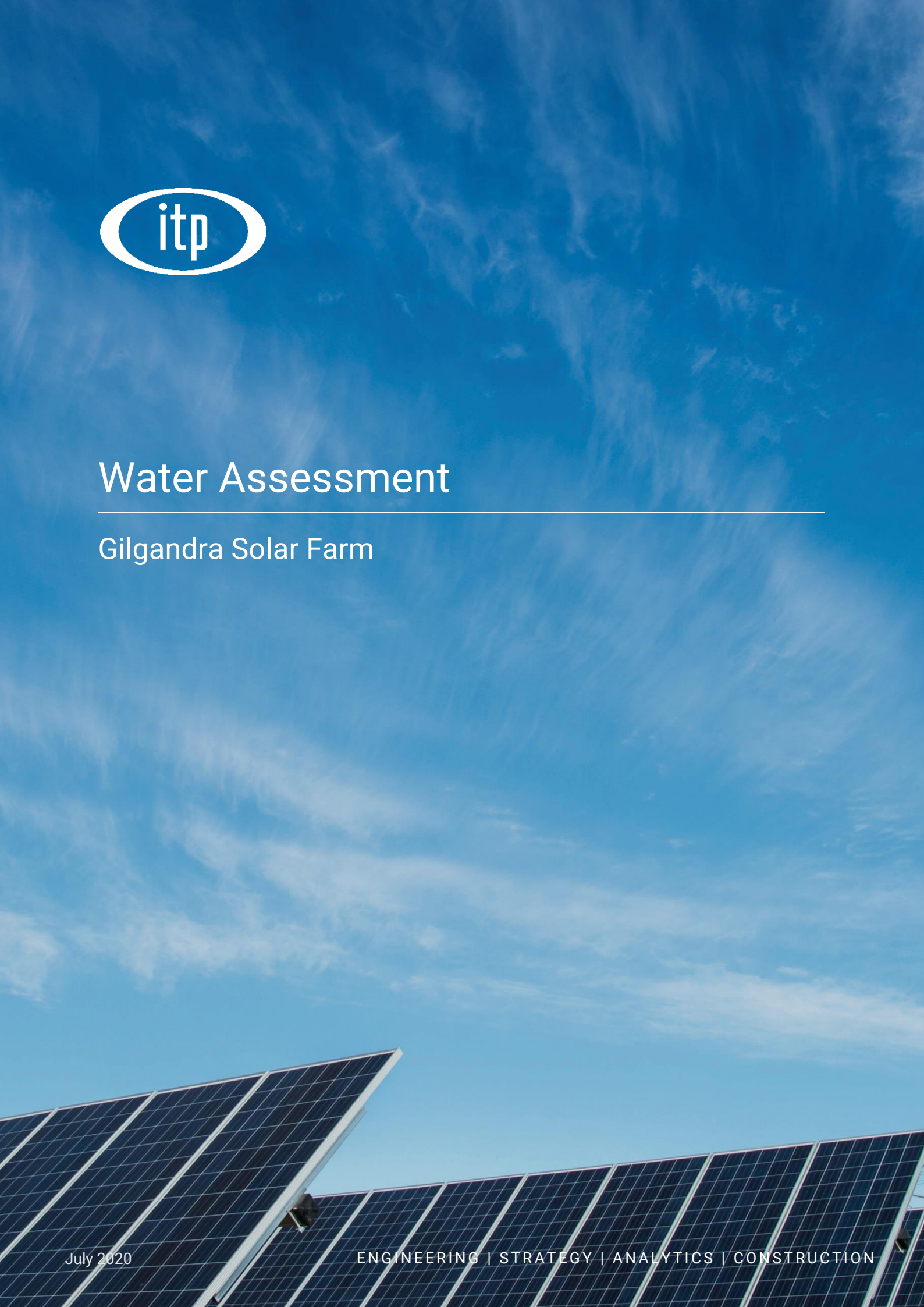

Water Assessment

Gilgandra Solar Farm

July 2020

ENGINEERING | STRATEGY | ANALYTICS | CONSTRUCTION

DOCUMENT CONTROL

Report Title		Water Assessment – Gilgandra Solar Farm			
Rev	**Date**	**Status**	**Author/s**	**Reviewed By**	**Approved**
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1 INTRODUCTION

1.1 Overview

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 recommended for construction and operation.

1.2 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.

2 PROJECT DESCRIPTION

2.1 Solar Farm

ITP Development (ITPD) is proposing to develop the Gilgandra Solar Farm (also referred to as GID1A-G-2100), as described in the solar farm summary sheet for this proposal (see Table 1). It will be located approximately 3.0 kilometres west of Gilgandra town, NSW (see Figure 1). Details of the layout are contained in the drawing GID1A-G-2100.

Table 1 - Site Information

Parameter	Description
Site name	Gilgandra Solar Farm
Lot/DP(s)	1& 2/1070081
Street address	362 Oxley Highway, Gilgandra, NSW, 2827
Council	Gilgandra Shire Council
AC capacity	5.0 MW
DC capacity	6.4 MW
Project area	11.3 ha

ITPD is proposing to construct a solar farm with a DC capacity of 6.4 MW and AC output of 5.0 MW, on an approximately 11.3 ha site that is currently used for grazing.

There are to be approximately 12,000 solar modules installed on around 138 mounting structures running north to south. Each row of solar photovoltaic (PV) modules will rotate to track the sun across the sky from east to west each day. The spacing between each row is 6.25m. The hub height of each tracker is around 1.5m, with the peak of the modules reaching a height of approximately 2.75m when the array is fully tilted to 60 degrees from horizontal. The general arrangement of the solar farm and the array tracker details are shown in drawing GID1A-G-2100.

The solar farm will also include two 3.4 MW inverter stations. The station is to be located within the array and each are mounted on a 12.19 metres skid. The inverter stations incorporate the high/medium voltage switchgear and transformers. The arrangement of the inverter station skid is shown in drawing GID1A-E-4300.

The mounting system is constructed on piles that are driven into the ground. During construction, there is expected to be 50 personnel on site working from 7 am – 4 pm, Monday to Friday. The construction is anticipated to take approximately 3 months. Once operational

the site will be unmanned. Maintenance is expected to be carried out quarterly by a crew of 2 – 3 people.

Solar panels and related infrastructure will be decommissioned and removed upon cessation of operations. This is likely to occur within two years of the end of the project. The site can then be returned to the pre-development land use.

