



**GOLDER**

**REPORT**

# Burrundulla Mini Sustainable Energy Park

## *Water Assessment*

Submitted to:

**ITP Renewables**

ITP Renewables



Submitted by:

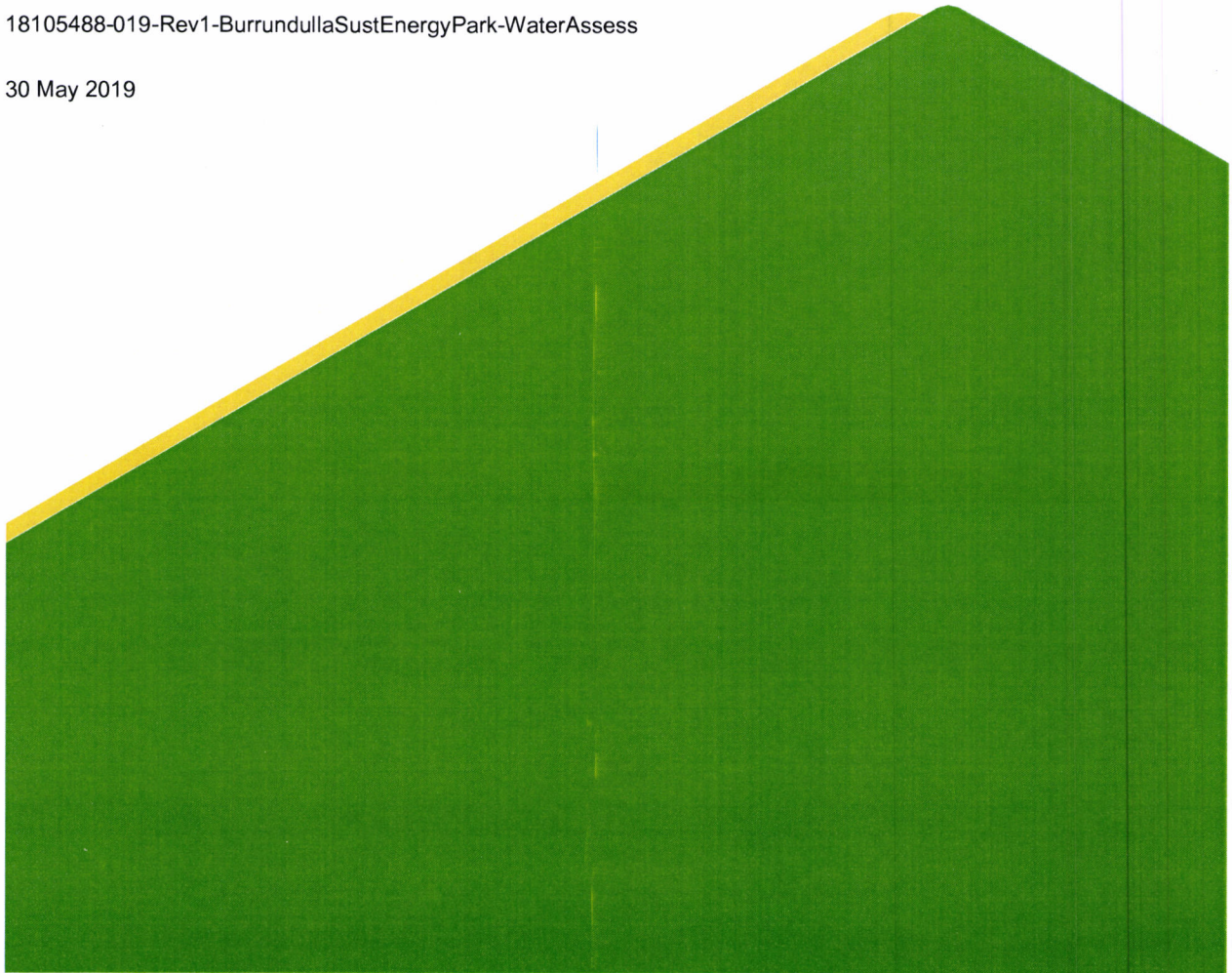
**Golder Associates Pty Ltd**



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18105488-019-Rev1-BurrundullaSustEnergyPark-WaterAssess

30 May 2019



# Distribution List

ITP Renewables



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Important Information Relating to this Report

## 1.0 INTRODUCTION

The proposed Burrundalla Mini Sustainable Energy Park (also referred to as Mudgee1C/3C Solar Farm) is located on the Castlereagh Highway 105 km south-east of Dubbo and 5 km south-east of Mudgee, New South Wales (NSW). The Project site is within Lot 6 / DP 1069441. ITP Renewables (Australia) Pty Ltd (ITP Renewables) propose to construct a 10 MWDC solar facility within the site that is currently used for grazing.

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

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

### 1.1 Limitations of assessment

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

### 1.2 Important information relating to this report

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



## 2.0 PROJECT DESCRIPTION

The proposed Burrundalla Mini Sustainable Energy Park is located on the Castlereagh Highway 105 km south-east of Dubbo and 5.0 km south-east of Mudgee (Figure 1).

Mudgee is located on the western side of the Great Dividing Range, approximately 261 km west of Sydney on the Cudgegong River. The Cudgegong River is a tributary of the Macquarie River and is significant in the region. The Project area is within the Mid-Western Regional Council area.

The town of Mudgee is located on the banks for the Cudgegong River and is drained by streams with their headwaters in the foothills in the south of the town. The watercourses within the town and its surrounds flow in a northerly direction and discharge into the Cudgegong River. Eight creeks or drainage lines run through the town of Mudgee. The lower reaches of the creeks and drainage lines are subject to flooding from the Cudgegong River. The creeks respond quickly to intense bursts of rain and consequently rise to a peak flood level (flash flooding) within 20 mins after the commencement of heavy rainfalls (Lyll and Associates Consulting Water Engineers, 2008).

The topography of Mudgee is relatively flat, with slight hills rising in the south of the town. There are steep hillsides present in the Avisford Nature Reserve, located south of the town (south-east of the Project area) (Hunter Water Australia Strategic Services, 2001).

The proposed facility is located 500 m east of Oaky Creek. A drainage line flows through the Project area towards the Cudgegong River located 1.3 km to the north. The Cudgegong River flows north towards the town of Mudgee.

The Project area is relatively flat, with the land sloping downwards approximately 6 m from west to east. The land in the south is 482 m AHD dropping to 472 m AHD in the north where a farm dam (0.5 ha) exists. The land is mostly cleared of native vegetation and is currently used for grazing (Figure 2).

ITP Renewables propose to construct a solar farm with two systems on the parcel of land (Lot 6 / DP 1069441). System A on the western portion of the land parcel and System B on the eastern portion. Both systems will have a DC array capacity of 6.05 MW<sub>DC</sub> and an AC output of 5 MW<sub>AC</sub> resulting in a 10 MW solar farm.

There will be 31,416 solar modules installed in rows running north-south across the site. Each row of PV modules will rotate to track the sun across the sky from east to west each day. The solar farm will also consist of two inverter stations, located within the arrays and mounted on a 20 ft skid. The inverter stations will incorporate High/Medium voltage switchgear and transformers.

The mounting system will be constructed on piles that are driven into the ground approximately 1.6-3.5 m. Trenching for low voltage is around 600 mm and high voltage 1,200 mm. Once operational the site will be unmanned with maintenance expected to be carried out quarterly by a crew of 2 – 3 people.





- LEGEND**
- Town
  - Rainfall Station
  - Distance and Direction to other Rainfall Station
  - Roads
  - Electricity Transmission Line
  - Hydrolines
  - Major Watercourses
  - Cadastre**
  - Lots/Plans of Interest
  - Other Lots/Plans

Coordinate System: GDA 1994 MGA Zone 56  
 Projection: Transverse Mercator  
 Datum: GDA 1994



**ITP RENEWABLES**

CONSULTANT	GOLDER
DRAWN BY	Z/US/2019
DESIGNED BY	BG
PLANNED BY	BG
REVIEWED BY	DP
APPROVED BY	JR

**NOTE(S)**  
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**Source:** Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community  
**REFERENCE(S)**  
**Rainfall Station:** © Commonwealth of Australia 2019, Bureau of Meteorology  
**All other data:** © State of NSW (Spatial Services - Department of Finance, Services and Innovation) 2019.

