Appendix S

Water Sourcing Strategy

Yanco Delta Wind Farm Modification 2

Scope 6 - Water Sourcing Strategy

Yanco Delta WF Project Pty Ltd,
subsidiary of Origin Energy Power Limited

Reference: P528124

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aurecon

Bringing ideas to life

Executive Summary

Yanco Delta WF Project Pty Ltd, a subsidiary of Origin Energy Power Limited (Origin) is proposing to construct a wind farm comprising up to 208 wind turbine generators (WTG), with a capacity of up to 1.5 gigawatts, known as the Yanco Delta Wind Farm (the Project). The Project is located on approximately 25,770 hectares of farmland situated on private properties owned by eight landholders. The Project is located approximately 10 kilometres (km) north-west of Jerilderie in New South Wales (NSW), within the South-West Renewable Energy Zone.

The purpose of this report is to provide:

- A summary of the legislative context for water licencing
- An estimate of anticipated water demand during construction
- A review of water resources on-site
- Outcomes of relevant stakeholder engagement
- A strategy to address water demand
- Next steps for proposed strategy.

The Project's current estimated water demand is 833 megalitres (ML), over the course of four years (48 months or 1,460 days). Project water demand can be broken down as follows:

- 41 megalitres per year (ML/year) (averaged) of non-potable water for dust suppression
- 66.5 ML/year (averaged) of non-potable water for soil/roadbase conditioning and compaction
- 19.5 ML/year (averaged) of potable water for concrete batching
- 77.5 ML/year (averaged) of potable water for the temporary worker accommodation and miscellaneous day use
- 3.8 ML/year (averaged) of potable water for hydro mulching
- 208.3 ML/year total water demand or 250 ML/year with a 20% margin of error.

Two water sourcing options are being considered for the Project, which include:

- Option A: water trucking from Coleambally Town Water Supply
  - Off-site sourcing via trucking from Colleambally Town Water Supply has been identified as the preferred option for potable water sourcing. Murrumbidgee Council communicated there are sufficient allocations to supply the Project during peak construction. Based on a conservative estimate of 15 kilolitre (kL) per water truck, on average 19 trucks per day would be required to meet potable water demands during construction.
- Option B: water sourcing from existing landowner groundwater bore with sufficient allocation
  - Bores within the project site have been investigated and several bores (located in the northern portion of the project area) have been identified as prospective production bores that would partially meet water demands via groundwater sourcing.
  - The potential groundwater bores are used for irrigation purposes, as such suitable licensing via water trade through a zero-share Water Access Licence (WAL) should be sought to access groundwater from existing bores for construction use.

Based on discussions with landowners, the total water demand is unlikely to be met solely through existing groundwater bores and would be sourced from a combination of imported water and utilising existing bores.

On-site temporary water storage options such as turkey nests and/or bladders with a minimum storage capacity of 2 megalitres per day have been identified as the preferred options. Four pre-selected temporary storage locations have been identified within the Project Area.

The key findings from the desktop assessment included:

- Sufficient water allocations exist within the project area boundary, attributable to basic land holder rights, harvesting rights, existing approvals, WALs and Water Sharing Plan (WSP) available allocations.
- There are significant water shares available across the Lower Murrumbidgee Shallow/Deep Groundwater Sources and the Murrumbidgee Unregulated River water sources, which constitute the main groundwater and surface water sources within and adjacent to the project area. However, it is noted that there is significant variability in water allocations year to year, evidenced by the overallocations of water in the Lower Murrumbidgee Deep Groundwater source during the 2024-2025 period (approximately 21,000 ML), while the 2023-2024 period experienced a surplus of approximately 100,000 ML
- Section 4.41 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) determines that approved State Significant Developments (SSDs) are exempt from Section 89 (water use), Section 90 (water management work) or Section 91 (controlled activities) approvals under the *Water Management Act 2000* (NSW) (WM Act), provided an assessment has been undertaken for the activity.
- The WALs may be transferred to Origin from select sellers through the lodgement of a transfer application form (71M) with Land Registry Services.
- While harvestable rights dams can hold rainwater, they may not necessarily be applicable to mixed use, such as holding groundwater. As such, there is existing on-site containment capacity in existing dams which may require mixed rights licensing to hold both rainwater and groundwater. Suitable auxiliary water storage for construction may be required which may include turkey nests, tanks and bladders.
- A WAL for construction dewatering works is not expected to be required as groundwater levels (> 15 metres below ground level (bgl)) are anticipated to be greater than the depth of WTG foundations (approximately 4 m bgl).
- Potable water quality stored on-site should be regularly tested to meet the requirements for the *Australian Drinking Water Guidelines* by the National Health and Medical Research Council (2011).

Correspondence with regional water regulators is recommended to assess contemporary dynamics of water availability in the project area, and landholders who may be transitioning away from historical water-usage activities. Recommendations from this desktop assessment are as follows:

- Allocations available for water trade with the private land holder should be determined as soon as practicable to confirm the need.
- Ongoing discussion with landholders and local water regulators for WAL term-transfers at existing prospective bores.
- Water quality requirements for water demands should be confirmed through field investigations at existing bores.
- If water allocations are transferred from other bores to the existing irrigation bores, a groundwater assessment and study to determine bore yields and whether continuous pumping at high flow rates significantly impact groundwater levels within highly productive alluvial groundwater sources in the project area would be required to satisfy the minimal impact consideration for aquifer interference activities as per the NSW Aquifer Interference Policy (Department of Primary Industries (DPI), 2012).
- WAL applications and discussions with water regulators should be undertaken early.
- Given the variability in water availability, particularly in the Lower Murrumbidgee Deep Groundwater source, it is recommended to secure allocations in a timely manner to ensure sufficient allocations ahead of construction.

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Abbreviations and glossary of terms

Abbreviation	Description
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
Floodplain	An area of land that is subject to flooding
km	Kilometres
LGA	Local Government Area
m	metres
NSW	New South Wales
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
WTGs	Wind turbine generators
bgl	below ground level
bgs	below ground surface
ML/year	megalitre per year
WAL	Water Access Licence
ML	megalitres
kL	kilolitre
WSP	Water sharing plan
WM Act	*Water Management Act 2000* (NSW)
Origin	Origin Energy Power Ltd (Origin)
DPIE	Department of Planning, Industry and Environment
DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
mm	millimetres
GDE	groundwater dependant ecosystems
IDE	inflow dependent ecosystems
BoM	Bureau of Meteorology
L/s	litres per second

1 Introduction

Yanco Delta WF Project Pty Ltd, a subsidiary of Origin Energy Power Limited (Origin) is proposing to construct a wind farm comprising up to 208 wind turbine generators (WTG), with a capacity of up to 1.5 gigawatts, known as the Yanco Delta Wind Farm (the project). The project is located on approximately 25,770 hectares of farmland situated on private properties owned by eight landowners. The project is located approximately 10 kilometres (km) north-west of Jerilderie in New South Wales (NSW), within the South-West Renewable Energy Zone. The project is located within the Murrumbidgee Council and Edward River Council local government areas (LGAs). The location of the Project is shown in Figure 1-1, and the proposed footprint of the Project is shown in Figure 1-2.

