity with full efficiencies of production including routine agronomic practices such as regular fertiliser inputs and upgrade of farm infrastructure to maximise production from the site. This value of agricultural production from the proposal site is a small percentage of the approximately $15 million yearly total of agricultural production in the Wodonga LGA (see Table 4) and represents 0.15% of the total value of agricultural production in the LGA (assuming current 2020-21 gross income).

Table 6 Indicative agricultural returns from the proposal site

	2020-21	Long term average	Area	Indicative returns (range)
Gross Margin	$525 /ha	$392 /ha	22.0	$8,624 - $11,550
Gross Income	$1,027 /ha	$566 /ha	22.0	$12,452 - $22,594

Source: Gross Margin data adapted from the Livestock Farm Monitor Project, Agriculture Victoria 2020-21

As outlined in the Livestock Farm Monitor Project, agricultural profitability across Northern Victoria rebounded from the lows reported in 2018-19 and 2019-20 to the second highest levels recorded in the 17 years of available data. Following prolonged drought, seasonal conditions improved and due to the favourable conditions, producers increased expenditure on pastures and fertiliser application and traded stock later while focusing on rebuilding herds. Beef production is currently experiencing very high prices, with the average beef price received by producers in Northern Victoria increasing by 32% in 2020-21. Historically, prices would likely decline in the longer term, there is speculation and uncertainty as to when this would occur. Favourable seasonal conditions look set to continue, even though there is softening at the retail end of the supply chain.

It should be noted that gross income from agricultural activities is not a measure of farm profitability as it does not include capital (machinery, land, buildings etc.) or fixed or variable costs (insurance, rates, taxes, variable costs incurred in agricultural enterprises).

While development of the site would represent a continuing annual reduction in agricultural output and income over the life of the project, it is expected that this would be offset by the value of future solar energy sales. In addition, the project is expected to have a marginal impact on land capability such that when it is at the end of its operational life (estimated to be 30 years), the site could be rehabilitated to a state that would allow resumption of agricultural production similar to its current status. The installation of solar farms on rural properties can also assist in diversifying sources of income for the agricultural sector with the following section outlining future agricultural land use of the site and documenting some of the benefits of 'agri-solar' for both solar farm operators and graziers.

3.6.3 Future agricultural land use

In addition to the proposed solar facility, the proponent would maintain the option to undertake opportunistic grazing of sheep on the subject site once the solar facility is established. Such grazing could be used to maintain the height of ground cover and would allow agriculture to continue on the site, although at reduced capacity. Alternatively, slashing and spraying might be required to manage groundcover should sheep not be a feasible option.

The proposal site is considered suitable for sheep grazing as it is already well fenced and adjoins other agricultural properties to the north and east. As the property has historically been used for cattle grazing, some of the fencing may need to be upgraded over time to ensure livestock do not stray onto public roads or adjoining properties. Internal fencing might also be required to ensure ease of livestock management and each paddock should have a dedicated stock watering point (farm dam or stock water reticulation system). Sheep handling yards (fixed or

portable) will need to be considered as part of any agistment / lease agreement. While the solar panels will provide shade and allow the sheep to graze underneath and in between, the trees on the site would be retained and a new screen planting / shelter belt established adjacent to the two public roads which would provide shelter from winds and shade during the summer period.

The Clean Energy Council (2021) defines “agrisolar” as the co-development of the same parcel of land to support both solar PV power production and agriculture. There are several forms of agrisolar developed for different agricultural purposes, and these are listed in Table 7. The solar facility proposed for this site would be comprised of ground mounted PV panels which will be compatible with future agricultural activities on the proposal site.

Table 7 Forms of agrisolar

Agrisolar	Compatible with:	Description
Ground-mounted PV panels	Sheep grazing, horticulture, beekeeping and biodiversity regeneration	Most common. 20 cm – 3 m high, mounted on steel frames
Elevated PV panels	Grazing, horticulture and viticulture	2.5 – 5 m high, raised on stilts or reinforced structures
PV greenhouses / rooftops	Horticulture, floriculture and aquaculture	Solar-panelled roofs
Floating PV systems	Aquaculture	Solar panels floating over bodies of water

Source: Clean Energy Council (2021), Australian guide to agrisolar for large-scale solar for proponents and farmers.

The co-existence of solar energy production and agriculture in the same area can yield certain benefits which may partly offset the overall loss of area for agricultural production. The panels and solar farm fencing could protect livestock from predators and provide shade during the daytime. Furthermore, moisture collected on panels from condensation or light rainfall events could increase the moisture content in soils and pasture directly below. This increased moisture level improves the water use efficiency on farm and supports pasture growth even during periods of drought.