**PROJECT**  
**BURRUNDALLA MINI SUSTAINABLE ENERGY PARK**

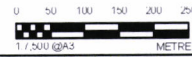
<b>PROJECT LOCATION</b>			
PROJECT NUMBER	CONTRACT	PGS	PHASE
18105488	019	0	1





- LEGEND**
- 10 m surface elevation contours
  - Hydrolines
  - Roads
  - Surface Water Features
- Cadastre**
- Lots/Plans of Interest
  - Other Lots/Plans

Coordinate System: GDA 1994 MGA Zone 50  
 Projection: Transverse Mercator  
 Datum: GDA 1994



**ITP RENEWABLES**

CONSULTANT



DATE	2/05/2019
DESIGNED	BG
PREPARED	BG
REVIEWED	DP
APPROVED	JR

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

**REFERENCE(S)**  
 All data: © State of NSW (Spatial Services - Department of Finance, Services and Innovation) 2019

**BURRUNDALLA MINI SUSTAINABLE ENERGY PARK**

**PROJECT AREA**

PROJECT NO	CONTROL	REV	DATE
18105488	019	0	2



### 3.0 LEGISLATIVE CONTEXT

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

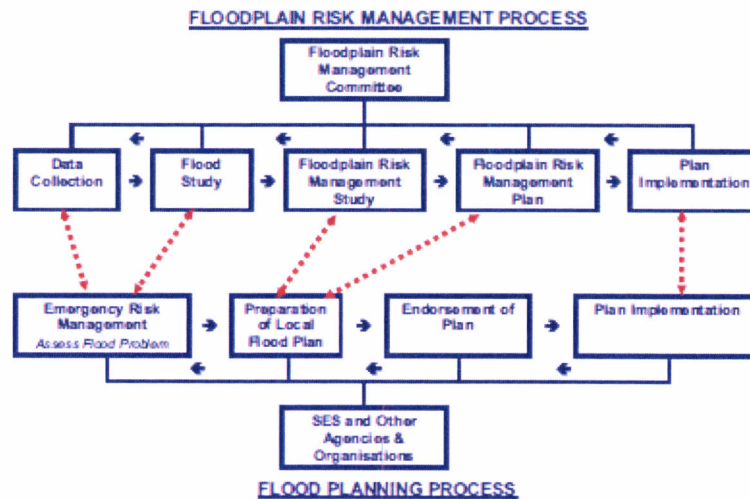


Figure 3: Floodplain risk management and planning process

#### 3.1 Local Government Act 1993

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

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

#### 3.2 Environmental Planning and Assessment Act 1979

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

#### 3.3 Water Management Act 2000

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

### 3.3.1 Surface water sharing plan

The Water Management Act 2000 applies to areas of NSW that have a water sharing plan. The Project area is located within the Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012 area. The water source for the area is listed as being the Cudgegong alluvial. The water sharing plan recognises the connection between the Cudgegong alluvial groundwater source and the Cudgegong river.

There is also an additional water sharing plan specific for the Cudgegong River; the Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016. This plan aims to ensure flows are protected. It contains provisions for the delivery of environmental water as well as stock and domestic replenishment flows to unregulated sources below the regulated river.

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

### 3.3.2 Groundwater sharing plan

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

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

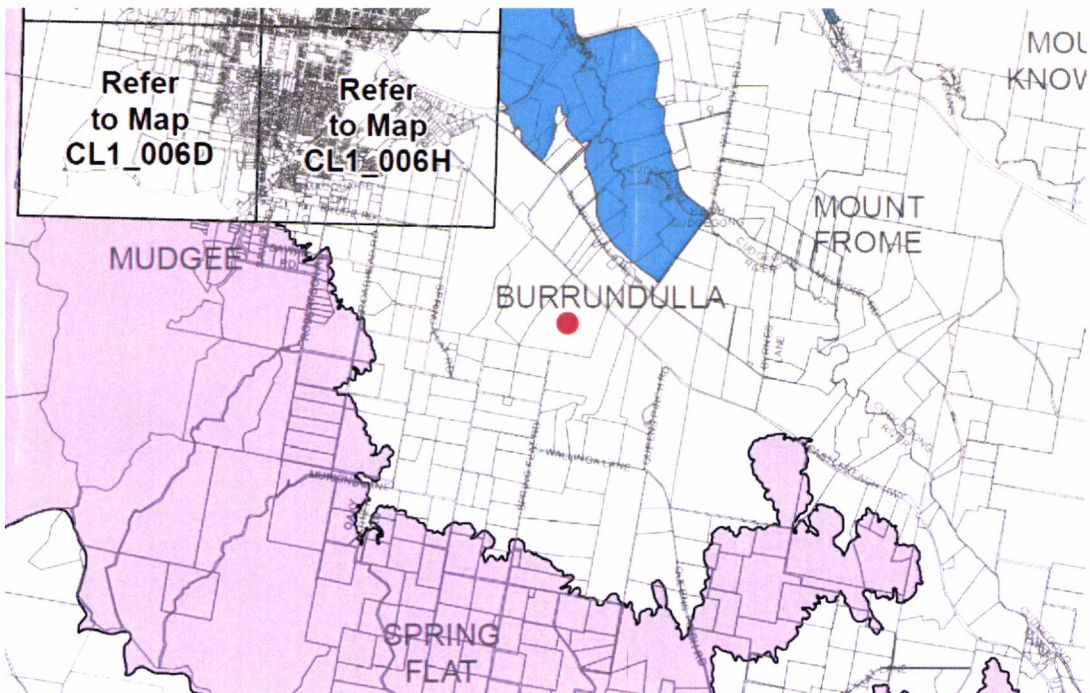
## 3.4 Mid-Western Regional Local Environmental Plan 2012

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

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

The Plan (Part 6.1) does provide specific management requirements for flood planning which applies to land at or below the flood planning level (1 in 100 ARI plus 0.5 m freeboard). It requires that development consent cannot be granted unless the proposed development is compatible with the flood hazard of the land, will not cause significantly adverse impacts to other developments, the environment and the community and incorporates measures to manage risk to life. According to the accompanying flood planning map, the site is not considered to be part of the flood planning area (see Figure 4 with the Project area marked in red and Appendix A for the full Flood Planning Map - Sheet CL1\_006 from the Local Environmental Plan). The closest flood planning area is located 1.4 km to the north of the Project area, which is indicated by blue shading within the area of the Cudgegong River.





**Figure 4: Flood planning area**

Groundwater vulnerability mapping (Groundwater Vulnerability Map - Sheet GRV\_006 within the Plan) (Figure 5) indicates that the Project area (indicated in red) is considered 'groundwater vulnerable' (blue shading). The plan requires that development consent cannot be granted unless the proposed development will be designed and managed to avoid significant environmental impact or if such impact is unavoidable the proposed development will be designed and managed to minimise the impacts or if such impact is unable to be mitigated the proposed developed will be managed to mitigate that impact.