Origin is carrying out preliminary project investigations of various disciplines to assess project feasibility and identify risk items which may impact approval acquisition and project delivery.

The objective of this document is to consider water supply constraints and potential water sourcing strategies, for delivery of the project. This includes a high-level review of the following, forming the basis of this document:

- Estimate of project water demand
- Summary of relevant legislations and policies applicable to water usage
- Summary of surrounding groundwater and surface water licenses
- Summary of the existing environment, focusing on water availability
- Literature review of local geology and hydrogeology
- Provide a water supply option and high-level water harvesting strategy.

The high-level water supply strategy will include:

- Project water usage entitlements
- Potential on-site and off-site source for project water
- Brief site water harvesting strategy considering on-site and off-site sources
- Advise on high-level securing water requirements.

1.1 Assumptions and limitations

Assumptions and limitations that are relevant to this strategy are:

- This assessment is desktop only and no site investigations have been undertaken as part of this assessment.
- Due to the early stage of the project, high-level water demand will be based on available information and reasonable assumptions as the basis for calculations in the absence of detailed design.
- This assessment is focused on the construction stage of the project, where most of water demand will occur.
- Surface water reliability calculations, modelling and monitoring has not been undertaken at this stage.
- No consideration of cumulative projects in the area was made for on or off-site water availability.
- Information presented in this document was sourced from publicly available sources or provided by Origin.
- Searches of Water Access Licenses (WALs) were based on the last complete financial year. No consideration was made for expired licenses.
- Project-specific water supply quality requirements have not been specified.
- Water quality of potential on or off-site water supply options has not been analysed.

Figure 1-1 Location of the Project

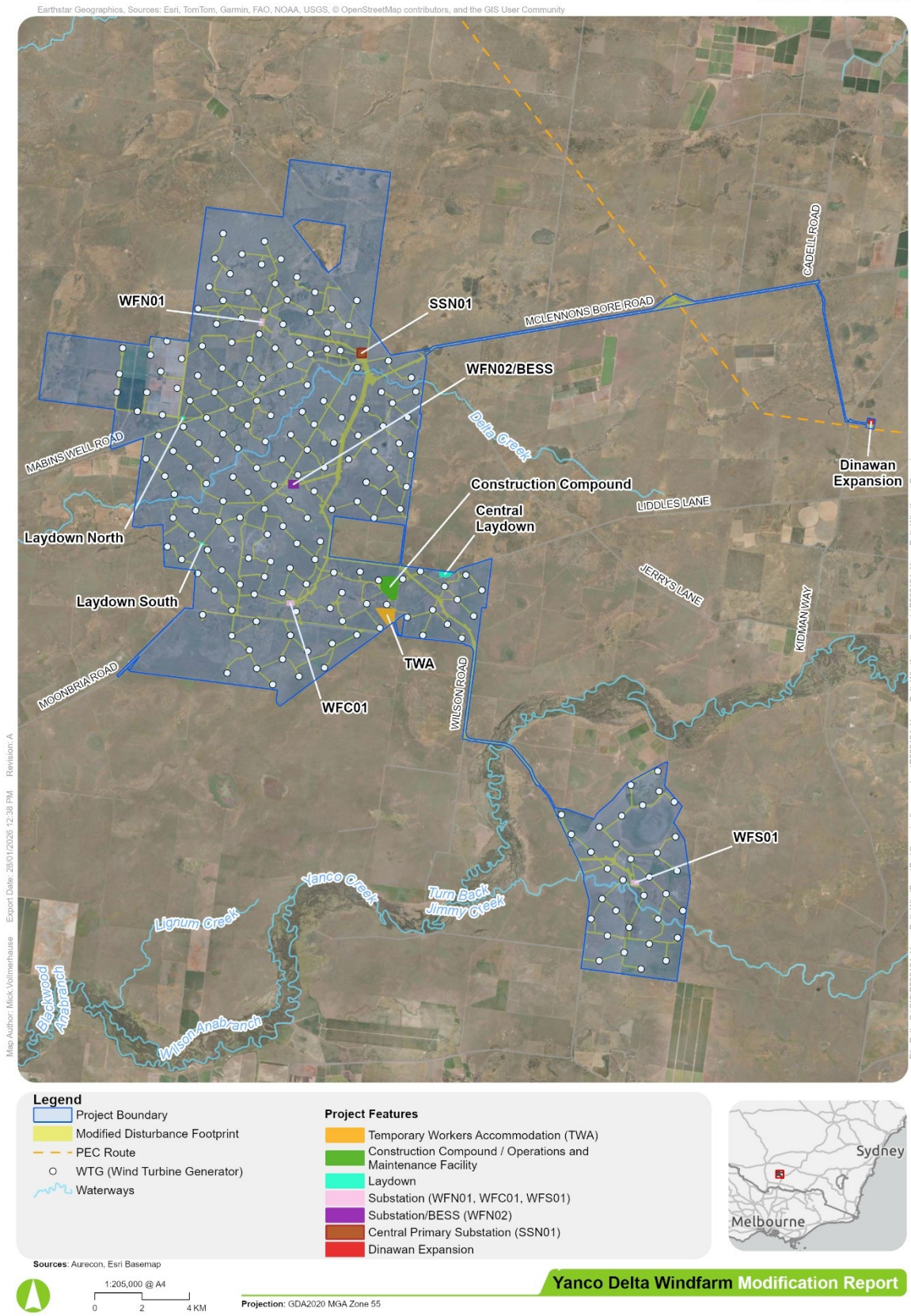

Figure 1-2 Proposed footprint of the Project

1.2 Document structure

This report follows the following structure:

- Introduction
- Legislation
- Estimated water demand for the Project
- Stakeholder engagement
- Site details
- On-site water supply options
- Off-site water supply options
- Water supply strategy
- Mitigation measures
- Conclusions and recommendations.

2 Legislation and water licensing

The following section provides background information governing how water may be used on projects, in accordance with applicable legislation should surface or groundwater entitlements be required.

2.1 Water Management Act 2000

The *Water Management Act 2000* (NSW) (WM Act) provides guidance for sustainable and integrated management of water sources in Australia for present and future generations.

Relevant guidance and legislation include:

- Section 4.41 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act)
- Section 89 (water use), Section 90 (water management work) or Section 91(2) (controlled activities) of the WM Act
- Water Sharing Plans

The WM Act regulates the use and interference with surface and groundwater in NSW through Water Sharing Plans (WSPs), and these are relevant due to licensing requirements. WSPs are discussed further in Section 2.1.1.