Given the relatively small area, GHD believe that opportunistic rather than continuous grazing of the site would be preferable, as this would allow stocking rates to be strategically and regularly adjusted to manage pasture biomass, maintain groundcover, reduce fuel loads/fire risk, allow desirable plants to set seed and germinate, and reduce weed impacts. This type of grazing strategy would be best achieved if the site was managed by an adjoining landholder and incorporated into an existing grazing rotation. The following table outlines the benefits to the solar farm operations when integrated with agricultural activities such as sheep grazing. A summary of the benefits for both landholders and solar farm proponents is presented in Table 8.

Table 8 Benefits of solar grazing for both graziers and solar farm operators

Benefits for solar farm operators	Benefits for grazier
– Keeps pasture down and reduces fire risk – Stronger vegetation management regime – Reduces operation and maintenance cost, reduces herbicide application, reduces risk of potential damage to solar farm caused by mechanical equipment – Additional monitoring when farmer is onsite – Reduces health and safety risks for solar farm personnel due to reduced need for operation of mowers and machinery – Strengthens relations, communication and interaction with local landholders and farming communities	– Access to free agistment (the taking in and feeding of livestock) – Increases health and wellbeing of sheep due to protection from the elements – Less water consumption by sheep – Livestock protected from predators due to secure fencing (e.g. shelter for lambs from eagles) – Access to greener pasture, especially in dry conditions or during drought, which reduces operating costs – High wool quality – Supporting the transition to clean energy and a healthier environment

Source: Clean Energy Council (2021), Australian guide to agrisolar for large-scale solar for proponents and farmers.

3.7 Agricultural employment

Within the Wodonga LGA, the agriculture, forestry and fisheries industry employs a total of 217 people making up 1% of overall occupations in the region and reflects the small contribution which agriculture within the Wodonga LGA contributes to the total gross value of agricultural production within Victoria (approximately 0.09%). Employment in Wodonga LGA comprises of public administration and safety (12.2%), manufacturing (10.7%), retail trade (10.6%), education and training (10.3%) and construction (10.1%) and together with Albury, the region is one of the largest single regional inland communities in Australia.

Table 9 Employees by industry of occupation

	Number employed Wodonga LGA	% of total
Agriculture, Forestry and Fishing	217	1.0
Mining	25	0.1
Manufacturing	2,269	10.7
Electricity, Gas, Water and Waste Services	124	0.6
Construction	2,133	10.1
Wholesale Trade	502	2.4
Retail Trade	2,241	10.6
Accommodation and Food Services	1,083	5.1
Transport, Postal and Warehousing	1,222	5.8
Information Media and Telecommunications	104	0.5
Financial and Insurance Services	221	1.0
Rental, Hiring and Real Estate Services	197	0.9
Professional, Scientific and Technical Services	607	2.9
Administrative and Support Services	545	2.6
Public Administration and Safety	2,575	12.2
Education and Training	2,176	10.3
Health Care and Social Assistance	3,193	15.1
Arts and Recreation Services	167	0.8
Other Services	805	3.8
Inadequately described/Not stated	751	3.5
Total	**21,166**	**100**

Source: Australian Bureau of Statistics (2022) 2021 Census of Population and Housing Working Population Profile Wodonga (LGA 27170)

3.8 Biosecurity impacts

The productivity and profitability of agricultural production depends in part on the management of pests and diseases, including the prevention of incursion of pests and diseases onto properties. Biosecurity is a term that is commonly used for such management and the set of measures adopted to protect a property from the entry and spread of pests, diseases and weeds.

The *Catchment and Land Protection Act 1994* is the main article of legislation governing the management of invasive plants and animals in Victoria with Agriculture Victoria responsible for administering the Act. All landowners and land occupiers (public and private) are responsible for managing noxious weeds and established pest animals on their land f they have or might have the potential to become a serious threat to:

- Primary production
- Crown land
- The environment

– Community health.

Under the Act, all landowners are legally required to manage declared noxious weeds and pest animals on their land and must take all reasonable steps to:

– Eradicate regionally prohibited weeds
– Prevent the growth and spread of regionally controlled weeds
– Prevent the spread of — and as far as possible eradicate — established pest animals on their land.

Farm biosecurity plans are often prepared for farm businesses based on industry guidelines such as those available on the website: www.farmbiosecurity.com.au. The guidelines include risk assessments and mitigation options to avoid / minimise impacts. The key biosecurity risks from this project relate to the movement of people, vehicles and machinery, with the risks occurring at both construction and operation phases. Table 10 outlines the potential biosecurity risks and potential measures that may mitigate the risks.