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



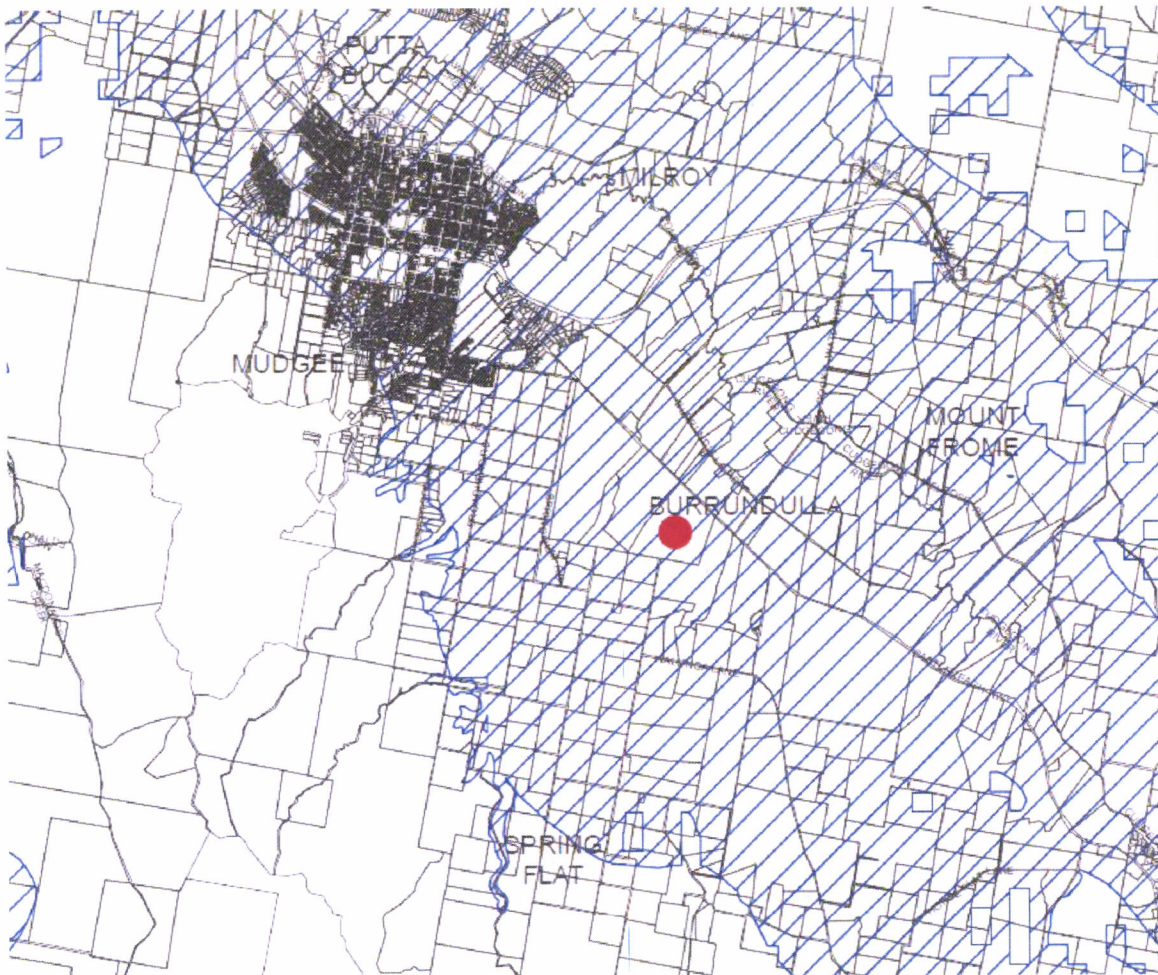


Figure 5: Vulnerable groundwater

### 3.4.1 Mid-Western Development Control Plan

The Mid-Western Development Control Plan 2013 (DCP) provides guidance for developments and supports the statutory planning controls of the Local Environmental Plan. The guidance provides proponents assistance with criteria to address in development applications, however this relates mostly to housing developments.

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

There is a Mid-Western Regional Council DCP report – Managing flood risks (2007) specific to the former Mudgee Shire Local Government Area. However, this information mostly relates to flood compatible materials and is likely to have been superseded with the current DCP and LEP.

### 3.4.2 Mid-Western Regional Council Community Plan

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

- Looking after our Community
- Protecting our Natural Environment
- Building a Strong Local Economy



- Connecting our Region
- Good Government

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

### 3.5 State Environmental Planning Policy (Infrastructure) 2007

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

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

### 3.6 Protection of the Environment Operations (POEO) Act 1997

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

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

### 3.7 Soil Conservation Act 1938

This Act makes provision for the conservation of soil resources and for the mitigation of erosion. The act allows the Minister for Primary Industries<sup>1</sup> 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.

## 4.0 CATCHMENT AND FLOOD HISTORY

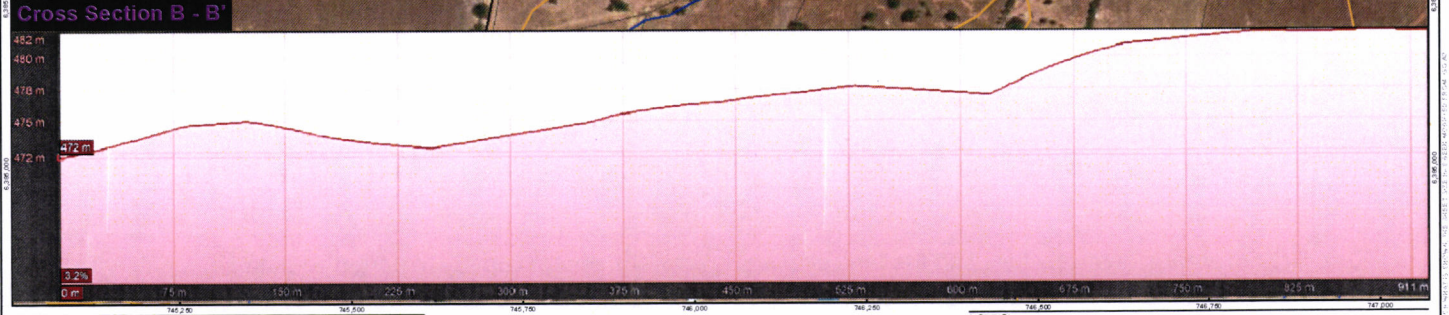
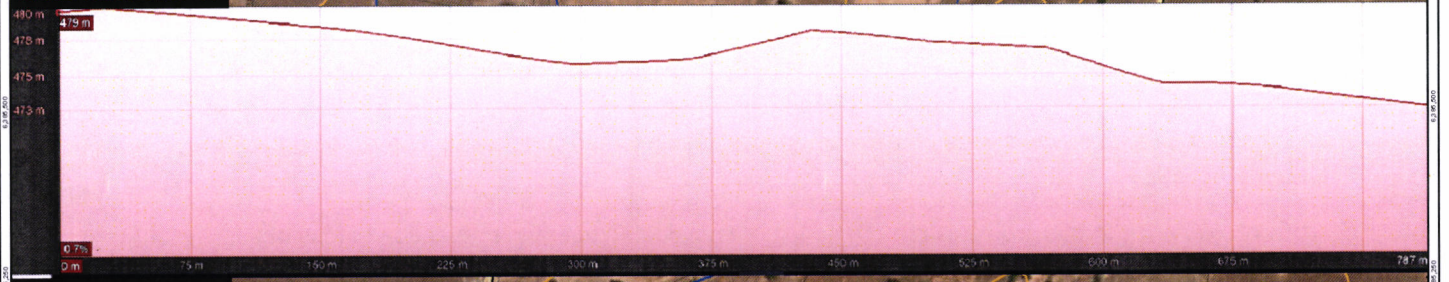
The Project is located in the Mid-Western Regional Council Area, 4.5 km south-east of Mudgee. The proposed facility is located 500 m east of Oaky Creek (Figure 2). A drainage line flows through the Project area towards the Cudgong River located 1.3 km to the north. The Cudgong River flows north towards the town of Mudgee.

The Project area is relatively flat, with the land sloping downwards approximately 6 m from west to east. The land in the south is 482 m AHD dropping to 472 m AHD in the north where a farm dam (0.5 ha) exists. The land is mostly cleared of native vegetation and is currently used for grazing (Figure 6).

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





- LEGEND**
- East-west Cross Section Start and End Points
  - North-south Cross Section Start and End Points
  - East-west Cross Section Line
  - North-south Cross Section Line
  - 10 m surface elevation contours
  - Hydrolines
  - Roads
  - Surface Water Features
- Cadastre**
- ▭ Lots/Plans of Interest
  - ▭ Other Lots/Plans

Coordinate System: GDA 1984 MGA Zone 55  
 Projection: Transverse Mercator  
 Datum: GDA 1984



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

**REFERENCE(S)**  
 All data: © State of NSW (Spatial Services - Department of Finance, Services and Innovation) 2019  
**Cross Section:** Derived from Google Earth on 23rd May 2019

PROJECT		Burrundalla Mini Sustainable Energy Park	
DRAWN		BG	
CHECKED		BG	
DESIGNED		DP	
APPROVED		JR	
DATE		2/05/2019	
PROJECT NO.		18105488	
SHEET NO.		019	
REV.		0	
DATE			
DRAWN BY		BG	
CHECKED BY		BG	
DESIGNED BY		DP	
APPROVED BY		JR	
DATE		2/05/2019	
PROJECT NO.		18105488	
SHEET NO.		019	
REV.		0	
DATE			