It is noted that Section 4.41 of the EP&A Act determines that approved State Significant Developments (SSDs) are exempt from Section 89 (water use), Section 90 (water management work) or Section 91 (2) (controlled activities) approvals under the WM Act provided water management aspects of project are appropriately assessed in the Environmental Impact Statement (EIS) or other planning approval submission. However, SSDs are not exempt from aquifer interference approvals.

2.1.1 Water Sharing Plans

WSPs set rules for sharing water between water users and the environment and bring water users into a single licensing system managed under the WM Act. Water extracted for commercial use such as power generation must be licensed. Commercial licenses under the WM Act outline the rules and constraints to water access by commercial users for a minimum of 10 years (Department of Planning, Industry and Environment (DPIE), 2024).

The main purposes of a WSP are to promote:

- Environmental health of water source
- Long-term sustainability
- Transparency of water availability

Main aquifer types within project area include porous rock, fractured rock and alluvial sediments.

WSPs within and adjacent the project area has been summarised in Table 2-1.

Table 2-1 Water Sharing Plans

Proximity	Media	WSP
On-site	Groundwater	Murrumbidgee alluvial groundwater sources 2020
	Groundwater	NSW Murray-Darling porous rock groundwater sources 2020
	Surface water	Murrumbidgee Unregulated River water sources 2012
Off-site	Groundwater	NSW Murray-Darling basin fractured rock groundwater sources 2020 (Lachlan Fold Belt MDB)
	Surface water	Murray Unregulated River water sources 2024
	Surface water	Murrumbidgee Regulated River water sources 2016

The various on-site water sources for each WSP have been summarised in Table 2-2.

Table 2-2 Summary of on-site water sources

WSP	Type	Water source	Extent	Extraction risks
Murrumbidgee alluvial groundwater sources 2020	Shallow unconfined to semi-confined aquifer	Lower Murrumbidgee Shallow Groundwater Source	Up to 40 m or to bottom of Shepparton Formation	Impact to groundwater dependent ecosystems Impact to groundwater users Reduction of water quality Structural damage to aquifer, including any permanent compaction of sediments within groundwater sources resulting from depressurisation or dewatering
		Lower Murrumbidgee Deep Groundwater Source	>40 m, within Calivil Formation and Renmark Group	
NSW Murray-Darling porous rock groundwater sources 2020	Deep confined aquifer	Oaklands Basin Groundwater Source	Includes groundwater contained within Permian and Triassic formations	Impact to groundwater dependent ecosystems Impact to groundwater users Reduction of water quality Structural damage to aquifer, including any permanent compaction of pore spaces within groundwater sources resulting from depressurisation or dewatering
	Shallow unconfined aquifer	Lower Murray Groundwater Source	Unconsolidated alluvial sediments below ground surface up to 20 m depth	
	Deep confined aquifer	The Lower Murray (Deep) Groundwater Source	Unconsolidated sediments of the Shepparton Formation, Calivil Formation and the Renmark Group greater than 20 m down to bedrock	
Murrumbidgee Unregulated River water sources 2012	Surface water	Lower Billabong Water Source: Lower Billabong Creek Management Zone	Includes water occurring naturally on the surface of the ground within the watercourse boundaries and river, lakes, wetlands within waterbody boundaries	Impact to inflow dependent ecosystems Impact to water users
		Middle Billabong Water Source: Billabong Creek Upstream of Culcairn Management Zone		

Irrigation areas have been identified in proximity to the project area, summarised in Table 2-3.

Table 2-3 Irrigation areas

Proximity	Purpose	Description
Off-site	Irrigation	Coleambally irrigation area
	Irrigation	West Corugan private irrigation district
	Irrigation	Berriquin irrigation district

2.1.2 Water Access Licences

A breakdown of WALs and water usage for each on-site water source for the period of 2024 to 2025 (WaterNSW, 2025) has been provided in

Table 2-4.

Table 2-4 Review of 2024 to 2025 WALs for water sources in project area

Access Licence Category	Number of WALs	Total share component (ML/year)	Cumulative AWD unit	Water share available (ML/year)	Usage (ML/year)
Lower Murrumbidgee Shallow Groundwater Source					
Aquifer	30	5,201	1 ML per share	3,458.5	2,443
Lower Murrumbidgee Deep Groundwater Source					
Aquifer	403	272,825	1 ML per share	-20,986.9	293,811.9
Aquifer (community and education	2	23	100% of share	11.6	11.4
Aquifer (town water supply)	1	20	100% of share	13.4	6.6
Domestic and stock (stock)	1	324	100% of share	0	324
Local water utility	3	2,210	100% of share	1,400.5	809.5
Oaklands Basin Groundwater Source					
None identified					
Lower Murray Shallow Groundwater Source					
Aquifer	257	57,653	1 ML per share	54,318.3	3,334.7
Aquifer (town water supply)	2	87	100% of share	87	0
Salinity and water table management	2	20,010	100% of share	20,010	0
Lower Murray Groundwater Source					
Aquifer	366tt	84,710	1 ML per share	27,324	57,386
Aquifer (town water supply)	2	67	100% of share	50.1	16.9
Local water utility	2	12	100% of share	4.2	7.8
Lower Billabong Water Source					
Domestic and stock	18	1,807	100% of share	1,512.3	294.7
Domestic stock (stock)	16	113	100% of share	102.7	10.3
Local water utility	2	40	100% of share	40	0
Unregulated river	31	8,285	1 ML per share	7,181.1	1,103.9
Middle Billabong Water Source					
Domestic and stock	2	16	100% of share	16	0
Domestic and stock (stock)	2	10	100% of share	10	0
Unregulated river	14	353	1 ML per share	353	0
Murrumbidgee Western Water Source					
Domestic and stock	10	70	100% of share	63	7
Domestic and stock (stock)	4	20	100% of share	20	0
Unregulated river	11	14,870	1 ML per share	14,737	133

Notes:

AWD – allocated water demand
ML = megalitre
ML/year = megalitre per year

It is noted that the Lower Murrumbidgee Deep Groundwater Source was overallocated for the 2024-2025 period, however it was not overallocated for the 2023-2024 period and experienced a surplus of approximately 100,000 ML.

2.1.3 Basic landholder rights

Under the WM Act, there are three basic landholder rights in NSW, which include:

- Domestic and stock rights (Section 52 of the WM Act)
- Harvestable rights (Section 53 and 54 of the WM Act)
- Native title (Section 55 of the WM Act).

Harvestable rights are considered the most relevant and applicable basic landholder rights to the project scope and have been described below.

Harvestable rights dams

Harvestable rights allow landholders to capture and store a portion of the rainfall runoff from their landholding in one or more harvestable rights dams without requiring a WAL, water supply work approval, or water use approval (DPIE, 2024).