Recommended mitigation and monitoring measures would be captured in a project specific Construction EMP.

Table 10 Biosecurity risks and mitigation measures

Biosecurity risk	Potential mitigation measures
Incursion of foreign weeds, pests and diseases during construction	• Limit the number of entry and exit points (one is preferable) • All construction vehicles, equipment and boots should be cleaned upon entering the property in a wash-down bay • Where possible destock the site during production. • Limit worker contact with livestock, crops or plant materials as much as possible and eliminate any unnecessary contact altogether • Maintain vehicle register • Clearly sign and lock restricted access areas • Ensure construction vehicles remain on designated tracks • Record, monitor and manage any chemical use during construction, avoiding any chemicals which may impact or contaminate soil, plants or livestock. • Ensure a complete and thorough clean-up of construction materials on the site
Incursion of foreign weeds, pests and diseases during operation	• Most of the biosecurity practices listed above are relevant and should be continued into the operational phase of the project. In addition the following practices should be considered: • Monitor and control any existing or new incursions of pest plants and animals, e.g. through grazing, spraying or baiting. • Establish signage and protocols to ensure gates are closed when vehicles enter and exit the facility. • Maintain good livestock proof fencing.

4. Land use conflict risk assessment

Land use conflicts occur when one land use is perceived to infringe upon a neighbouring land use. In rural areas land use conflicts commonly occur between agricultural and residential uses. As noted in Section 2, a permit is required under clause 53.13 of the Wodonga Planning Scheme to use or develop land for a renewable energy facility. The potential for an alternative land use at the proposal site could give rise to land use conflict with adjoining landholders. Many industrial and other land uses have the potential to produce off-site impacts, such as noise, dust, odour and hazardous air pollutants. Ensuring land use compatibility is fundamental to the objectives of planning in Victoria. *Managing buffers for land use compatibility - Planning Practice Note 92* (March 2021) prepared by Department of Environment, Land, Water and Planning emphasises the importance of ensuring land use compatibility and if required buffer distances should be established to ensure land use compatibility and avoid land use conflict.

The land use conflict risk assessment tool that can be used to assess the potential of any negative impacts on surrounding land use and provide options for mitigation of potential impacts. The following assessment has been prepared to ensure the solar facility does not impact on the continuing ability of neighbouring properties to pursue agricultural production. The key potential sources of land use conflict have been identified, the risk of land use conflict has been assessed and where possible management strategies have been proposed to reduce the possibility of land use conflicts arising.

Issue	Risk of land use conflict	Discussion and mitigation measures
Catchment management and drainage	Low	As per section 3, there is a drainage line which runs through property and joins two fam dams on the proposal site. This area is subject to localised depressions. Existing farm dams would be retained. The site was assessed as comprising of heavy clay soils in drainage lines and the proposed solar energy facility has been designed to avoid disturbance of the lower lying areas including a 10m set back each side to meet North-East CMA requirements. The proposal site is located within a relatively small catchment which drains directly to the Murray River. It is not subject to a Flood Overlay or Land Subject to Inundation Overlay as mapped by Victorian Department of Environment, Land, Water and Planning.
Dust	Low	During construction, there is the potential for impacts as a result of airborne particulate matter and dust deposition to settle on crops and pastures, however dust suppression protocols would reduce the occurrence and the impacts on production are likely to be minimal. Post construction dust generation is expected to be similar to that occurring on adjacent agricultural land for routine agricultural activities. It is expected that there would be minimal dust generation as a result of vehicles accessing the site for maintenance / operational purposes. A buffer / setback from the site boundary is proposed and landscaping measures to be located on site would potentially reduce dust moving beyond the site boundary.
Fencing	Medium	Fences with adjoining agricultural land would need to be maintained in a condition to minimise the possibility of livestock straying onto the site from adjoining properties. The maintenance of shared boundary fencing is the responsibility of all landowners. The maintenance of the boundary fence adjoining roads is the sole responsibility of the proponent. Current internal fencing would likely need to be improved to ensure fences are stockproof, particularly if the property enterprise mix is changing from cattle to sheep. .
Fire	Medium	Risk of fire escaping and entering adjacent agricultural properties during construction activities. A Bushfire Management Plan should be established as part of the operational plans and procedures to guide activities on total fire ban days.
Lights	Low	Construction of the project would be limited to standard construction hours and therefore it is not proposed that any lighting would be required. During operation there would not be any lighting required on site. The hours of operation for the panels would be during daylight hours, and for construction would be standard construction hours. The standard construction hours from the EPA guide (publication 1834) is 7am to 6pm on weekdays and 7am to 1pm on Saturdays.
Noise	Low	Construction noise may be audible from adjoining sensitive receivers but is not expected to have significant impacts on adjacent land use. Construction activities would be limited to standard working hours as outlined in the CEMP. No significant operational noise is anticipated.