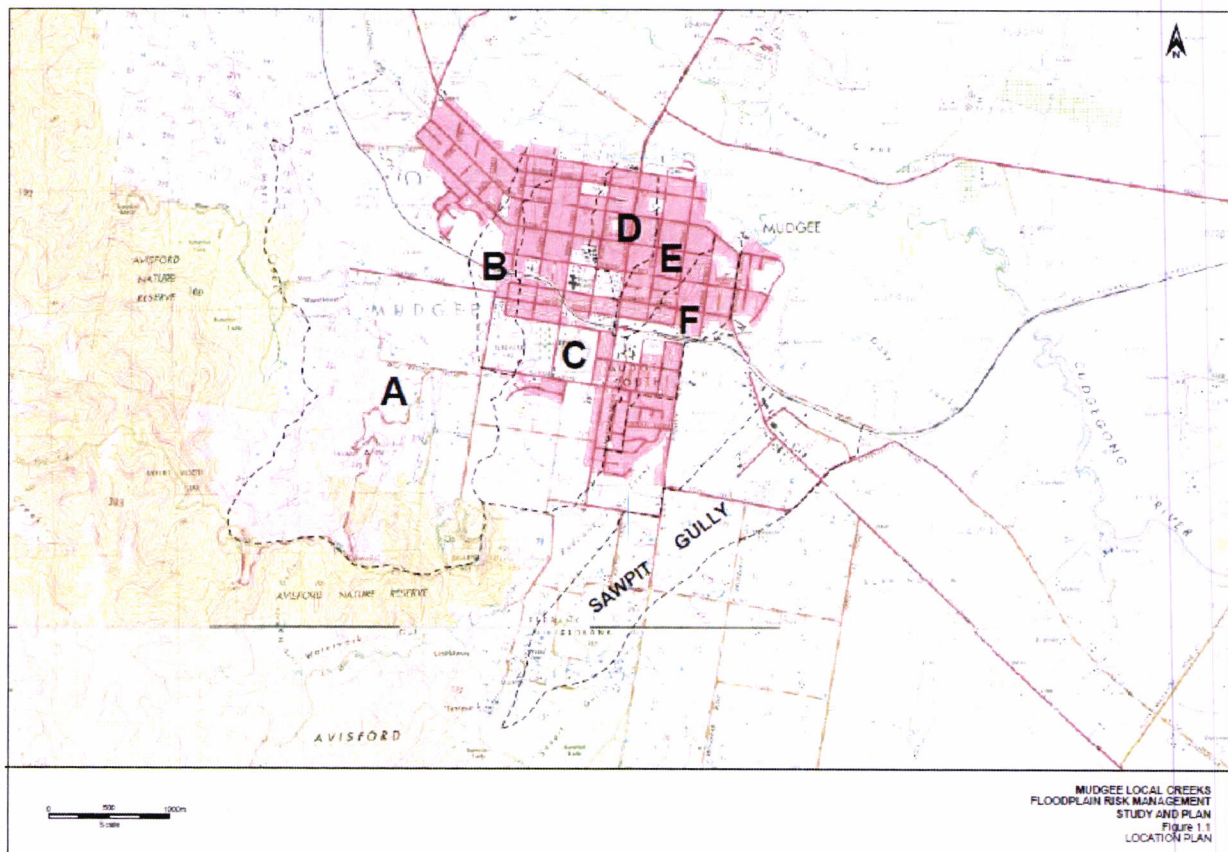
ITP RENEWABLES - BURRUNDALLA MINI SUSTAINABLE ENERGY PARK - SITE TOPOGRAPHY - 019



## 4.1 Mudgee and Gulgong Stormwater Management Plan

Mudgee and Gulgong Stormwater Management Plan (SMP) 2001 (Hunter Water Australia Strategic Services, 2001) aimed to address stormwater management problems within the catchment area (particularly water quality issues). The plan describes the catchment and existing catchment conditions. The SMP discussed drainage studies undertaken that identified problem areas within the town that were prone to flooding.

Lyall and Macoun Consulting Engineers (1998) divided the town into 7 sub-catchments (catchments A to F and Sawpit Gully). These catchments are the same as those more recently described in the Mudgee local creeks floodplain risk management study and plan 2008 (Section 4.3) (Lyall and Associates Consulting Water Engineers, 2008). Figure 7 is taken from the Mudgee local creeks floodplain risk management study and plan 2008 (Lyall and Associates Consulting Water Engineers, 2008).



**Figure 7: Mudgee town catchments**

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

**Table 1: Construction phase stormwater management objectives for new developments**

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

## 4.2 Mudgee floodplain management study and plan 2002

The Mudgee floodplain management study and plan (2002, Bewsher Consulting) was developed for the Council to understand the risks to houses and buildings located within the lower lying areas of Mudgee from floods. The study aimed to investigate what could be done to minimise the effect of flooding. The Project area (indicated in red) is outside of the Mudgee floodplain management study area (the PMF area for Cudgegong River) (Figure 8).

The 2002 (Bewsher Consulting) report identified the following significant floods in the Mudgee area:

- February 1955 (believed to be the largest on record since 1870)
- March 1956
- November 1969
- February 1971
- January 1974
- August 1990



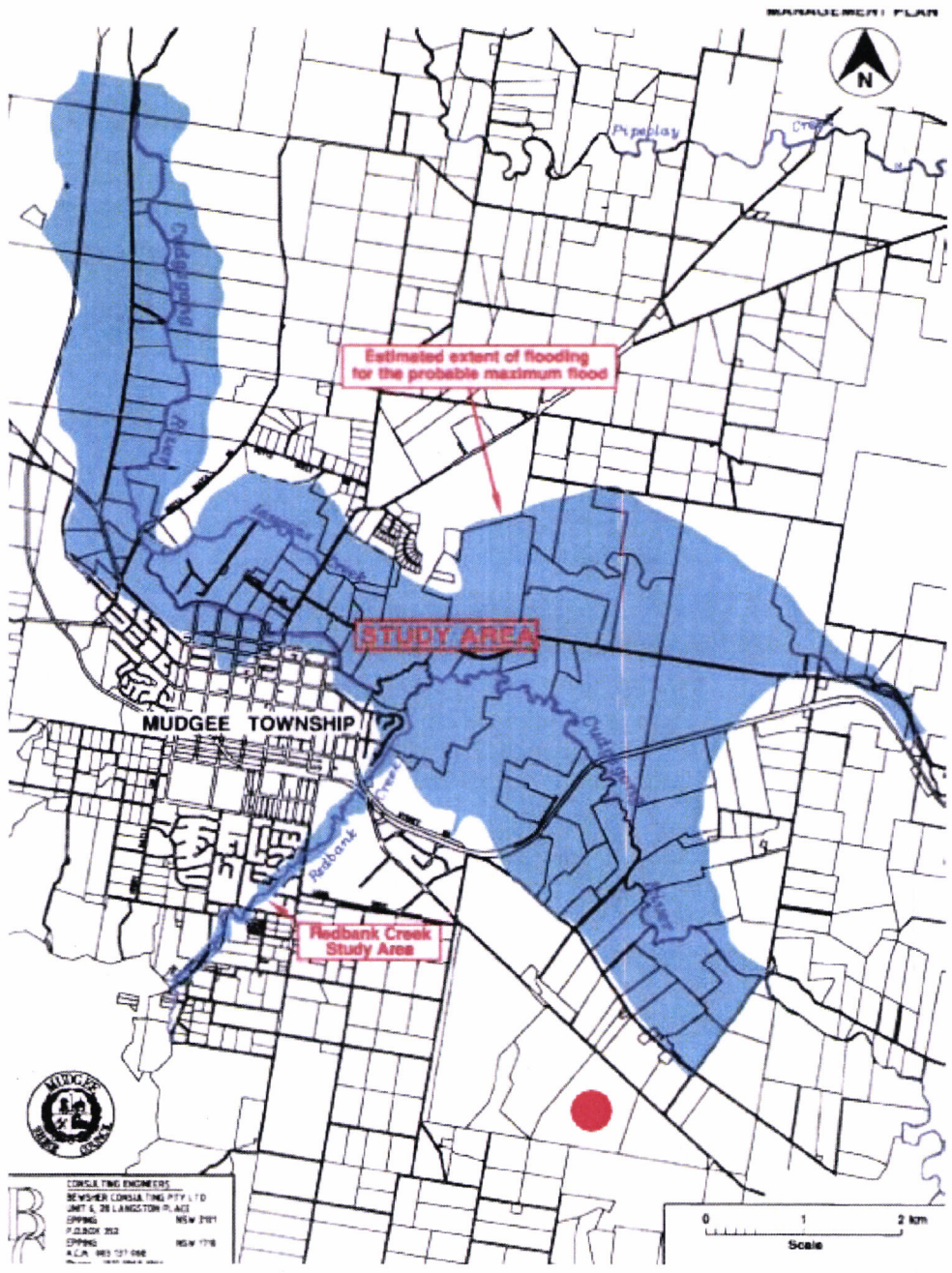


Figure 8: Probable maximum flood area for 2002 study

### 4.3 Mudgee local creeks flood study 2008

The Mudgee local creeks floodplain risk management study and plan 2008 (Lyll and Associates Consulting Water Engineers, 2008) aimed to assess the impacts of flooding, define flooding conditions, review policies and options for management of flood affected land and to develop a draft Floodplain Risk Management Plan (FRMP). It also aimed to identify properties with potential to flood.