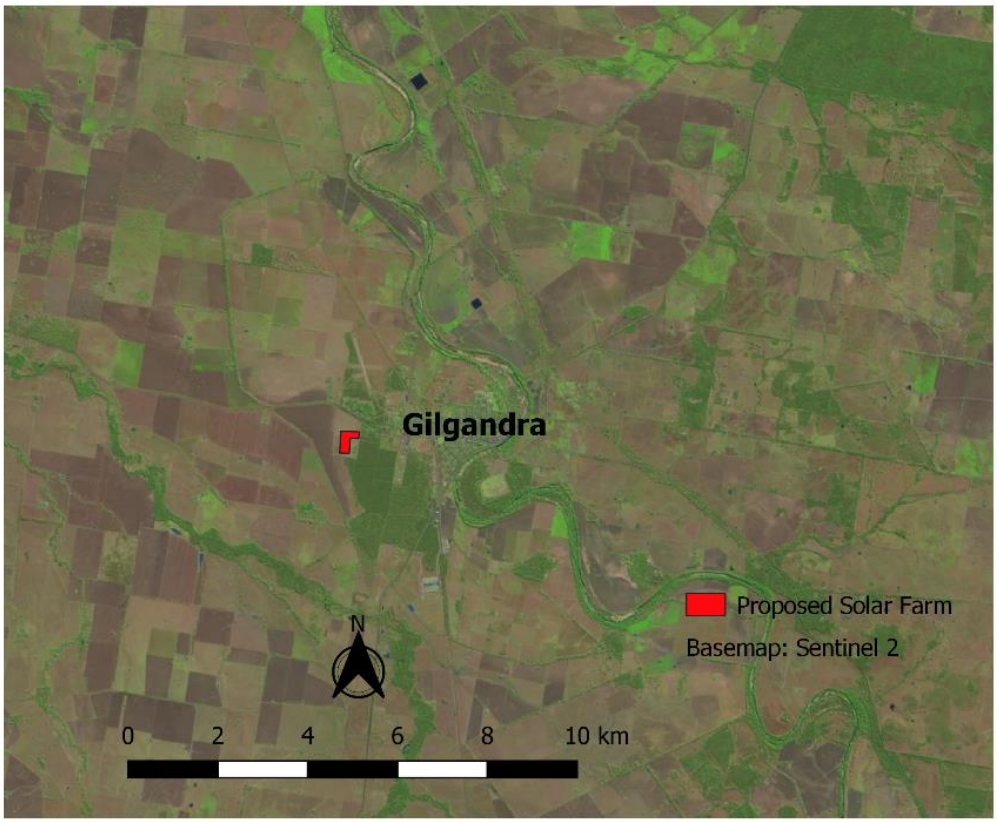


Figure 1 - Proposed solar farm site and surrounding area

2.2 Hydrology, climate and topographic conditions

The project area for the Gilgandra Solar farm is within the Gilgandra Shire Council Area.

Gilgandra in NSW (285m AHD) is located in the southern part of the Castlereagh River valley which is subject to a water sharing plan (Rabbidge, 2016). Other towns in the broad vicinity include Coonamble (179m AHD) and Gulargambone (225m AHD) to the north, Coonabarabran (512m AHD) to the east and Mendooran to the south (351m AHD). The Castlereagh River runs along the eastern edge of the town of Gilgandra. It flows to the north towards Gulargambone and Coonamble before discharging into the Macquarie system near Brewarrina (Rabbidge, 2016). The topography of the eastern parts of the Castlereagh River catchment are characterised by the volcanic remnants that shape the Warrumbungle Ranges to the east with elevations up to 1,200 metres and with annual average rainfall in these cooler regions ranges

being above 600mm (MDBA, 2021). Many smaller creeks and streams join the Castlereagh River, forming a floodplain that carries flows between the Castlereagh and Barwon Rivers during floods (NSWDPI, 2021). The catchment area of the Macquarie–Castlereagh system covers 7% of the Murray–Darling Basin and contributes 7% of water in the basin (MDBA, 2021). More than 80% of the Macquarie–Castlereagh catchment is used for agriculture and less than 5% is irrigated. Dryland cereal production, sheep and cattle livestock grazing are the main forms of agriculture (MDBA, 2021b). The catchments of the Castlereagh and Macquarie rivers support a diverse range of ecosystems, from forest, woodlands, and wetlands to grasslands, in temperate and semi-arid environments (MDBA, 2021). The Ramsar-listed Macquarie Marshes are located on the are located on the lower floodplain of the Macquarie River. These marshes represent one of the largest freshwater wetlands in the Murray–Darling Basin with variety of wetland types, ranging from semi-permanent and frequently inundated marshes to ephemeral wetlands inundated by only the largest floods (NSWOEH, 2012). These environmental values and land use practices are dependent on the waterways of the catchment.

3 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 2.

Figure 2 - Floodplain risk management and planning process

3.1 Local Government Act 1993

The Local Government Act provides the legal framework for the system of local governments of the state of NSW. Specific to this project is Section 733, which exempts councils from liability in relation to flood prone land under the provision that they have undertaken substantial assessments in accordance with the latest approval manual.

The 2005 gazetted Floodplain Development Manual is the current approved manual and supports section 733 and the NSW Government's Flood Prone Land Policy. Both the manual and the policy provide councils with the framework to implement processes, and sustainable strategies to manage the floodplain risks that specifically impact human occupation.

3.2 Environment Planning and Assessment Act 1979

This is an Act to instate an environmental planning system and assessment arrangement 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. Section 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 offers sustainable and integrated management of the state's water sources for the benefit of both present and future generations. Water management principles are intended to guide decision-making under the Act in relation to floodplain management. They require the existing and future risk to human life and property, arising from occupation of the floodplain, to be minimised.

3.4 Gilgandra Local Environmental Plan 2011

The Gilgandra Local Environmental Plan (LEP) 2011(current version for October 2021 sourced from Legislation NSW, 2021) aims to make local environmental planning provisions for land in the shire in accordance with the relevant standard environmental planning instrument. The LEP includes specific information for residents in the town Gilgandra. The Plan provides the prohibited and permitted types of development within the local area. Some types of development are also regulated by specific state environmental planning policies. The Plan (Part 5.21) does provide specific management requirements for flood planning, which applies to land at or below the flood planning level (1 in 100 ARI plus 0.5m 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. The site is shown in relation to a series of flood maps showing the flood planning area from the Gilgandra LEP (2011) in figure 3 and the Gilgandra Shire local flood plan, a sub-plan of the Gilgandra Shire Disaster Plan (Gilgandra Shire, 2008) in figure 4. The site for the proposed solar farm, is not within the mapped flood planning area of the local environment plan, being over 1,300m from the western edge of the flood planning area. The contours of the hillslope around the site indicate that localized drainage would be towards the north-west (see figure 6 – site topography).