Issue	Risk of land use conflict	Discussion and mitigation measures
Odour	N/A	No odour impacts are anticipated.
Pesticides	Low	Pesticide use within the project site would be limited to activities such as weed control to ensure the land can be continued to be utilised for grazing and returned to agricultural use upon decommissioning. Where possible, the proponent could also explore opportunities for the grazing of sheep on the site in order to control pasture growth on site. Accredited and licensed contractors would be used, and any products used would be approved for the proposed use. Herbicides to be used are likely to be similar to those used by surrounding landholders. The distance from neighbouring properties means that potential conflict is assessed as low. Landholders are required to follow their obligations under *Agricultural and Veterinary Chemicals (Control of Use) Act 1992* which control agricultural and veterinary chemical use in Victoria.
Roads and traffic	Low	Existing access to the proposal site is via two gates on Margerys Road. These would be closed off and an access easement for construction and operation would be established via a new gate on Old Barnawartha Road. This avoids project traffic entering the Murray Valley Highway from Margerys Road. Given the alternative access is to be via land owned by the same landowner as the solar facility site, no impacts on access arrangements for adjoining properties or landholders are expected. There would be a temporary increase in traffic volume during construction, however no significant impact on local roads is anticipated. Construction traffic and access is addressed elsewhere in the planning application. Operational traffic volume for maintenance and supervision of the site is expected to be similar to that currently experienced at the site.
Straying livestock	N/A	The proposal site is currently used for livestock grazing and it is likely that cattle would need to be removed from the site during construction. During the operation phase, protocols and signage would be established to ensure gates are closed and stock-proof fences would be maintained if the proposal site is sued for the grazing of sheep (see Fencing above).
Visual amenity		There is the potential for visual impact on sensitive receivers nearby and loss of scenic agricultural views. The proposed solar energy facility is located on relatively flat land and adjacent to land which is considered to be non-agricultural and includes driver training facility and livestock saleyards. It is assumed that the height of the solar panels are likely to be low in profile to other existing developments and therefore it is not expected to result in a change in the character of properties that are directly impacted by the proposal. The site layout includes vegetative buffers adjacent to public roads. It is understood that visual impact matters are addressed in a separate technical assessment for the proposal.
Weed and pest management (biosecurity)	Low	Planning, construction, and operation activities may create the possibility of introducing or spreading weeds, pests and diseases onto a property. In addition, soil disturbance could reduce competition against current weeds and necessitate increased control costs. Weed incursions or proliferation would reduce crop and livestock production unless properly controlled. Weed and pest control, including for noxious weed and pests, will be subject to ongoing routine monitoring and management and is the responsibility of the proponent. See also biosecurity (Section 3.8) including landholder obligations under the *Catchment and Land Protection Act 1994*.

5. Rehabilitation and decommissioning

The proposed solar facility is anticipated to have a lifespan of 30 years (plus a one-year construction period and six months for decommissioning). At the end of its operational life, the project site would be either reconditioned or decommissioned. This development has a reversible nature, so once the solar farm is decommissioned the land can be returned to its former agricultural use.

5.1 Decommissioning

The Decommissioning EMMPs (DEMMP) would focus on site rehabilitation and traffic management. Given that best practice methodologies associated with decommissioning cannot be reasonably foreseen in advance of project construction, it is proposed that the DEMMP would only be prepared towards the end of the solar farm's operational life. It is assumed this would include the removal of all the solar facilities equipment above and below ground and the site rehabilitated as close to pre-construction as possible.

To return the site to agricultural production the site is likely to require tillage, application of fertiliser/soil ameliorants followed by sowing of a pasture/crop. Soil testing should be undertaken and advice from a qualified agronomist sought to develop an appropriate plan for agricultural rehabilitation.

6. Conclusion

The proposed conversion of 22 ha of agricultural land to a solar facility has been assessed for its impact to existing agricultural industry and to adjoining agricultural land within the Wodonga LGA. This assessment has considered the agricultural land, soils, landform and existing land use of the subject site and addresses the strategic site selection assessment criteria outlined in the Solar Energy Facilities, Design and Development Guidelines (DELWP, 2019).