The study identified seven (7) catchments for the flood study and assessed the 100-year design flood extent and the Probable Maximum Flood (PMF) extent for the Mudgee local creeks (including the Cudgegong River to the north of the Project area). The PMF is described as the limiting value of floods that could reasonably be expected to occur (Lyall and Associates Consulting Water Engineers, 2008).

The report notes the major flooding event which occurred at Mudgee on 22 February 2003. The Mudgee PO rain gauge recorded 178 mm of rain within a 24 hour period with rainfall occurring over the prior days. The rainfall event was resulted in flood peaks greater than the design 100-year average recurrence interval (ARI) event (Lyall and Associates Consulting Water Engineers, 2008).

The Project area is outside of the PMF extent for the Cudgegong River, as shown in Figure 9.

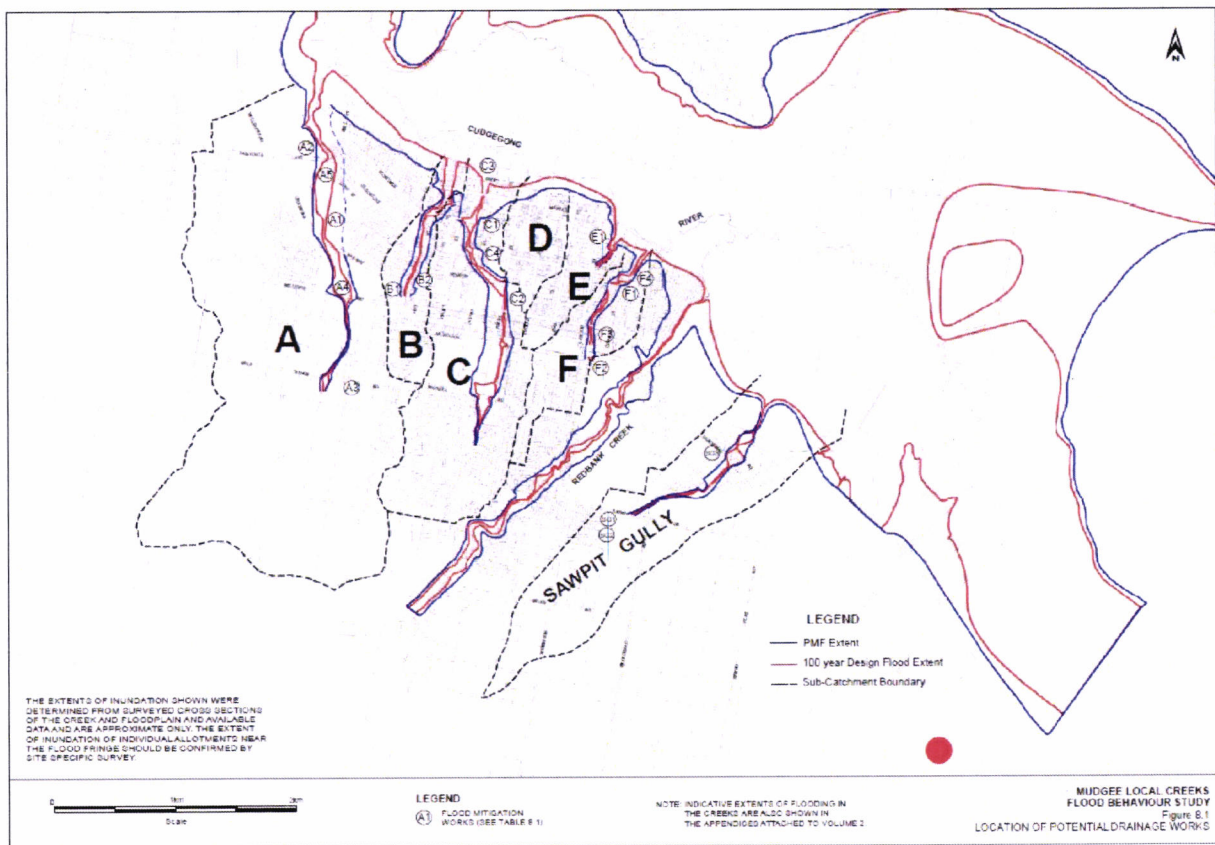


Figure 9: Mudgee local creeks - flood extents

## 5.0 AVAILABLE DATA

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

### 5.1 Rainfall

The Bureau of Meteorology (BOM) has one station within Mudgee, George Street (Figure 1). Another site is located 4.45 km to the north at Mudgee airport. Table 2 outlines the average annual, maximum annual, maximum daily and maximum monthly rainfall. Average monthly values for the two rainfall stations are in Table 3.

**Table 2: Rainfall**

Station Number	Station Name	Period of Record	Rainfall (mm)			
			Average Annual	Highest Annual	Maximum Daily	Highest Monthly
062021	Mudgee (George Street)	1870 - 2019	670.3	1442.5	169	303.2
062101	Mudgee airport	1994 - 2019	663.2	1152.4	174.2	241.6
062013	Gulgong post office	1881 - 2019	650.5	1411.7	134.4	354.3

**Table 3: Average Monthly Rainfall**

Station Number	Rainfall (mm)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
062021	68.0	62.7	52.9	43.5	48.9	54.9	52.6	52.1	52.3	59.4	61.8	65.2
062101	67.6	63.1	58.9	33.2	37.9	45.0	43.4	35.2	54.6	51.1	75.4	80.7
062013	70.5	60.9	55.0	43.7	44.9	50.8	48.8	45.8	47.0	55.6	60.0	67.3

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

## 5.2 Streamflow

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

**Table 4: Stream Gauging Stations**

Station Number	Station Name	Available/Relevant Data	Distance from project area
421150	Cudgegong River at Wilbertree Road	Level, discharge	16 km south
421019	Cudgegong River at Yamble Bridge	Level, discharge, EC, water temp	16 km 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 which may impact on site access. Information is publicly available from WaterNSW Real-time data portal and could be incorporated into site management plans.



### 5.3 Groundwater

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

- minor alluvial systems in the highlands
- fractured rock aquifers of the Lachlan Fold Belt
- porous rock aquifers associated with the Gunnedah Basin

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

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

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

Alluvial aquifers are the main groundwater sources for town water supply and irrigation water in the Macquarie-Bogan catchment. The Project area falls within the Lachlan Fold Belt fractured rock groundwater management area. As indicated in Figure 10, the site (located 105 km south-east of Dubbo) is underlain by the fractured rock unit (DECCW, 2010).

#### Macquarie-Bogan Catchment

Groundwater Aquifer Type

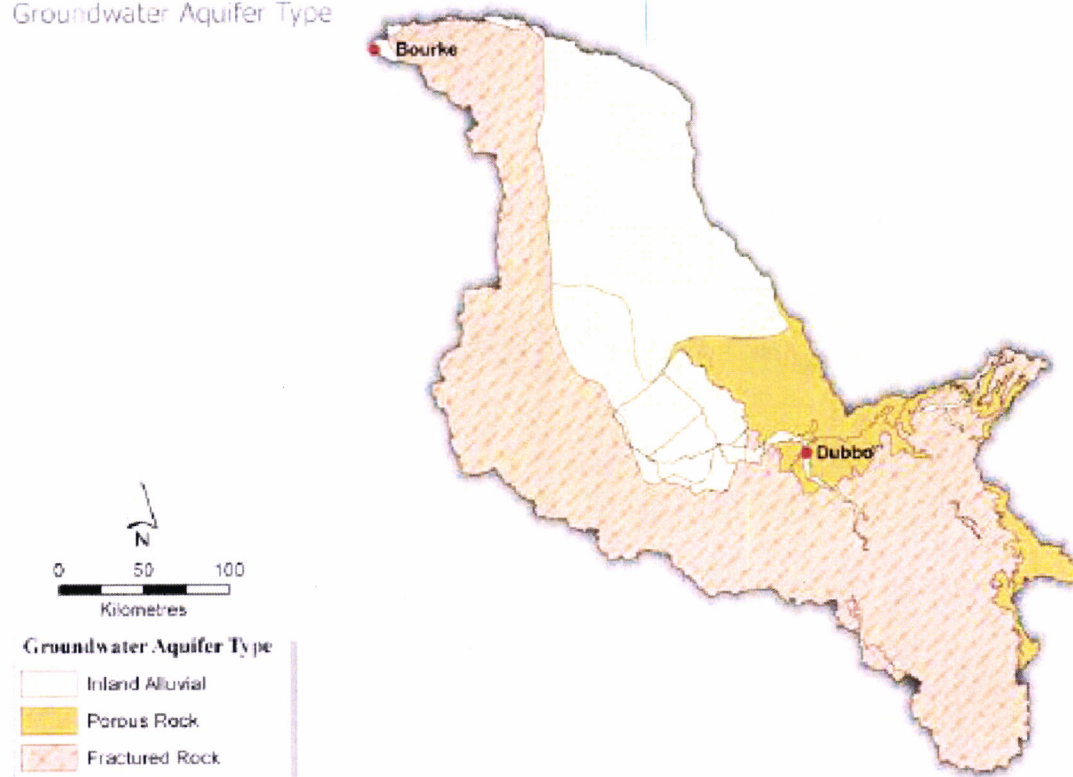


Figure 10: Macquarie-Bogan Catchment Groundwater Aquifer Type



The Murray Darling Basin Authority (MDBA) commissioned an independent assessment of approaches to achieve sustainable use and management of basin groundwater resources which includes the Lachlan Fold Belt (Anderson et al, 2013). The closest MDBA monitoring bore is GW096082 (Figure 11) Figure 12 indicates a relatively long term and stable water level in this government monitoring bore for the groundwater unit which confirms there is unlikely to be rising groundwater and salinization associated with groundwater from this geological unit (DPIW, 2017).