Landholders in NSW can build harvestable rights dams on non-permanent minor streams, hillsides or gullies. However, a harvestable rights dam may not be built on or within 40 metres of a third-order or higher order stream, 3 kilometres upstream of a wetland of international importance (Ramsar Convention) or a declared floodplain, where a WAL and approvals may be required. Upon review of the Australian Ramsar Wetlands the project area does not contain or is located 3 kilometres upstream of a Ramsar Wetland (NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024).

The portion of rainfall runoff that may be captured under harvestable rights, and how the water can be used depends upon where a landholding is located. In this case, the project area is situated within the central inland-draining catchments harvestable rights area, where up to 10% of the average annual regional rainfall runoff may be captured and used for any purpose (DPIE, 2024). Section 5.2 summarises historical rainfall data within the project area.

A summary of the key local surface water features within the study area is provided in Table 2-5.

Table 2-5 Summary of the key local water features within the project area

Key surface water features	Water feature type	ANZG (2018) ecosystem type	Expected flow regime	Key features	Water users
Yanco Creek	Watercourse	Lowland river	Perennial / regulated river	Strahler 9 Flows southwest during significant rainfall and only connects to downstream major channel when area is flooded Well defined channel Wetland / swamp environment Large woody debris present Riparian and in steam vegetation present Relatively flat catchment	Aquatic ecosystems – contains threatened species of Flathead Galaxias (Critically Endangered) and Silver Perch (Vulnerable) Cultural value Stock watering Recreation

Key surface water features	Water feature type	ANZG (2018) ecosystem type	Expected flow regime	Key features	Water users
Delta Creek	Watercourse	Lowland river	Ephemeral	Strahler 3 Flows southwest towards Murray River during significant rainfall Doesn't connect to any downstream major channel Minor channel definition Relatively flat catchment	Aquatic ecosystems – contains threatened species of Flathead Galaxias (Critically Endangered) and Silver Perch (Vulnerable)
Turn Back Jimmy Creek	Watercourse	Lowland river	Offtake from regulated river (Columbo Creek)	Strahler 9 Flood-runner between Colombo Creek and Yanco Creek Water visible in some sections on aerial imagery Relatively flat catchment	Aquatic ecosystems – contains threatened species of Flathead Galaxias (Critically Endangered) and Silver Perch (Vulnerable)
Delta Creek Tributary	Watercourse	Lowland stream	Ephemeral	Strahler 3 Flows westward connecting back to Delta Creek inside Project area Relatively flat catchment	Aquatic ecosystems similar to Delta Creek
Turn Back Jimmy Creek Tributary	Watercourse	Lowland stream	Ephemeral	Strahler 3 Flows westward connecting back to Turn Back Jimmy Creek outside of Project area Relatively flat catchment	Aquatic ecosystems similar to Turn Back Jimmy Creek
Floodplain Wetlands on Yanco Creek	Floodplain wetland	Wetland	Perennial	Holds moderate to high water levels Lagoons are shallow in nature and support high quality ox bow lagoons and wetland depressions Relatively flat catchment	Aquatic ecosystems

As such, based on the stream order assessment above, in the event water harvesting is adopted, harvestable rights are to occur at least 40 m from Yanco Creek, Turn Back Jimmy Creek and Delta Creek.

3 Estimated water demand

An early contractor water strategy was developed in October 2025, based on the detailed design, and estimated a total water demand of 833 ML for both potable and non-potable uses. Previously, the concept design water demand referenced in the Project Scoping report was based on Origin's estimates was 718.3 ML and the water demand estimated in the EIS was originally 417.9 ML.

Potable and non-potable water demand requirements are included in Table 3-1:

Table 3-1 Project water requirements

Water demand	Volume (ML)
Non-potable water	
Dust suppression	164
Soil and roadbase conditioning for compaction	266
Total	**430**
Potable water	
Concrete batch water	78
Camp	237
Day use	73
Hydro mulching	15
Total	**403**

Water demand requirements by calendar year based on the current construction program and may vary as part of design adjustments. This is represented in Table 3-2.

Table 3-2 Water requirements by calendar year

Year	Non-potable water (ML)	Potable water (ML)	Total (ML)
1	30	19	49
2	183	194	377
3	196	170	366
4	21	20	41
Total	**430**	**403**	**833**

Based on discussions with landowners, the total water demand is unlikely to be met solely through existing groundwater bores and would be sourced from a combination of imported water and utilising existing bores.

Water demand estimates exclude any farming or agricultural demands that may continue in parallel during construction of the project. The period of time requiring dust suppression is a significant component of the project's water demand. A maximum duration of 48 months has been assumed, over a 4 year construction program, including commissioning. This may reduce significantly during wetter months as dust suppression requirements (and associated vehicle movements) would reduce.

In terms of on-site storage capacity, no information or references to existing on-site dam access have been made within the project area by Origin. Temporary on-site storages would include turkey's nests or water bladers with a minimum of 2 ML capacity based on approximately a day's water demand during peak construction. Water structures would be filled overnight for day use. Consideration of access for harvestable rights dams for collection of rainwater and alternate storage options have been provided in Section 6.5.

3.1 Benchmarking of water demand

Benchmarking was undertaken to compare the estimated water demand presented in Table 3-1 with similar projects, to assess the demand estimate is reflective of early-stage project planning. This was undertaken by reviewing published local wind farm water demand estimates from the NSW major projects planning portal, which is presented in Table 3-3 including a comparison of the project estimates. Other wind farm SSD projects range in total water demand from 1.04 to 5.21 ML per WTG. Concrete water demands (where data is available) range from 0.1 to 3.13 ML per WTG across other relevant wind farm SSD projects within the Hay Shire, Murrumbidgee and Edward River LGAs. Total water demand of the Yanco Delta WF project per WTG is approximately 4 ML, which is consistent with the expected water demand range for other wind farm projects in surrounding LGAs.