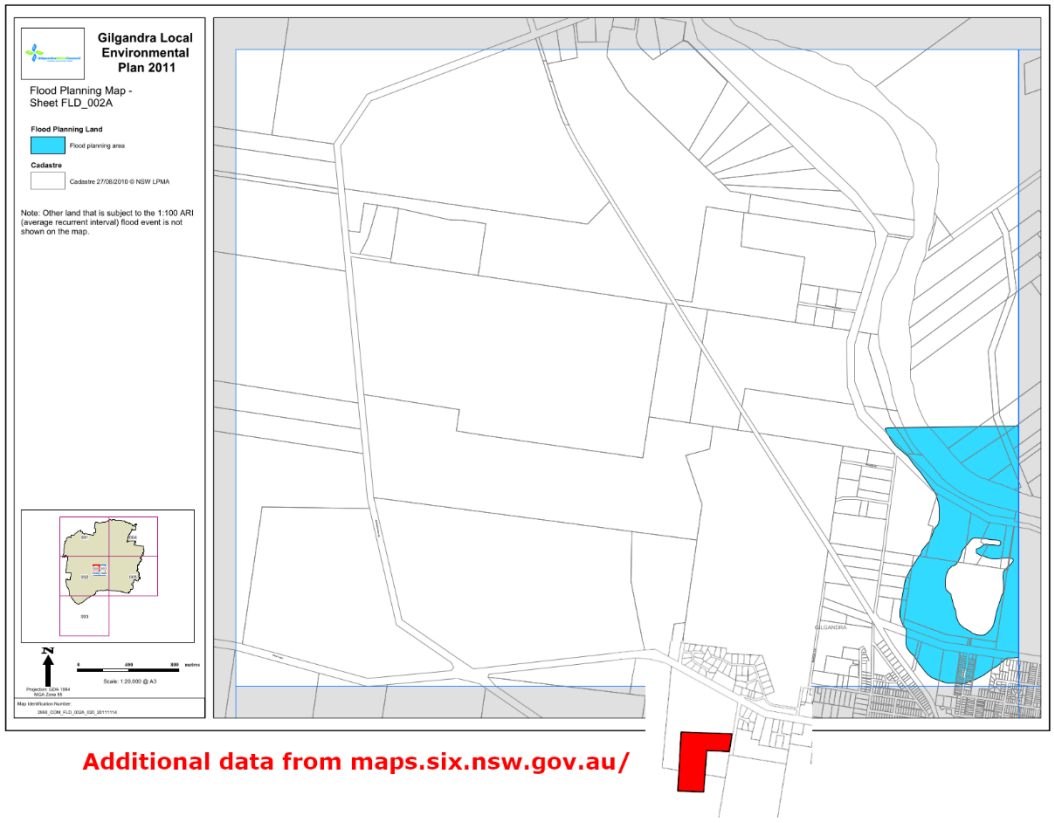


Figure 3 - Site in relation to Gilgandra LEP Flood Planning Area (Source: NSW Legislation, 2021)

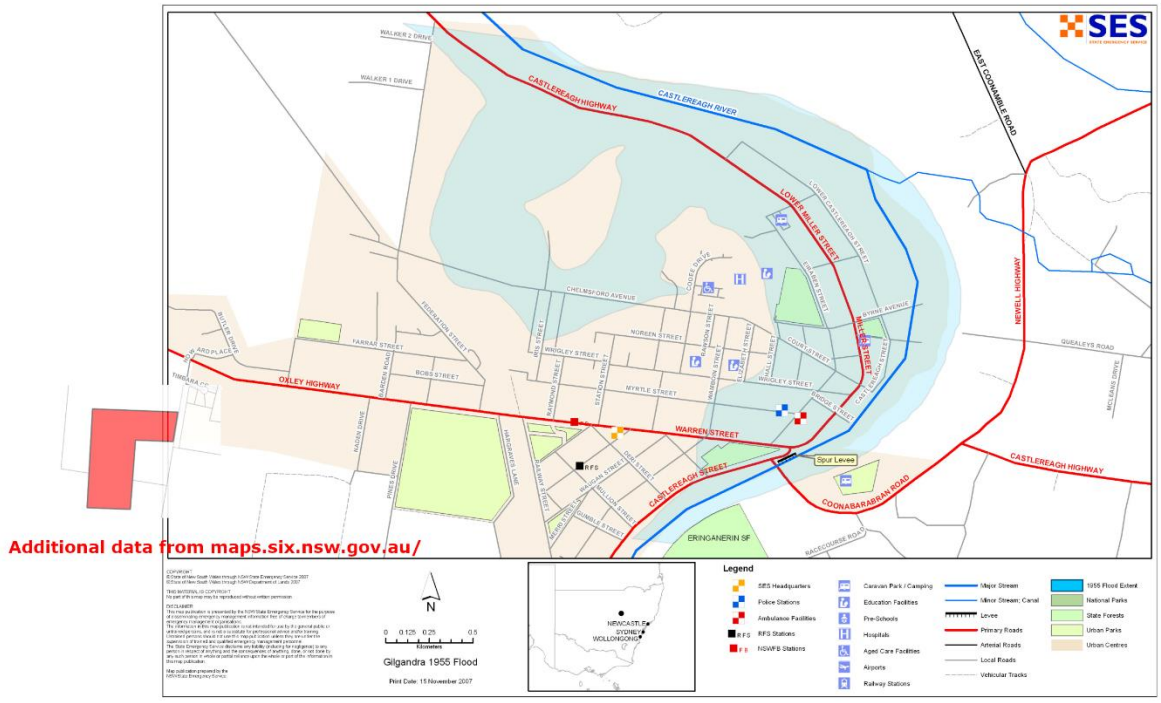


Figure 4 - Site in relation to 1955 flood extent (Source: adapted from Gilgandra Shire Flood Plan; page 47)

3.4.1 Gilgandra Shire Council Development Control Plan 2011

The Gilgandra Shire Development Control Plan (DCP) 2011 provides guidance for developments and the statutory planning controls of the Gilgandra Local Environmental Plan 2011 (NSW Legislation, 2021). The guidance provides proponents assistance with criteria to address in development applications.

The guidance on flood protection states that the consent authority must be satisfied on a number of points regarding developments, including that the development:

a. Is compatible with the flood hazard of the land, and
b. is not likely to significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties, and
c. incorporates appropriate measures to manage risk to life from flood
d. is not likely to significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses, and
e. is not likely to significantly adversely affect the environment or
f. cause avoidable erosion, siltation, destruction of riparian
g. vegetation or a reduction in the stability of river banks or watercourses,

Development Control Plans typically state that planning restrictions will apply to development on land below the 'flood planning level' of watercourses. The 'flood planning level' for new residential developments '… will generally be based on the 1% AEP (Annual Exceedance Probability) flood' and historical events (DIPNR, 2005, appendix K-7).

NSW local government DCPs also typically provide guidance on stormwater drainage systems for rural lots and large residential lots, which are relevant to the proposed solar farm site. Guidelines typically suggest that, where drainage easements over downstream properties is required, consent from the owners of the downstream properties is to be submitted with the development application. The Gilgandra Shire DCP states that measures to control stormwater flow and water quality are required including "…ensure stormwater systems are carefully planned, designed and located to prevent the disturbance, redirection, reshaping or modification of watercourses and associated vegetation and to protect the quality of receiving waters … [and to] prevent increases in the quantity of stormwater discharge from the development site which can impact on downstream environments" in relation to a 1 in 100 year ARI flood (Gilgandra Shire Council, 2014).