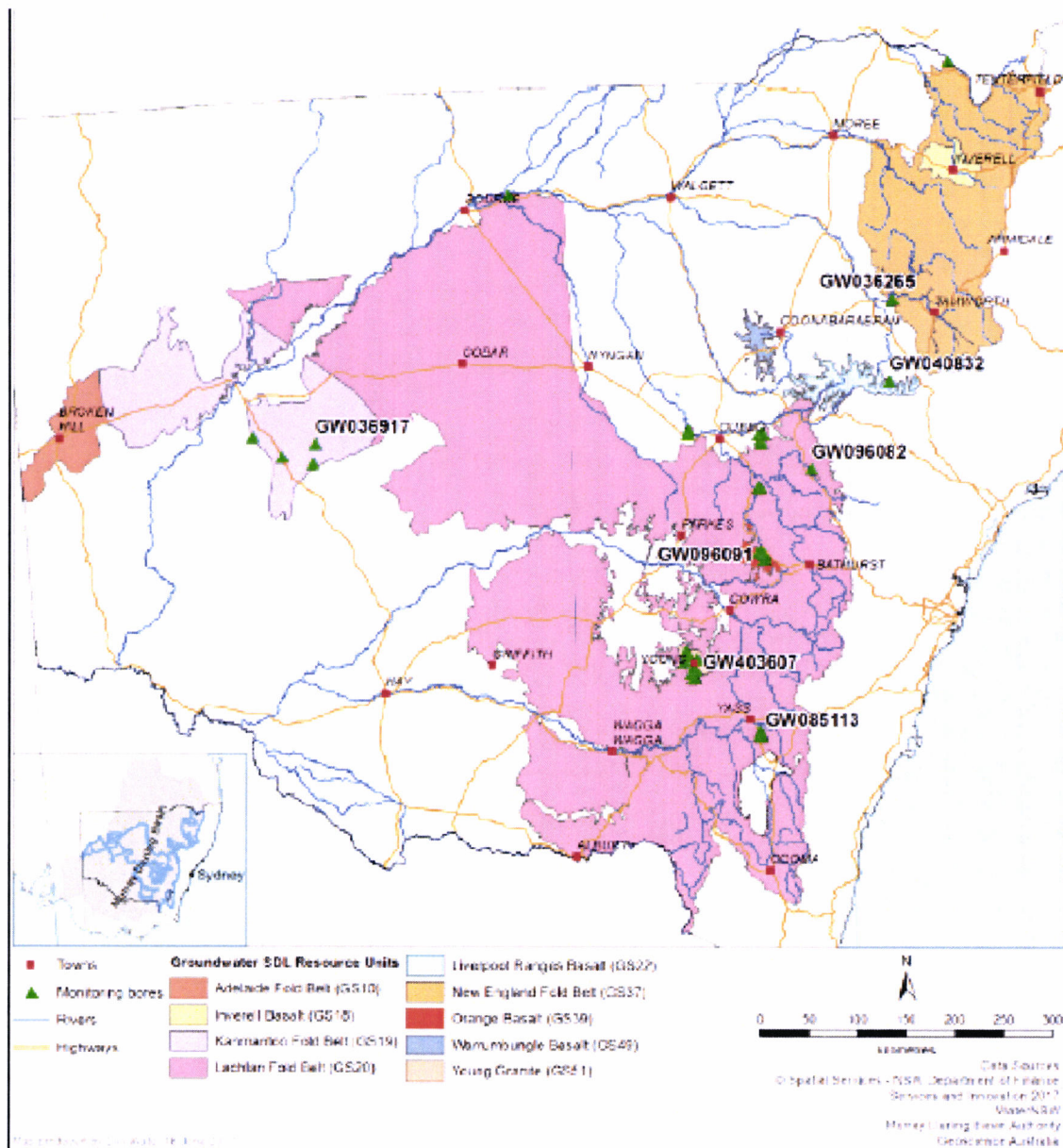
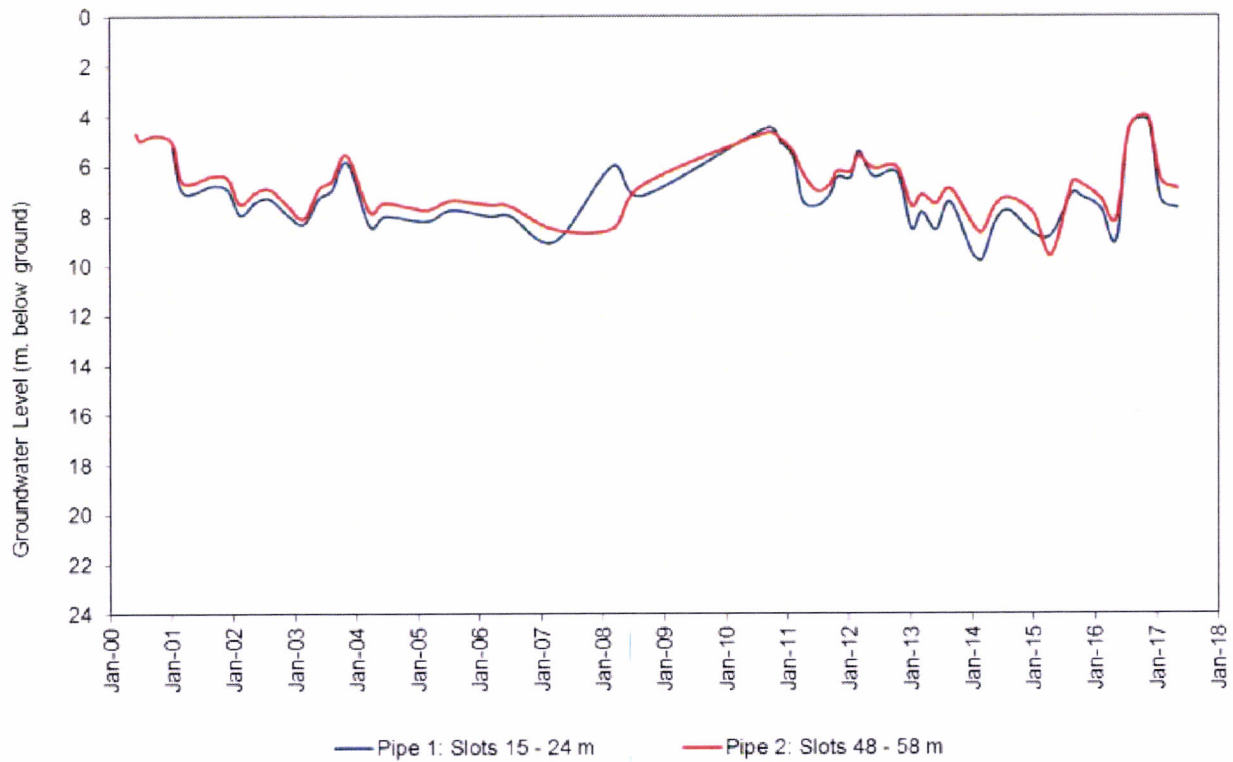


Figure 11: Location of monitoring bores used in the MDBA independent assessment





**Figure 12: Lachlan Fold Belt groundwater level at GW096082**

The nearest real time Groundwater Monitoring Site on the Water NSW database (WaterNSW 2019) is located 16 km north of Mudgee at Mudgee - Wilbertree Rd (Site no. GW096087.1.1). The levels recorded on 16 May 2019 indicated that the bore level below MP was 5.767 m and the ground water level 427.603 m AHD (Figure 13). The landholder of the Project site has reported that a bore drilled to 70 m depth did not reach groundwater.