Table 3-3 Review of estimated water demand from wind farms in the surrounding LGAs

Wind farm	LGA	Total demand (ML)	WTG	Duration (months)	Concrete demand (ML)	Other demand (ML)	Total demand/ WTG (ML)	Concrete demand/ WTG (ML/WTG)	Demand/WTG / month (ML/WTG/month)	Concrete demand/WTG/ month (ML/WTG/month)
Bullawah	Hay Shire, Murrumbidgee, Edward River	224	143	44	57	167	1.57	0.4	0.04	0.01
Keri Keri	Murray River	161	155	30	14	147	1.04	0.1	0.03	0.003
Pottinger	Hay Shire, Edward River	623	247	55	424.1	198.9	2.52	1.72	0.05	0.03
Baldon	Edward River	850	180	42	*ND*	*ND*	4.72	*ND*	0.11	*ND*
Junction Rivers	Murray River	401 to 500[1]	96	48	300	200	5.21	3.13	0.11	0.07
The Plains	Hay Shire	811.6	188	36	*ND*	*ND*	4.32	*ND*	0.12	*ND*
Dinawan	Murrumbidgee	364	200	60	*ND*	*ND*	1.82	*ND*	0.03	*ND*

Notes:

ND = no data, specific water demand not specified

1. Worst case assumed

3.2 Water quality requirements

Water quality requirements can influence the selection of feasible water sources (e.g. dust suppression quality requirements are less stringent than concrete making requirements). A solution can arise whereby water with more stringent requirements may be sourced from a separate supply to those with lower quality requirements. This blended approach could allow for more flexibility, and potentially lower costs, when purchasing water. Three scenarios have been considered for this assessment, which include:

- Water sourcing from a groundwater source without treatment
- Water sourcing from a groundwater source with treatment
- Water sourcing from harvestable rights (assumes no treatment required)
- Water sourcing from council potable water supply

Water quality guidelines for concrete mixing requires the following mandatory testing to confirm suitability, shown in Table 3-4.

Table 3-4 Mandatory chemical testing for concrete mixing water

Chemical	Limit	Test method	Notes
Chloride	500 ppm 1,000 ppm	ASTM D512	Prestressed concrete/grout, reinforced concrete
Sulfate	3,000 ppm	ASTM D516	Water with higher salt contents has been used satisfactorily (Building Research Station)
Alkalis as $Na_2O + K_2O$	1,500 ppm	ASTM C114 or EN 196-21	Total sodium and potassium ions, computed as Na_2O_{eq}, from all ingredients is limited to 2.8 kg/m^3 of concrete to safeguard potential alkali-aggregate reaction if used with reactive aggregate
Total solids	50,000 ppm	ASTM C1603	May exceed if slurries are used but may not exceed limit by 13,400 ppm (pH 12)
Sugars Phosphate Nitrates Lead Zinc	100 ppm 100 ppm 500 ppm 100 ppm 100 ppm	AS 1141.35 Local Standard ISO 7890-1 ASTM D3559 ASTM D1691	AS 1379 and EN 1008 requirements. In the first instance, qualitative tests may be carried out. If the qualitative tests show a positive result, either the quantity of the substance shall be determined or tests for setting time and compressive strength shall be performed
pH units	>5.0	AS 1580.505.1	AS 1379 requirement
Oil and grease	<50 ppm	APHA 5520	AS 1379 requirement

Source: Cement concrete and aggregates Australia (2007)

Notes:

1 ppm = 1 mg/L, 0.1% = 1,000 ppm

Associated water quality guidelines have been provided as follows:

- Potable water – Australian Drinking Water Guidelines (2011, Updated 2022). *National Health and Medical Research Council, Canberra.*
- Mixing concrete – AS1379-2007 Specification and Supply of Concrete
- Dust suppression – (Draft) Water Quality for Irrigation and General Water Uses: Guidelines (2024). *Australia and New Zealand Guidelines for Fresh and Marine Water Quality*
- Recycled water – Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase1) (National Resource Management Ministerial Council, 2009)

4 Stakeholder engagement

Engagement for the Project's Water Sourcing Strategy has identified that use and source of water on the project is of great importance to landholders, local community members, and councils. To ensure transparency and early input into the strategy's development, a targeted engagement approach has been implemented. To date, this has included meetings with landholders to understand local groundwater access and usage, discussions with councils regarding potable water supply, and collaboration with other large-scale infrastructure projects operating in the area, such as Transgrid's Dinawan project. A breakdown of engagement is listed in Table 4-1.

Table 4-1 Stakeholder engagement

Date	Method	Stakeholder	Discussion points	Engagement outcome
March 2025	Workshop	Project team/the Contractor	-	-
April 2025	Workshop	Project team/the Contractor	-	-
April 2025	In person engagement	Landholders (A, B, C)	Bore yields Water availability Impact on faming	LHs indicated interest in setting up water storage/selling water from bores on property to the project
May 2025	In person engagement	Landholder (D)	Bore yields Water availability Impact on faming	LHs indicated no interest in selling water to the project from bores on their property
May 2025	In person engagement	Murrumbidgee Council	Potable water availability	Council indicated unable to provide the project with water due to capacity constraints
May 2025	In person engagement	Edward River Council	Potable water availability	Potable water is available to the project for purchase in nearby township of Deniliquin Concerns have been raised regarding supplying water to multiple projects within the Renewable Energy Zone and associated impacts
May 2025	In person engagement	Transgrid Dinawan Camp	Potable water availability	Transgrid stated that they import all water for the project (potable and non-potable)
August 2025	Teams	Murrumbidgee Council	Potable water availability	Murrumbidgee Council indicated that they do have sufficient supply of potable water from the Coleambally standpipe.
August 2025		Landholder (D)		Confirmed landholder has two high performing bores on property and has sufficient water resources to meet project needs
October 2025	Teams	Murrumbidgee Council	Potable water availability	Further detailed discussions with Council to confirm availability based on contractor requirements.
November 2025	Teams	Murrumbidgee Council	Securing agreement with Council	Council confirmed they support supplying the project and will provide a letter of support.

Community feedback regarding the Project's water sourcing has been received and highlights the concerns of landholders and near neighbour properties about the impact of construction drawing from shallow water aquifers on the water table and the impact to the quality of the groundwater. Concerns also highlight the impact to neighbouring properties with bores downstream from construction sites and what measures will be taken to prevent contamination.

Ongoing engagement will continue throughout the planning and delivery stages to ensure that local water resources are appropriately managed, and community concerns are addressed.

5 Site information, climate, geology and hydrogeology

This section summarises site information relevant to this assessment and specific site conditions including climate, geology and hydrogeology relating to surface water availability and groundwater supply.

5.1 Site information

The project surface area is approximately 25,770 hectares and is zoned for primary production (RU1). Immediately adjacent properties with the Murrumbidgee Council and Edward River Council LGA are also zoned for primary production, more specifically supporting agricultural enterprises involving broadacre cropping, pasture irrigation and pasture grazing. The project area hydrology is spatially represented in Figure A-1.

5.2 Climate

The project is situated within a temperate region. Climatic conditions across the Murrumbidgee and Edward LGAs indicate moderate rainfall, with mean annual rainfall of 401 millimetres (mm) and mean annual evaporation of 51 mm (Bureau of Meteorology (BoM), 2024). Annual rainfall from 1988 to 2018 has been relatively stable in the Murray region, with an annual rainfall decrease of 10 mm compared to 1959 and 1988 rainfall (from 520 mm to 510 mm) (BoM, 2018). Climatic trends observed over the last 30 years specific to the Murray region have been identified as follows (BoM, 2018):

- Rainfall has generally decreased in autumn and spring
- Winter rainfall has been generally reliable and summer rainfall has generally been unreliable
- Dry years have occurred nine times and wet years have occurred eleven times
- Spring frosts have generally been more common and have been occurring later
- Temperatures have generally increased, along with more consecutive days above 38 degrees

In addition to the above observations, a summary of seasonal rainfall reliability has been provided in Table 5-1.