3.4.2 Gilgandra Community Strategic Plan 2017/18 – 2026/27

The Gilgandra Community Strategic Plan been developed and executed under key themes identified through extensive community consultation. The plan seeks "…to identify the community's main priorities and aspirations for the future and to plan strategies for achieving

these goals." (Gilgandra Shire Council, 2017). Key outcomes identified for the ten years of the plan include:

- **Sense of place:** Facilitate and work with the community to develop a sense of place through branding, promoting and enhancing local identity and promoting social cohesion and health and well-being;
- **Community engagement:** Engage with our community, sharing information about community, council and government business and where appropriate, provide opportunities for residents to influence and/or participate in council decision making.;
- **Land use planning and sustainable environment:** Operate as strategic land use planners who work with the community to create an environment that guides the use of land to balance economic, environmental and community/social values and to support the health and well-being of the community.;
- **Economic development:** Facilitate the economic development of the community by working with the business community to attract and retain investment and support sustainable economic growth.

Theme 3, sustainable natural, agricultural and built environments, specifically mentions or water management in relation to sustainable energy use, with key measures being consumption rates and water quality (page 25). Also implicit within the themes above, is the need for strategies that minimize the impact on the environment from development activities and to maintain and manage water quantity and quality.

3.5 State Environmental Planning Policy (Infrastructure) 2007

Part 3, Division 7 of the State Environmental Planning Policy (Infrastructure) 2007 relates to 'Flood Mitigation Work'. This policy provides details on the types of works which may be required for land that is susceptible to flooding by the probable maximum flood event, also known as flood liable land. The policy states that 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 within the mapped flood planning area under the Local Environmental Plan and does not require additional flood mitigation work.

3.6 Protection of the Environment Operations (POEO) Act 1997

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

With relevance to the site, the Act aims to reduce risks to human health and avoid degradation of the environment by promoting pollution prevention, through the reduction of materials used and advocating the re-use, recovery or recycling of materials. The Act contains the requirements for the management of water discharges and 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

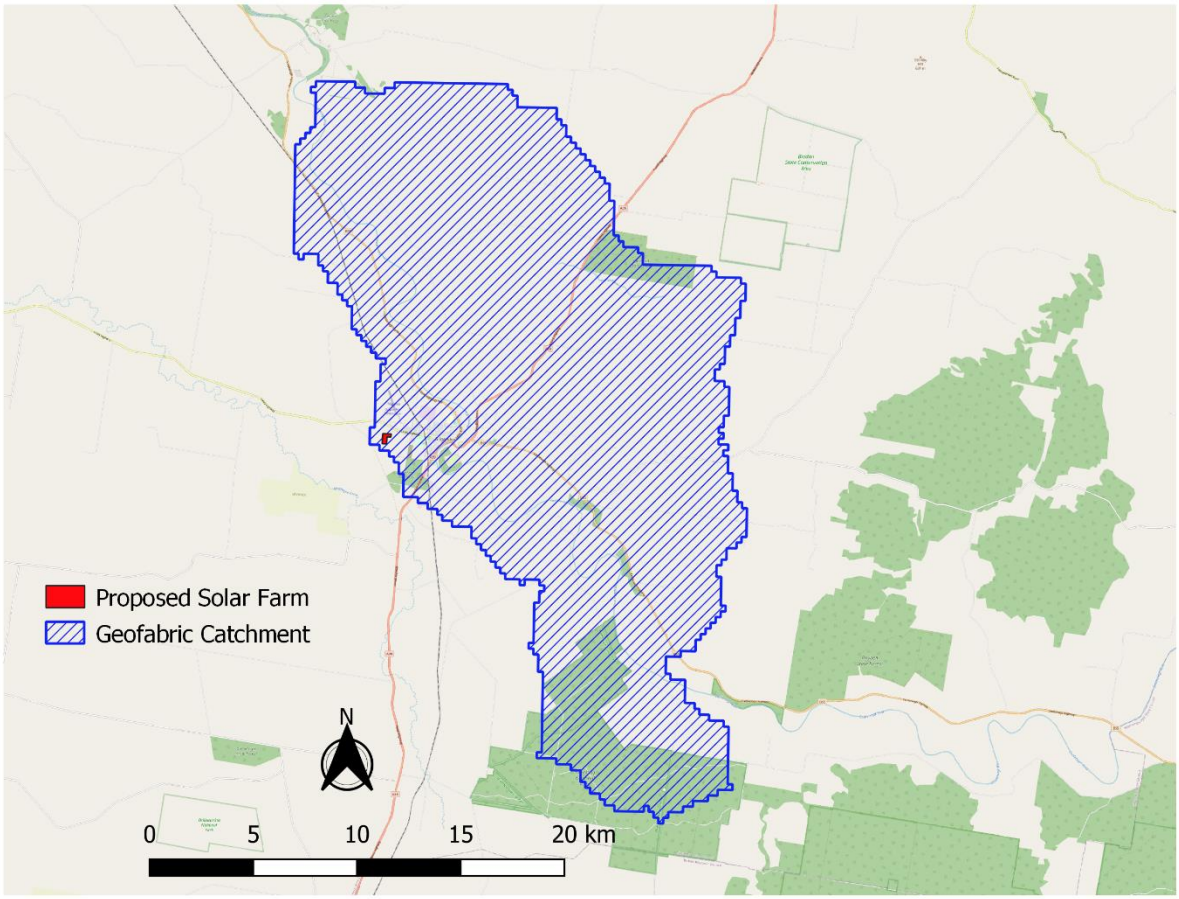
This Act makes provisions for the conservation of soil resources and mitigation of erosion. The Act allows the Minister for Primary Industries [1] to issue soil conservation notices, declare areas to be sites of erosion hazard, proclaim works in catchment areas and outlines specific regulations regarding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

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

4 CATCHMENT AND FLOOD HISTORY

The Project is located in the Gilgandra Shire Council, to the west of the town of Gilgandra. According to spatial data from the Australian Hydrological Geospatial Fabric (Geofabric), the proposed facility is located within a large sub-catchment that includes much of the Castlereagh River (see Figure 5 below). The project site is situated on a north-west facing gradual hillslope, with heights ranging from approximately 290m (AHD) on the south-eastern side of the site to 280mm (AHD) on the north-western side. (Figure 6). The surrounding area is relatively flat, with little topographic variation. Figure 5 shows a localised drainage line between the proposed site and the town of Gilgandra, running to the south-east. The centre of the site has an elevation of 388m (AHD), with the nearest part of the Castlereagh River having an elevation of 276m (AHD) [2]. The land is mostly cleared of native vegetation and is currently



used for farming.