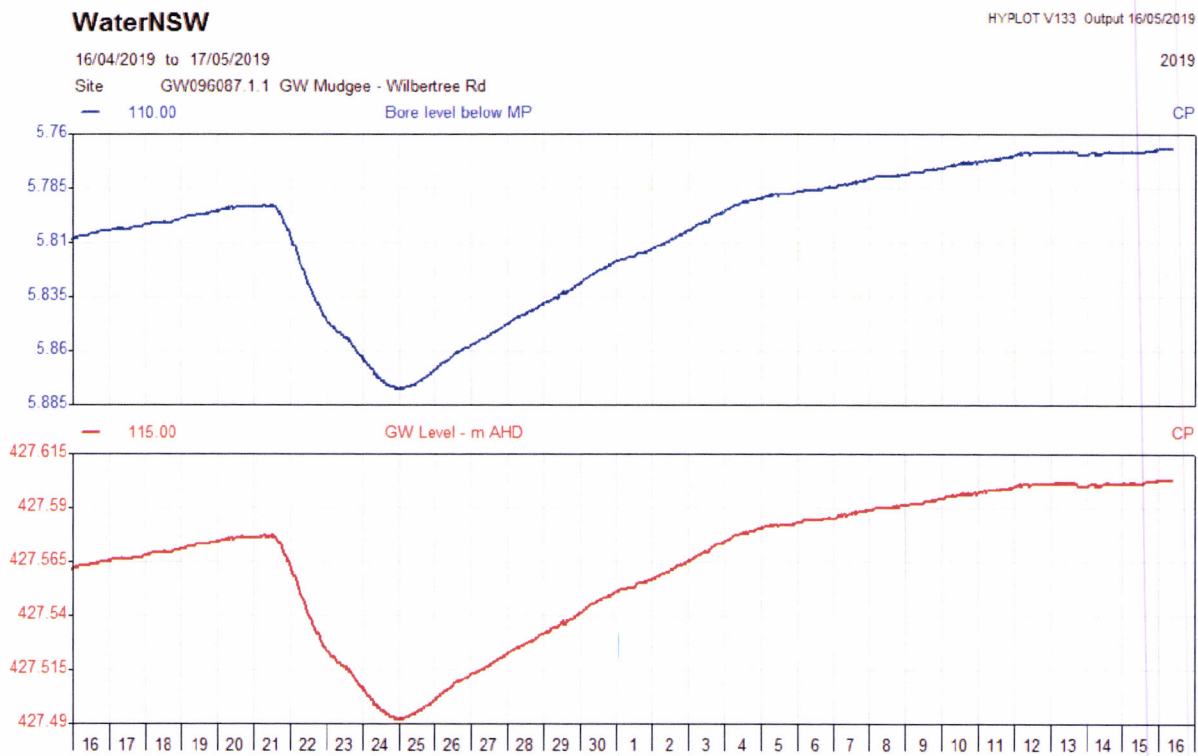


Figure 13: Mudgee - Wilbertree Rd groundwater levels (levels recorded on 16 May 2019)

## 6.0 POTENTIAL IMPACTS

Although the site is located within an area listed as groundwater vulnerable in accordance with the LEP, proposed on site activity is not expected to materially contribute to any regional groundwater issues particularly those associated with nearby irrigation districts. Proposed trenching would be to a maximum 1,200 mm deep and piling would extend to a maximum depth of 1.5 m, which is expected to be above the local groundwater level.

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

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

As a drainage line exists at the site between the two planned System A and System B solar panels there is potential for overland flow during rainfall. The water will flow into the existing dam and could overflow towards the Cudgegong River.

### 6.2 Water quality and erosion

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

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

The Cudgegong alluvial soils are found along the alluvial plains and terraces of the river. The soils have moderate fertility and water holding capacity with weakly structured surface soils. The town of Mudgee is characterised by the Craigmere non-calcic brown soils. These soils have a moderate to high fertility, weakly structured surface soils and moderate to high water holding capacity. Craigmere soils have a moderate to high erosion hazard under cultivation (Hunter Water Australia Strategic Services, 2001).

There is the potential that site runoff will contain sediments and increase turbidity or other water quality parameters in downstream water ways. The existing farm dam should capture surface flow from the site and reduce sedimentation downstream.



## 7.0 PROPOSED MITIGATION MEASURES

### 7.1 Site accessibility and inundation

The site accessibility and potential for inundation issues may be managed in the project's risk management register(s) owing to the regional nature of the events and the potential to impact whole of site works. There should be procedures in place to halt construction during heavy rainfall to reduce impacts to the project construction and also 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 5.

**Table 5: Proposed Mitigation Measures**

Stage	Measure	Activities/Approach
Design	Site drainage and water quality controls	<p>Design Basis</p> <ul style="list-style-type: none"> <li>■ Undertake hydrological assessment of the sites catchment in accordance with relevant methods outlined in Australian Rainfall and Runoff.</li> <li>■ Determine sediment management targets and drainage control standards in accordance with Managing Urban Stormwater: Soils and Construction Vol 1 (Blue Book) (DECC, 2008).</li> <li>■ Develop a site erosion and sediment control plan in accordance with the Blue Book.</li> <li>■ Develop site drainage design incorporating detention basins and sedimentation management structures where relevant.</li> <li>■ Permanent site drainage should coincide with temporary arrangements where possible.</li> </ul>
Construction and/or Demolition	Site drainage and water quality controls	<p>General site works:</p> <ul style="list-style-type: none"> <li>■ Catch drains to be located downslope of any proposed road works.</li> <li>■ 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.</li> <li>■ All stormwater collection points need to have appropriate sedimentation and erosion controls.</li> <li>■ Undertake ongoing inspections of stormwater facilities and water control measures to assess their effectiveness.</li> </ul>

Stage	Measure	Activities/Approach
		<ul style="list-style-type: none"> <li>■ Vibration grids or wash bays at all construction exits.</li> <li>■ Level spreaders at locations where concentrated flow is discharged offsite to ensure sheet flow like conditions are maintained.</li> <li>■ Flat land erosion control options include erosion control blankets, gravelling, mulching, soil binder, turfing and revegetation.</li> </ul>
Construction and/or Demolition	Stormwater point source control	<p>In the event of concrete works:</p> <ul style="list-style-type: none"> <li>■ Do not undertake works if chance of heavy rain.</li> <li>■ Store rinsate<sup>2</sup> water, if applicable, separately to other water on site and dispose of offsite as appropriate.</li> <li>■ Block on site drains in the area of the works and remove any contaminated runoff.</li> </ul> <p>In the event that dewatering practices are required:</p> <ul style="list-style-type: none"> <li>■ 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.</li> <li>■ Limit direct discharge off site (consistent with the design requirements for sediment pond discharge).</li> <li>■ Stormwater collected on site should be reused where possible. Controls should be inspected and maintained on a regular basis. All water released from sediment basins should be clear or disposed off site by vehicle.</li> <li>■ Material and waste storage areas should be designed and operated to minimise interaction with surface waters.</li> <li>■ Vehicle washdown areas should be located away from water courses.</li> </ul>

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



## 8.0 REFERENCES

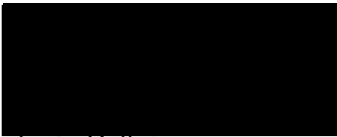
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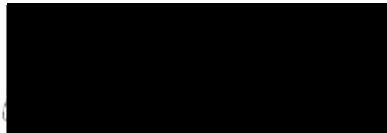


## Signature Page

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<https://golderassociates.sharepoint.com/sites/29921g/deliverables/r-019-mudgee-1c-3c-water/rev1/18105488-019-rev1-burrundullasustenergypark-waterassess.docx>

**APPENDIX A**

**Mudgee LEP Maps**

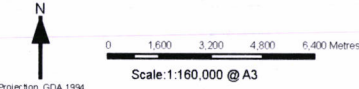
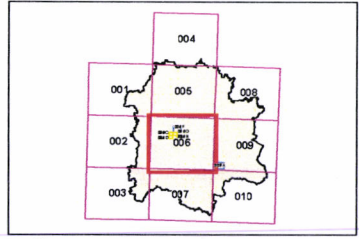