Table 5-1 Project area seasonal rainfall reliability

Season	Reliability	Description
Winter	40%	Usually, reliable rainfall
Spring	40 to 50%	Usually reliable to unreliable rainfall
Summer	50 to 60%	Unreliable rainfall
Autumn	60%	Unreliable rainfall

Source: BoM (2018)

Based on the Murray Local Land Services mapping, drought affected areas within the region have encroached from 31 March to 31 August 2024, where approximately half of the region is currently within an intensifying drought affected area. The project area is currently within a non-drought area, however, is expected to transition to a drought affected area in the warmer months. A summary of rainfall range from 09/2023 and 09/2024 has been provided in Table 5-2.

Table 5-2 Project area monthly rainfall range from September 2023 to September 2024

Timeframe	Total rainfall
1 September 2023 to 30 September 2023	0 to 5 mm
1 October 2023 to 31 October 2023	25 to 50 mm
1 November 2023 to 30 November 2023	~ 50 mm
1 December 2023 to 31 December 2023	~ 50 mm
1 January 2024 to 31 January 2024	~ 50 mm
1 February 2024 to 29 February 2024	5 to 10 mm
1 March 2024 to 31 March 2024	5 to 10 mm
1 April 2024 to 30 April 2024	~ 25 mm
1 May 2024 to 31 May 2024	~ 50 mm
1 June 2024 to 30 June 2024	~ 10 mm
1 July 2024 to 31 July 2024	~ 25 mm
1 August 2024 to 31 August 2024	~ 10 mm

Rainfall availability which drives harvesting potential would be used for project operations such as dust suppression and is therefore highly weather dependent. Dust suppression demands are usually highest in summer and lowest in winter, with exceptions noted during El Niño and La Niña cycles, resulting in generally reduced rainfall through winter and spring (BoM, 2024d). An important factor to consider for water supply is water reliability which is affected by climate and patterns in rainfall and evaporation.

Nearest available climate stations reporting daily rainfall and evaporation data have been summarised in Table 5-3.

Table 5-3 Summary of climate stations

Climate station	Climate station ID	Data type	Data range	Distance from project area
Jerilderie Treatment Works	74055	Total rainfall	1886 - 2024	~ 11 km (south-east)
Coleambally Irrigation	74249	Total evaporation	1996 - 2024	~ 34 km (north-east)

Mean, 10th percentile and 90th percentile rainfall and evaporation (measured in mm), have been presented in Figure 5-1, Figure 5-2 and Figure 5-3.

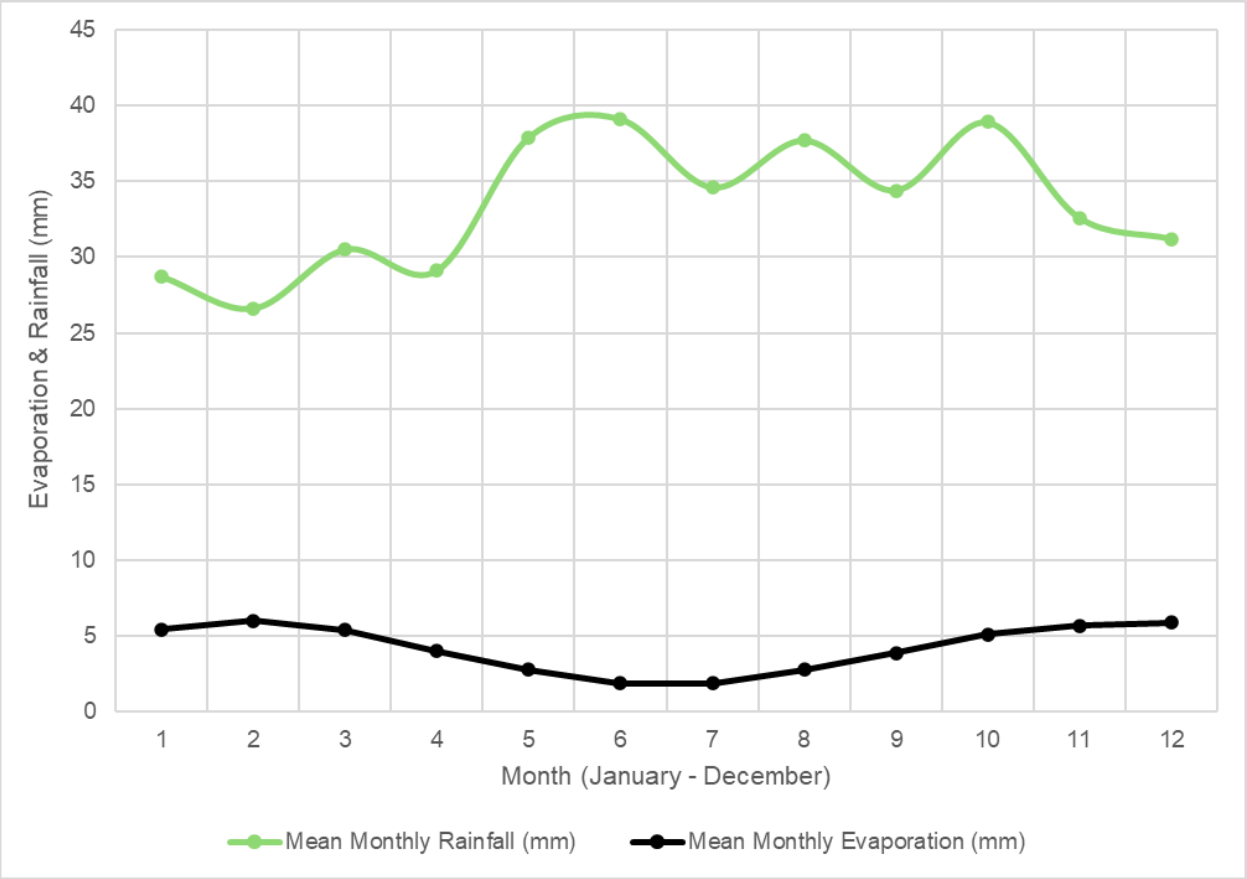

Figure 5-1 **Mean monthly rainfall (1886 to 2024, 74055 Jerilderie Treatment Works Station) and evaporation (1996 to 2024, 74249 Coleambally Irrigation Station)**