[2] Elevation values sourced from ELVIS - Elevation and Depth - Foundation Spatial Data (locations: -31.7106136 °/ 148.6319926° and -31.7178805°/ 148.6591053°

Figure 5 - Catchment of the project area identified in Geofabric

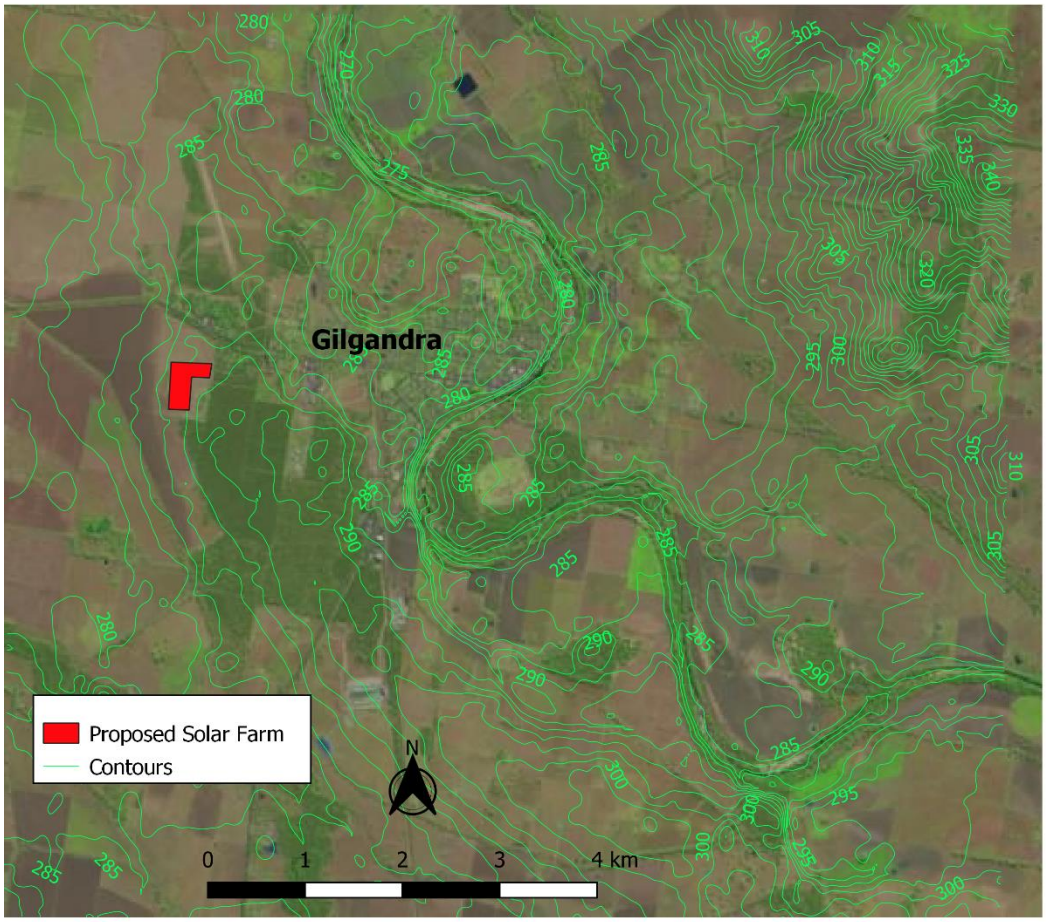


Figure 6 - Site topography

4.1 Historical Floods and Gilgandra Shire Local Flood Plan

The Gilgandra Shire Local Flood Plan (Gilgandra Shire Council, 2008) provides a summary of the record flood for the area in 1955 and other major flooding events. This record flood was the result of cyclonic depressions forming troughs extending from northern Australia and directing northerly streams of moist, unstable air into northern and central western NSW. Upstream of the town of Gilgandra the Castlereagh River is typified by rapid rises and falls, relatively short warning times before flooding occurs, and relatively high-velocity flood flows. Downstream of the town the grade of the stream flattens considerably and there is a lowering of flow velocities and channel capacity. The local flood plan states that "Flood travel times on the Castlereagh River vary greatly, depending largely on the severity of flooding ..." and that "Most flooding at Gilgandra would be limited to one to two days" (page A-2).

Figures 3 and 4 (above – Section 3.4) provide an indication of the location of the project site in relation to the LEP Flood Planning Area and record 1955 flood. These maps indicate that the project site is unlikely to flood from the direction of the Castlereagh River. However, it

would seem that there is potential for some localized (minor) inundation from minor drainage lines running from the north-west facing hillslope of the site.

5 AVAILABLE DATA

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

5.1 Rainfall for selected stations

The Bureau of Meteorology (BOM, 2021) has a station at the Gilgandra (station number 051018). Table 2 outlines the average annual and maximum daily, monthly and annual rainfall for the Gilgandra (Chelmsford Ave) station and another selected station approximately 34km from the town - Gilgandra (Wallumburrawang) Average monthly values for these rainfall stations are provided in Table 3.

Table 2 - Rainfall

Station Number	Station Name	Period of Record	Rainfall (mm)			
			Average Annual	Highest Annual	Maximum Daily	Highest Monthly
051018	Gilgandra (Chelmsford Ave)	1889 - 2021	560.2	1272.6	122.7	379.3
064024	Gilgandra (Wallumburrawang)	1901 - 2021	577.0	1255.7	129.0	282.2

Table 3 - Average Monthly Rainfall

Station Number	Rainfall (mm)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
051018	63.5	53.2	48.8	39.3	42.1	46.2	42.8	38.9	39.7	46.9	47.6	54.4
064024	65.8	56.8	48.7	37	43.5	48.5	45.3	39.9	41.3	50.2	51.8	58.3

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

The nearest surface water monitoring site to the town of Gilgandra (420901) is located 10kms upstream of the town. Streamflow records (Table 4) for this location are available from the WaterNSW Real-time portal but only old data or levels are available. A water monitoring site on the Castlereagh River approximately 100kms downstream of Gilgandra (420020) is listed as having full streamflow records.

Table 4 - Stream Gauging Stations

Station Number	Station Name	Available/Relevant Data	Distance from project area
420901	Castlereagh@Lucas Br	Only old data or levels available	10kms south
420020	Castlereagh@Gungalm	Watercourse Level, Watercourse Discharge, Water Temperature, Electrical Conductivity @ 25deg C	100kms north

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 that 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 and Hydrogeological Conditions

Gilgandra falls within the Macquarie-Castlereagh Alluvium Water Resource Plan Area (WRPA) as shown in Figure 7 below (NSWDPIE, 2018). This plan is currently pending resubmission (NSWDPIE, 2021). Consumer risk outcomes in the Macquarie-Castlereagh Alluvium WRPA for the Castlereagh Alluvium (GS14), indicate low risks to the structural integrity of the aquifer system, groundwater extraction, localised drawdown in bores reducing groundwater access, climate change reducing recharge and groundwater availability. Risks to water available for the environment are similarly listed as low (NSWDPIE, 2021). Groundwater salinity for GS14 is low (i.e. 0-1500 mg/L; see figure 8 below). There are few ground water dependent ecosystems near Gilgandra, with values along the Castlereagh River and surrounding tributaries showing low or unclassified potential (see figure 9 below). The project catchment site does not fall within the major area groundwater vulnerability along the Castlereagh River according to Environmental Planning Instrument (EPI) data (see figure 10 below and NSW Government, 2020). As there will be no extraction of groundwater or interference with the groundwater table during project activities, potential for impacts have not been considered further.