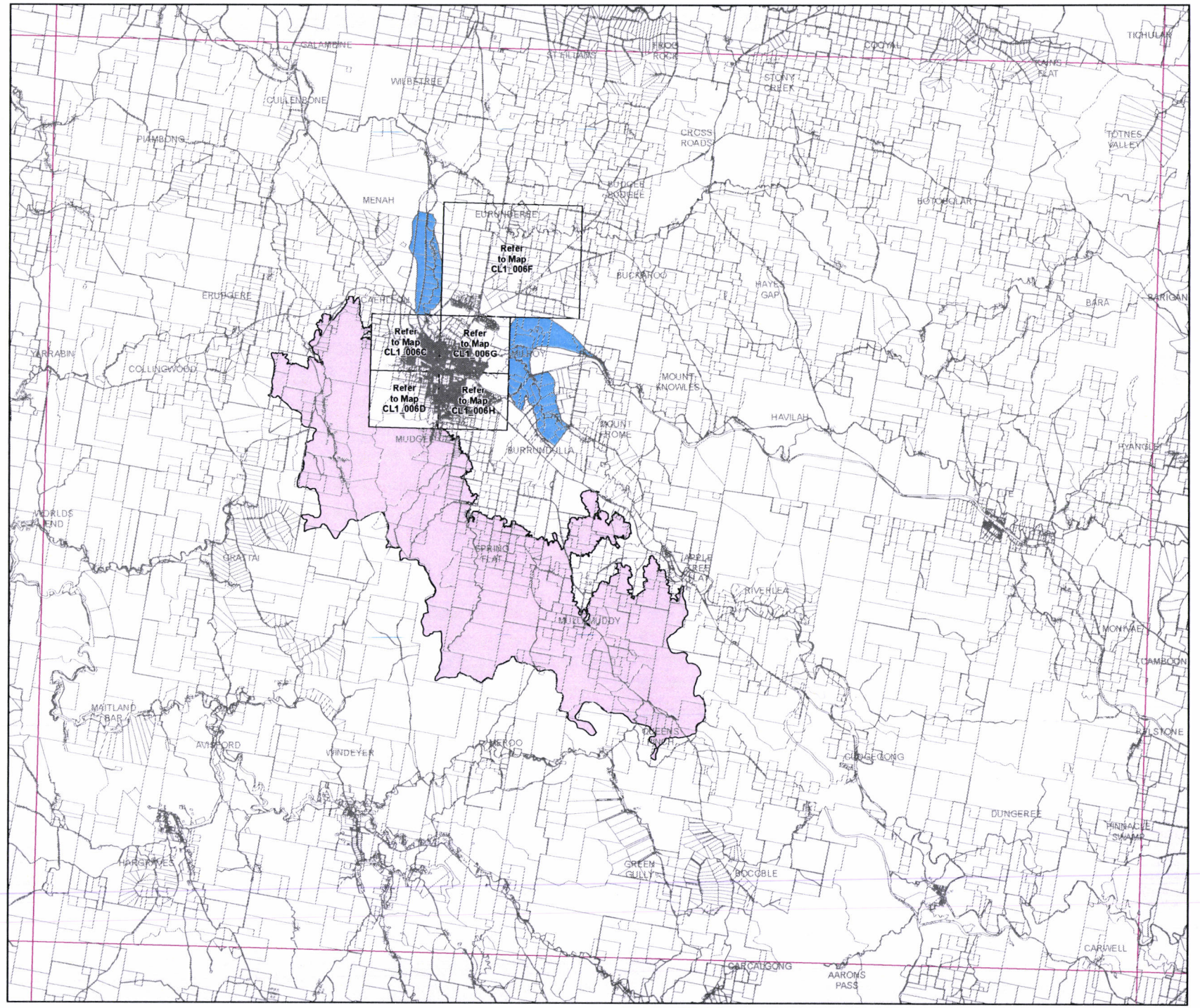
# Mid-Western Regional Local Environmental Plan 2012

Flood Planning Map  
Active Street Frontages Map  
Visually Sensitive Land Map  
Sheet CL1\_006

- Flood Planning Land**
- Flood Planning Area
- Active Street Frontage**
- Active Street Frontage
- Visually Sensitive Land**
- Visually Sensitive Land
- Cadastre**
- Cadastre 15/12/2010 Land and Property Information (LPI)



Projection: GDA 1994  
MGA Zone 55  
Map Identifier: 5270\_COM\_CL1\_006\_160\_20120621







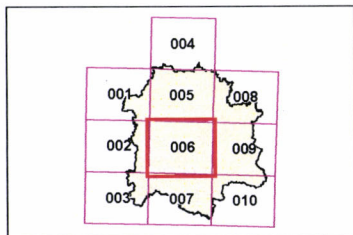
Mid-Western  
Regional Local  
Environmental  
Plan 2012

Groundwater Vulnerability Map -  
Sheet GRV\_006

 Groundwater Vulnerable

Cadastral

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

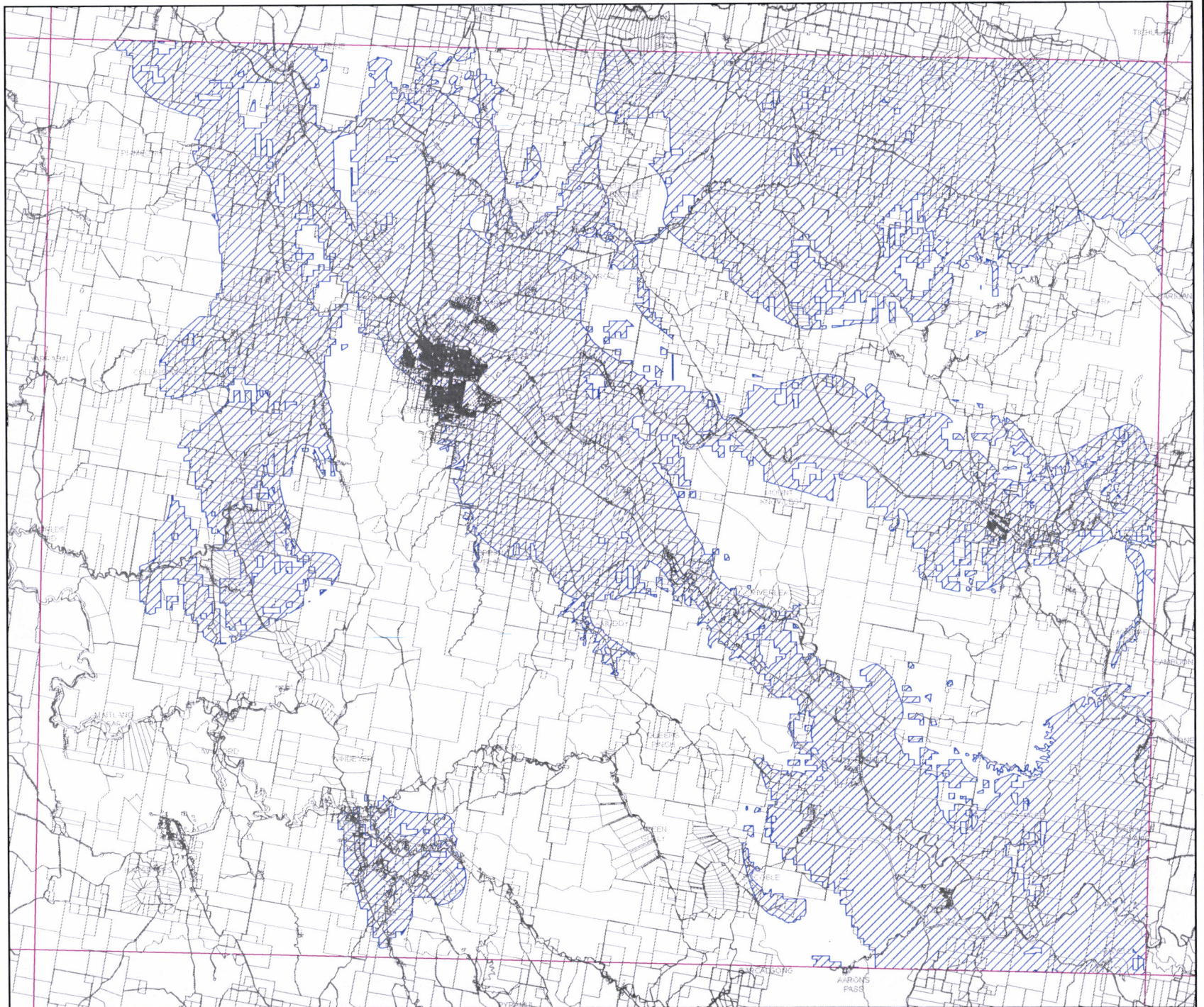


0 1,600 3,200 4,800 6,400  
Metres

Scale: 1:160,000 @ A3

Projection GDA 1994  
MGA Zone 55

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**APPENDIX B**

**Important Information Relating to  
this Report**

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