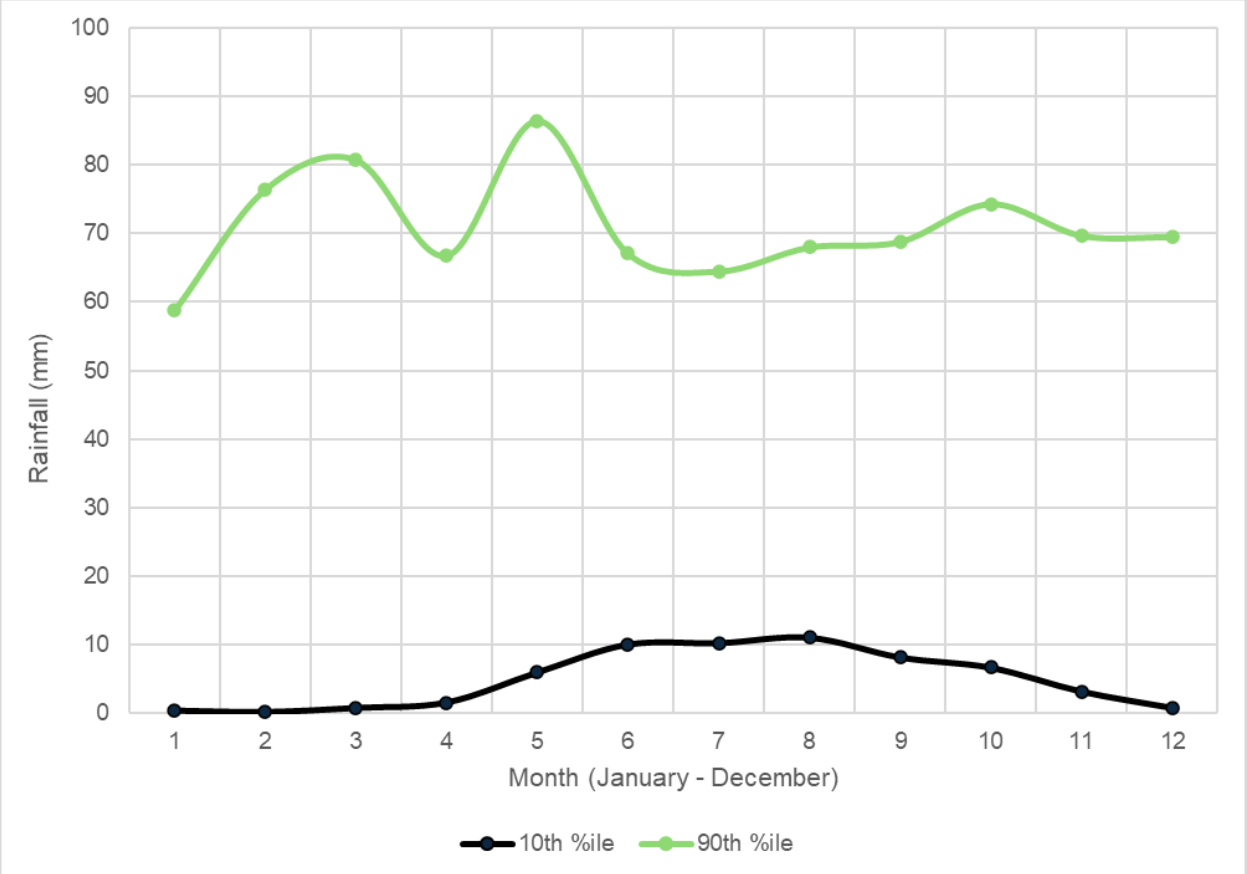

Figure 5-2 **10th percentile and 90th percentile rainfall from 1886 to 2024 (74055 Jerilderie Treatment Works Station)**

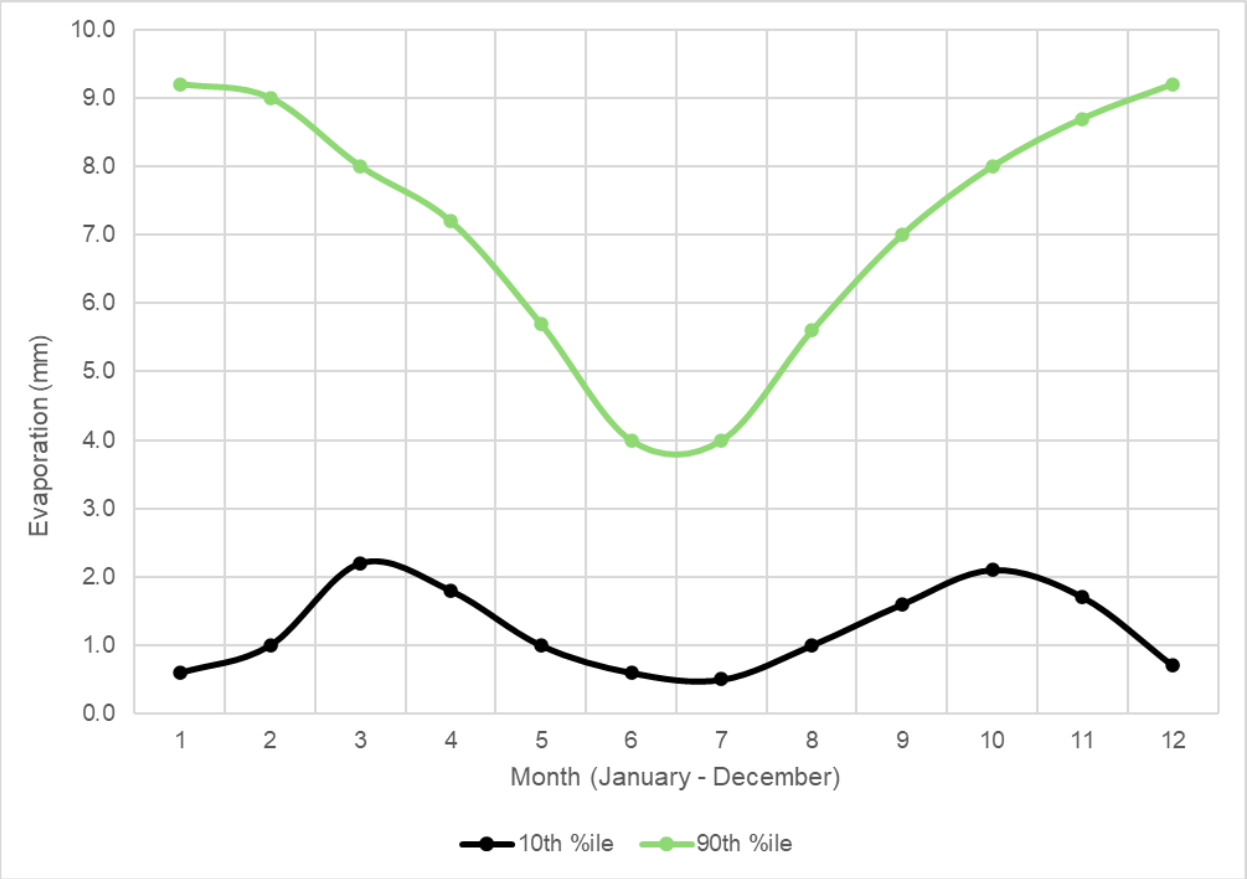

Figure 5-3 **10th percentile and 90th percentile evaporation from 1996 to 2024 (74249 Coleambally Irrigation Station)**

Rainfall and evaporation data have been provided in Table 5-4 and Table 5-5 respectively.