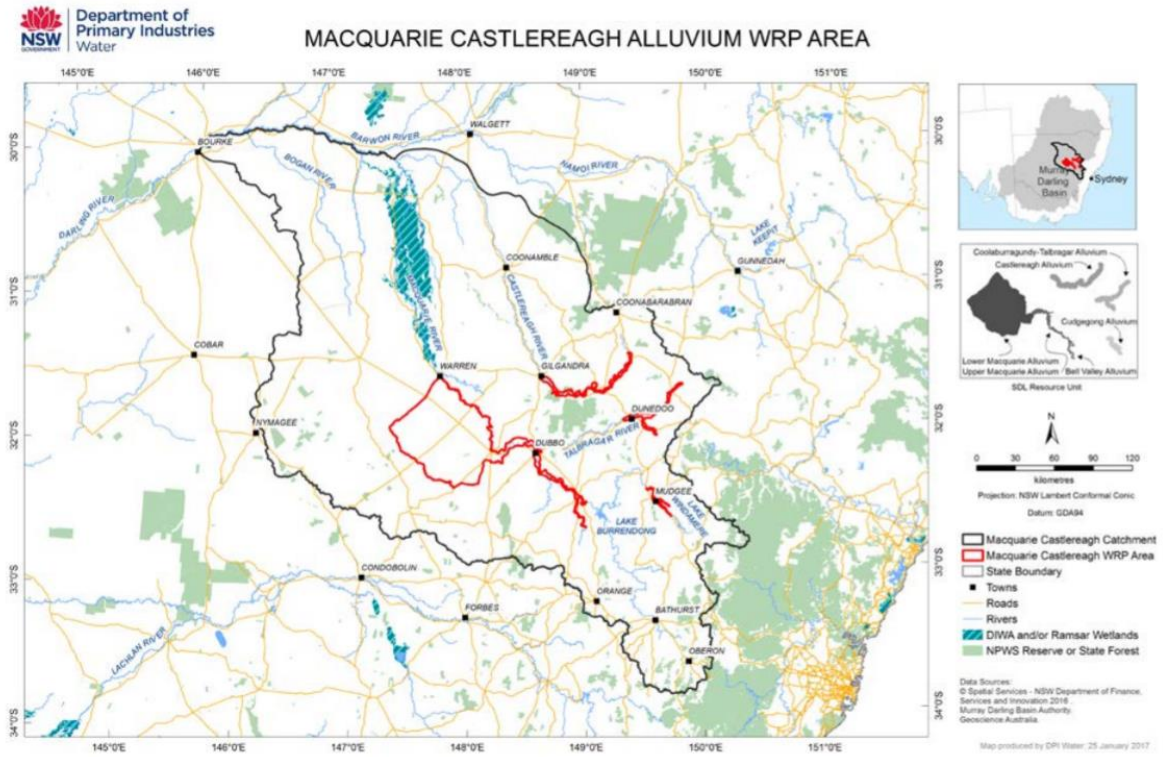
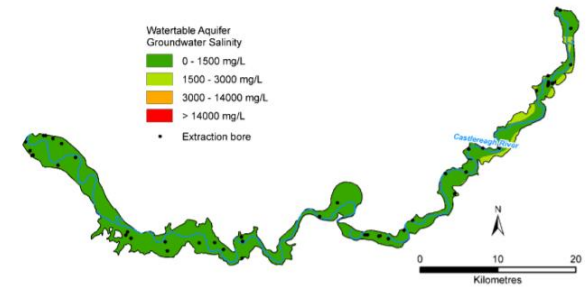


Figure 7 – The Macquarie-Castlereagh Alluvium Water Resource Plan area (source: NSWDPIE, 2018: 15)

Castlereagh Alluvium (GS14)



The groundwater salinity distribution was derived from the Basin in a Box dataset (MDBC, 2000)

SDL Resource Unit	Castlereagh Alluvium
Water Resource Plan Area	Macquarie-Castlereagh Alluvium
GMU(s) Covered	Castlereagh Alluvium
Recharge (RRAM Step 1)*	12.58 GL/y
Recharge Input	WAVES recharge modelling
PEL	0.63 GL/y
BDL	0.63 GL/y
SDL**	0.63 GL/y
Licensed Entitlement***	0.58 GL/y
Measured Groundwater Use	0.63 GL/y
Estimated Stock and Domestic Use***	0.09 GL/y
Entitlement plus stock and domestic	0.67 GL/y

Figure 8 – Groundwater salinity for the Castlereagh Alluvium GS14 (source MDBA, 2012, page: 28)

Figure 9 – Groundwater dependent ecosystems near Gilgandra (source: BOM, 2021b)

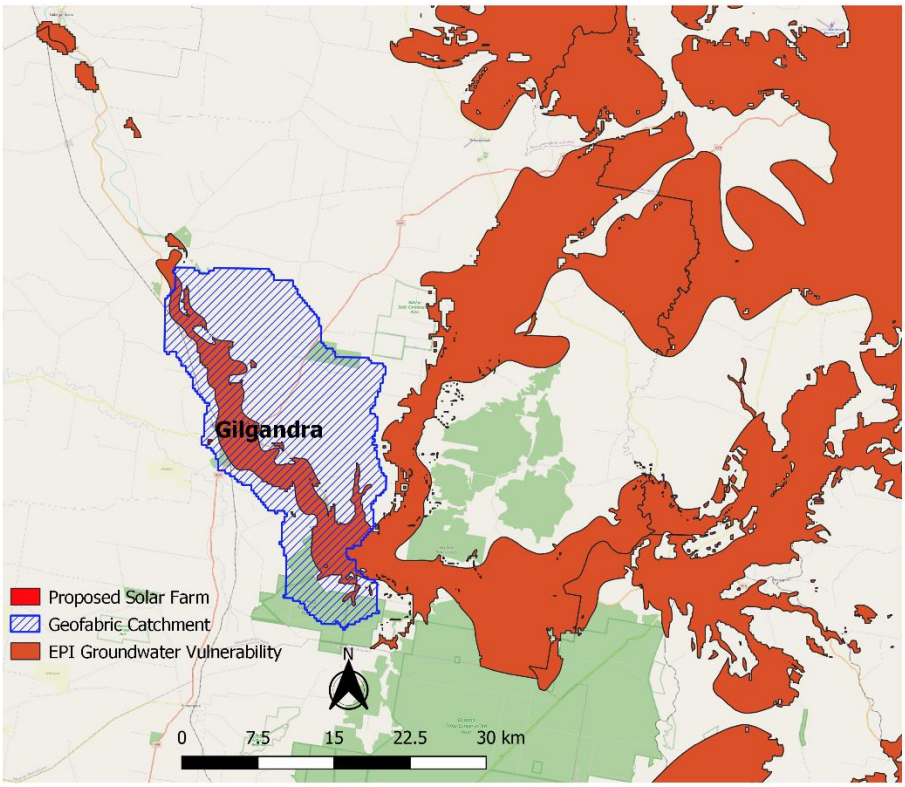


Figure 10 – The Project Geofabric Catchment and EPI Groundwater vulnerability areas