The assessment has used a variety of information sources including current land use, Victorian geomorphology framework, gross value of agricultural production and employment statistics. The impact of removal of this parcel of land on the broader agricultural economy within the Wodonga LGA has also been assessed. A site inspection was conducted to understand the proposed configuration of the solar facility, current land uses, assess current farming infrastructure, site conditions and understand adjoining land uses.

The Victorian Geomorphology Framework (VGF) incorporates information from geomorphology, pedology and ecology fields, and provides an assessment of both soil and vegetation distribution. The VGF was used to analyse the soils within the subject site and to compare them against the Wodonga LGA. The proposal site was classified as 'alluvial fans and aprons' and was assessed as comprising of heavy clay soils in drainage lines, while elevated areas were considered to include red loam material. Soil physical and chemical properties limit some primary production options (such as cropping) on the site. This soil landform accounts for almost 35% of soil and landforms across the Wodonga LGA and cover the entirety of the proposal site.

Agricultural land covers approximately 62% of all land within the Wodonga LGA. The proposal site is classified as livestock grazing and accounts for approximately 0.1% of land utilized for Domestic Livestock Grazing, and only 0.05% of overall land in the Wodonga LGA.

The gross agricultural returns from the site are estimated at approximately $11,550 per annum with favourable seasonal conditions and commodity prices. This value of agricultural production from the proposal site is a small percentage of the approximately $15 million yearly total of agricultural production in the Wodonga LGA and represents 0.08% of the total value of agricultural production in the LGA. Therefore the removal of the land from agricultural production would have minimal impact on the relevant agricultural industries within the region. The proposal site would not be financially viable as a standalone agricultural enterprise and therefore would need to amalgamate with other adjoining holdings if it was to become a profitable enterprise in the future.

'Agrisolar' refers to the co-development of the same parcel of land for both solar PV power production and agriculture. The solar facility proposed for this site will comprise of ground mounted PV panels which would be compatible with future agricultural activities on the proposal site. The proponent would maintain the option to undertake opportunistic grazing of sheep on the subject site once the solar renewable energy facility is

established. Such grazing could be used to maintain the height of ground cover and will allow agriculture to continue on the site, although at reduced capacity.

An analysis of the potential for land use conflicts to arise from the solar facility has been undertaken. The likelihood of significant conflict is considered low, and current land use (including non-agricultural related land uses) on surrounding land could continue with minimal impact. A range of impact mitigation measures have been identified. Biosecurity impacts have been considered to ensure that declared noxious weeds and pest animals on the site are managed in accordance with the *Catchment and Land Protection Act 1994*.

The construction of alternative site access arrangements mitigate against traffic impacts and hazards at the intersection of Margerys Road and the Murray Valley Highway.

Construction impacts are expected to be short term in nature. The limited earthworks associated with construction and operation of the site mean that the majority of the soil surfaces would not be impacted by the development.

The project is anticipated to have an operational life of 30 years. If at some time in the future, the solar facility ceases to operate, the project site can be rehabilitated to enable agricultural production to resume

7. References

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Appendix A

Site Photos

The following site photos were taken on 21 October 2022 and demonstrate current land uses on and adjacent to the proposal site.

Photo 1: Looking north-east across the proposal site adjacent to the southern bourndary with Murray-Valley Highway. The site is largely cleared of vegetation and the trees in the distance are along the eastern boundary. The site has a number of localised depressions and water logging was present at the time of the site inspection. *Juncus spp* rushes indicate periodic water logging.

Photo 2: Looking south across the proposal site to the Murray-Valley Highway

Photo 3: View north east from the eastern boundary of the proposal site across adjoining land. An established vegetative buffer includes a recently planted eucalypt windbreak extension on the eastern boundary.

Photo 4: A section of the internal fencing which is nearing the end of its useful life. Fencing along the northern and eastern boundary with adjoining paddocks will likely require replacement to avoid livestock straying into the solar energy facility.

Photo 5: The proposal site is fenced into two main paddocks with a laneway adjacent to the northern boundary of the proposal site which leads into a set of steel livestock handling yards for cattle. These yards would likely require some capital investment to allow for the ongoing safe and efficient handling of livestock, or alternatively a new set of sheep yards will need to be constructed if sheep are to be grazed on the site.

Photo 6: A windmill and water tank is located in the north-east corner, and while not currently in operation, it is understood they could be refurbished or replaced. There are two dams on the property for stock watering purposes. The capacity of these dams is insufficient to support the irrigation of broadacre crops and the property has not been configured for this purpose.

Photo 7: The proposal site has extensive localised depressions and is subject to periodic water logging, making grazing land uses suitable but cereal cropping marginal.

Photo 8: Extensive livestock grazing country with one of the two farm dams located on the proposal site.

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