5.4 Surface Water and Riparian Conditions

The Water Sharing Plan for the Castlereagh Unregulated River Water Sources (known as WSP012) was first developed in 2011 and has a series of proposed amendments in 2019. It is currently pending resubmission (MDBA, 2021c). Gilgandra falls within the 'Gilgandra to Coonamble' water source area. Key objectives stated under the vision for the plan (see NSWDPIE, 2020) are to provide for:

- the health and enhancement of these water sources and their water dependent ecosystems;
- the productive and economically efficient use of water resources;
- the social and cultural benefits to urban and rural communities that result from the sustainable and efficient use of water;
- the spiritual, social, customary and economic benefits to Aboriginal communities that result from the sustainable and efficient use of water;
- protect and enhance the recorded distribution or extent of target ecological populations including native fish and native vegetation

Water quality in the Macquarie Castlereagh surface water resource plan area (SW11) is listed as fair in the Gilgandra area based on the Integrated water quality index (see figure 11 below). Recovery potential of rivers in the Gilgandra area show moderate values and value for conservation (see figure 12 below). Potential impacts on surface water quality are considered further in sections 6 and 7 below.

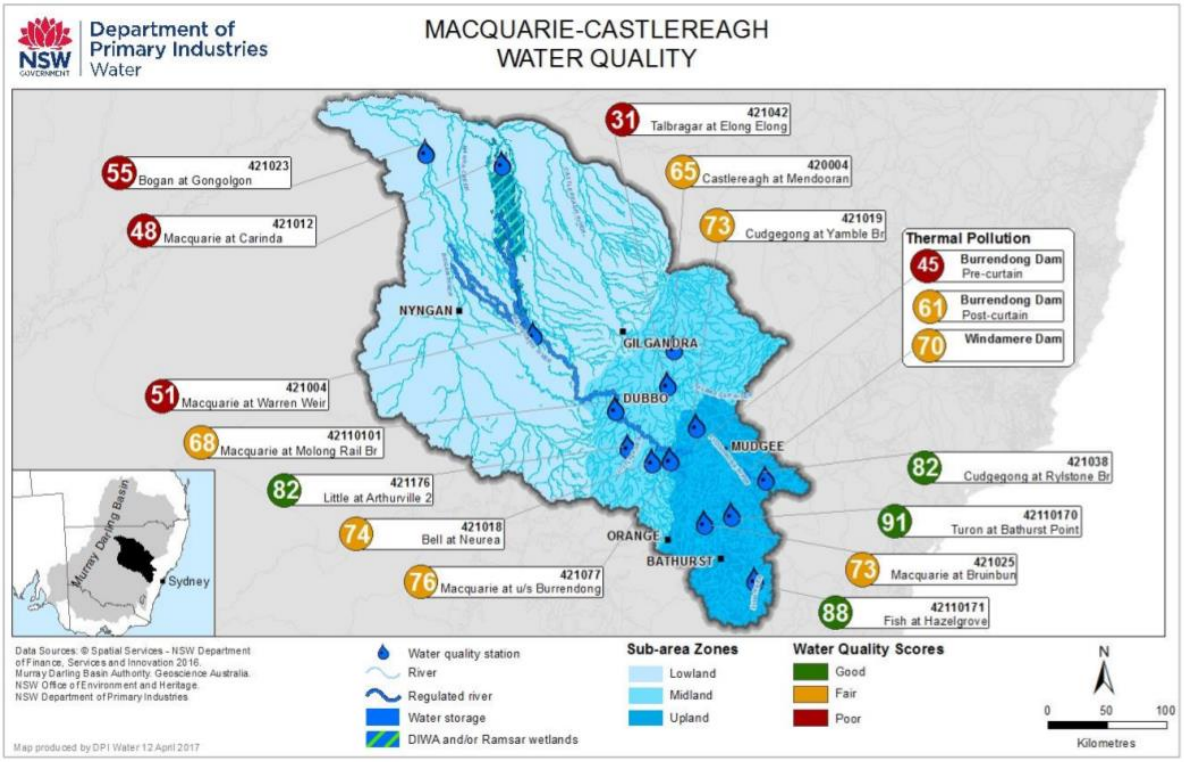


Figure 11 – Macquarie Castlereagh WRPA water quality index scores (source: NSWDPIE, 2018:30)

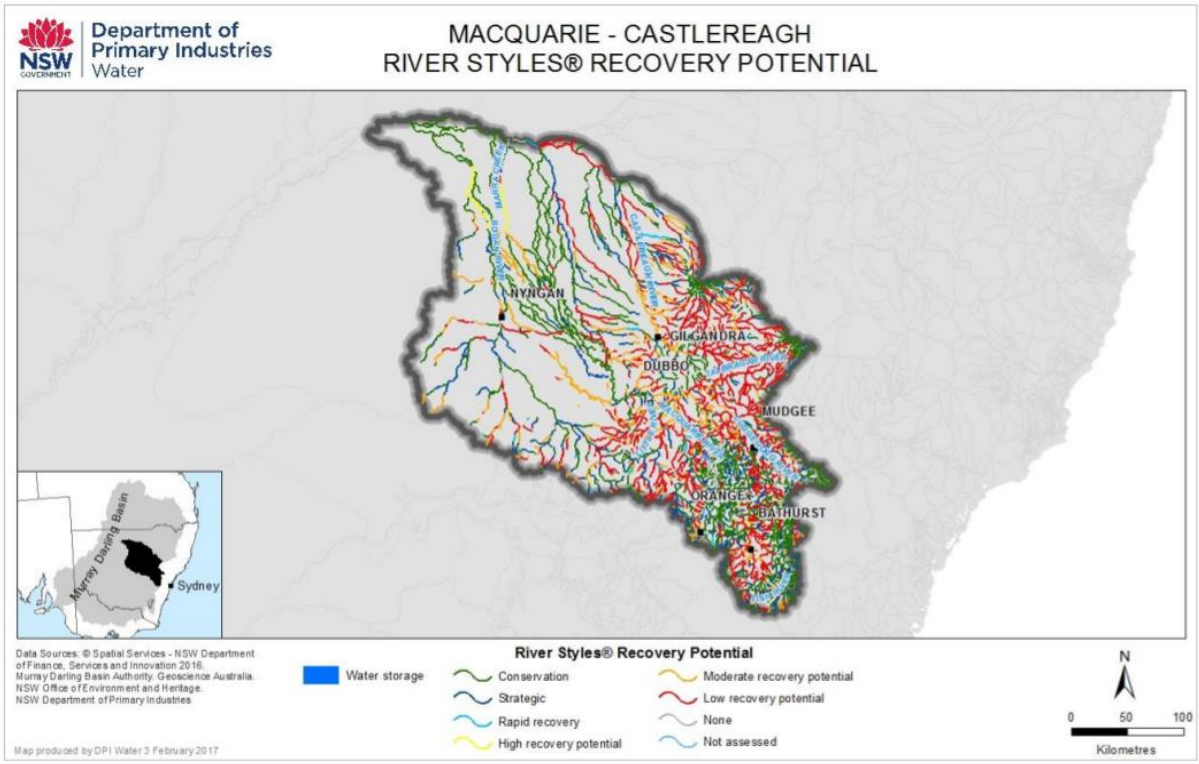


Figure 12 – River recovery potential in the Macquarie Castlereagh WRPA (source: NSWDPI, 2019 page 39)

6 POTENTIAL IMPACTS

The proposed site activity is not expected to materially contribute to any regional groundwater issues, particularly those associated with nearby farming districts.

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

- Site accessibility and inundation.
- Managing downstream sedimentation.

As there will be no extraction of groundwater or interference with the groundwater table during project activities, potential for impacts have not been considered further.

6.1 Flooding

The project site is not within any mapped flood zones flood shown in the Gilgandra LEP (2011) and the Gilgandra Shire local flood plan (see figures 3 and 4 above). The site does not have any significant drainage lines passing through it due to the flat topography of the immediate area (see figure 6 above).

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 farming there is very little natural ground cover vegetation. The eSPADE resource (NSWOEH, 2021), provides a Soils Profile Report (id: 1005202) for a site within 7.5 kilometres to the south-west of the proposed solar site (see figure 13 and table 5 below). Site 1005202 indicates a soil profile with dark brown light clay with alluvium lithology. The physiography is described as having extremely low local relief. There is the potential that the proposed solar site runoff will contain sediments and increase turbidity or other water quality parameters in downstream water ways.

Table 5 - Site details for eSPADE site 1005202

SITE DETAILS

Site Location:	4km Townsend Lane
Map Reference:	MGA Grid Reference: Zone 55, 647405E, 6488452N. 8634 GILGANDRA (1:100000) map sheet.
Profile Details:	Gilgandra 1:250,000 soil landscapes - CMA Survey (1005202), Profile 204, collected by Mr Geoffrey Kew on 29 January, 2009
Physiography:	woodland grass understorey on alluvium lithology and used for timber/scrub/unused. Slope 1% (estimated), local relief extremely low (< 9m), elevation 277.0 m, aspect north. Surface condition is cracked, firm, profile drainage is imperfectly drained, erosion hazard is moderate, and no salting evident
Soil Type:	Epicalcareous Crusty Black Vertosol (ASC)
Base of observation:	
Profile Field Notes:	

SOIL DESCRIPTION

Layer 1

0.00 - 0.05 m A Horizon	dark brown (10YR 3/3) [moist] light clay with weak pedality (crumb, 1 - 2 mm, rough-faced peds), common (10-25/10x10cm) roots (<1mm), field pH is 5.5. Coarse fragments are not evident, segregations are not evident; sharp (<5 mm) boundary to ...

Layer 2

0.05 - 0.40 m B21 Horizon	very dark greyish brown (brownish black) (10YR 3/2) [moist] medium clay with moderate pedality (angular blocky, 20 - 50 mm, rough-faced peds), few (1-10/10x10cm) roots (<1mm), field pH is 9.0. Coarse fragments are not evident, segregations are not evident; clear (20-50 mm) boundary to ...

Layer 3

0.40 - 0.90 m B22k Horizon	brown (dull yellowish brown) (10YR 4/3) [moist] medium clay with moderate pedality (angular blocky, 20 - 50 mm, rough-faced peds), few (1-10/10x10cm) roots (<1mm), field pH is 9.0. Coarse fragments are not evident, segregations are common (10% - 20%), calcareous; clear (20-50 mm) boundary to ...

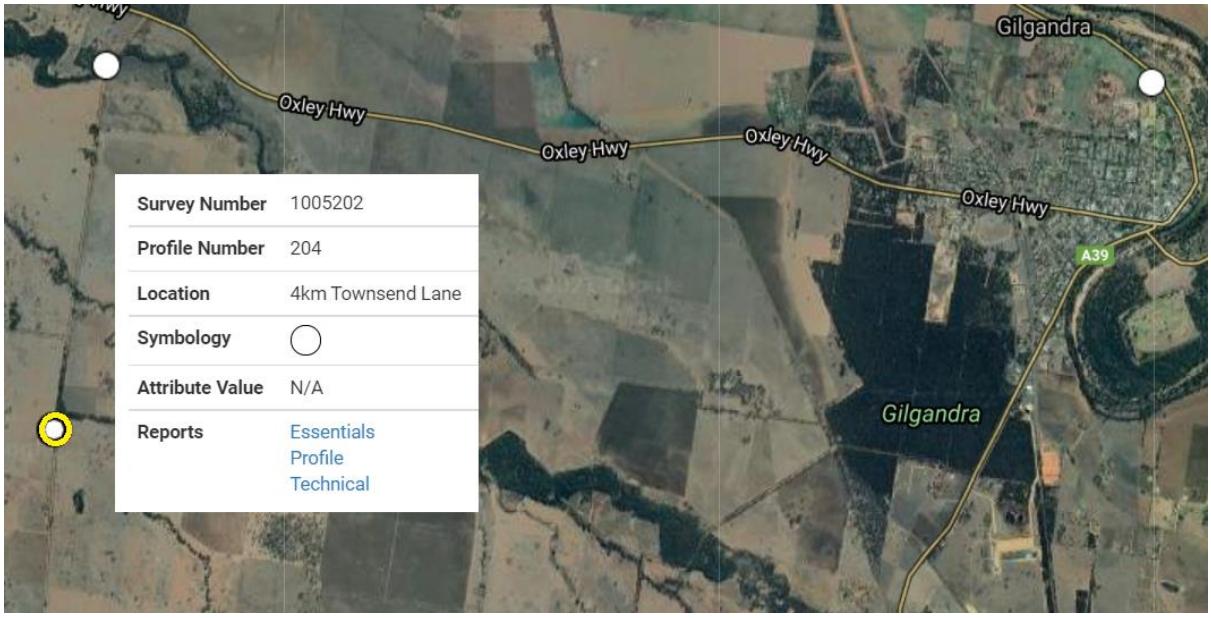


Figure 13 - The location of the eSPADE site 1005202 (source: espade.environment.nsw.gov.au © State of NSW and Office of Environment and Heritage 2021)

7 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 impacts to the project construction and to increase 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 6.

Table 6 – Proposed Mitigation Measures

Stage	Measure	Activities/Approach
Design	Site drainage and water quality controls	Design Basis • Undertake hydrological assessment of the site's 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. • 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[3] 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 offsite (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 of offsite 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.

[3] 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

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