Table 5-4 **Rainfall statistics (1886 to 2024, 74055 Jerilderie Treatment Works Station)**

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	28.7	26.6	30.5	29.1	37.9	39.1	34.6	37.7	34.4	38.9	32.6	31.2	401
10th %ile	0.4	0.2	0.8	1.6	6	10.1	10.3	11.1	8.2	6.7	3.2	0.8	258.1
90th %ile	58.8	76.4	80.7	66.8	86.4	67.1	64.5	68	68.8	74.3	69.7	69.5	567

Table 5-5 **Evaporation statistics (1996 to 2024, 74249 Coleambally Irrigation Station)**

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	28.7	26.6	30.5	29.1	37.9	39.1	34.6	37.7	34.4	38.9	32.6	31.2	401
10th %ile	0.4	0.2	0.8	1.6	6	10.1	10.3	11.1	8.2	6.7	3.2	0.8	258.1
90th %ile	58.8	76.4	80.7	66.8	86.4	67.1	64.5	68	68.8	74.3	69.7	69.5	567

5.3 Geology

The project is located within the Cenozoic sedimentary basin. The surface geology at the project area consists of a series of sedimentary deposits originating from various depositional environments. The sub-surface geology at the project area comprises of the Palaeozoic Mesozoic Tectonic ‘West’ Province.

The project is additionally situated within the Murray Basin, which comprises the Marry Basin hydrogeological landscape at the project area. The Murray Basin consists of a series of sedimentary deposits transitioning between terrestrial (fluvial and lacustrine) and marine depositional environments, which include in stratigraphic order (Geoscience Australia, 2024):

- Renmark Group: fluvial sands at the base and overlain by marine carbonaceous clay and lignite (34 to 65.5 ma)

- Ettrick Formation: marl (carbonaceous clay and silt) (23 to 34 ma)
- Murray Group Limestone (23 to 34 ma)
- Bookpurnong Formation: marine shelly clay and silt (3.6 to 11.2 ma)
- Loxton Sands: fluvial to marginal quartz sands (2.4 to 5.3 ma)
- Blanchetown Clay - Pliocene to Pleistocene (0 to 5.3 ma)
- Norwest Bend Formation: clay and ferricrete (0 to 5.3 ma)
- Shepparton Formation (0 to 2.4 ma)

A summary of the surface geology sourced from (MinView, 2024) at the project area has been provided in Table 5-6. The project area surface soil classification is spatially represented in Figure A-2 and surface geology is provided in Figure A-3.

Table 5-6 Surface geology summary (MinView, 2024)

Code/ID	Unit name	Description	Province	Age	Location
CZ_af	Alluvial floodplain deposits	Silt, very fine to medium grained lithic to quartz-rich sand and clay	Cenozoic Sedimentary Province	0 to 66 ma	Within project area
Q_a	Alluvium	Unconsolidated grey to brown to beige humic micaceous silty clay, quartz-lithic silt, fine to medium grained quartz-rich to quartz-lithic sand, polymictic pebble to cobble gravel (as sporadic lenses); sporadic palaeosol horizons	Cenozoic Sedimentary Province (Quaternary Deposits)	0 to 2.58 ma	Within project area
Q_af	Alluvial floodplain deposits	Silt, very fine- to medium-grained lithic to quartz-rich sand, clay	Cenozoic Sedimentary Province (Quaternary Deposits)	0 to 2.58 ma	Within project area
Q_ds	Aeolian sand plain	Flat to low undulating or hummocky fossil sand plain, red-brown to brown and humic, clayey, silty to fine grained sand, silty clay; abundant regolithic & pedogenic carbonate, extensively modified by pedogenesis	Cenozoic Sedimentary Province (Quaternary Deposits)	0 to 2.58 ma	Within project area
Q_dds	Source-bordering dunes	Red-brown to light-brown, poorly sorted to bi-modal, fine to medium grained feldspathic quartz sand	Cenozoic Sedimentary Province (Quaternary Deposits)	0 to 2.58 ma	Adjacent to project area (north)
Q_lp	Playa lake deposits (clastic sediments)	Friable to plastic, finely laminated grey clay, silty clay, humic clay, grey paleosols; locally includes fine to medium grained sand; gypsi-ferous surficial deposits, selenite beds in sub-surface	Cenozoic Sedimentary Province (Holocene Deposits)	0 to 0.012 ma	Adjacent to project area (east)

A summary of the surface geology sourced from (Geoscience Australia, 2024) at the project has been provided in Table 5-7.

Table 5-7 Surface geology summary (Geoscience Australia, 2024)

Code / ID	Unit name	Description	Province	Age	Location
Czws / Czs	Shepparton Formation	Unconsolidated to poorly consolidated mottled variegated clay, silty clay with lenses of polymictic, coarse to fine sand and gravel; partly modified by pedogenesis, includes intercalated red-brown paleosols. Forms extensive flat alluvial floodplains.	Cenozoic Sedimentary Province	Pliocene to Holocene (0 to 5.3 ma)	Within project area

Code / ID	Unit name	Description	Province	Age	Location
Cza	Alluvium 38494	Reworked or incised alluvium in older stream channels; alluvial terraces above younger alluvium; alluvial and colluvial outwash deposits not in defined channel systems; lateritised alluvium; sand, silt, gravel, clay, evaporites	Cenozoic Sedimentary Province	Quaternary (0 to 2.4 ma)	Within project area
Qt	Lake deposits 38492	Lake and swamp deposits; mud, silt, evaporites, limestone; minor sand, peat	Cenozoic Sedimentary Province	Quaternary (0 to 2.4 ma)	Within project area
Qd	Dunes 38496	Dunes, sandplain with dunes and swales; may include numerous interdune claypans; may be locally gypsiferous	Cenozoic Sedimentary Province	Quaternary (0 to 2.4 ma)	Within project area

A summary of the subsurface geology sourced from (Geoscience Australia, 2024) at the project area has been provided in Table 5-8.

Table 5-8 Subsurface geology summary

Code/ ID	Unit name	Description	Province	Age	Location
Os	Abercrombie Formation	Brown and buff to grey thinly to thickly bedded fine to coarse grained mica-quartz sandstone, interbedded with laminated siltstone and mudstone with discrete chert layers	Lachlan Supergroup	453 to 485 ma	South and east of project area
Ss	Yalmy Group	Marine turbiditic sandstone, mudstone, mass-flow conglomerate	Lachlan Orogen	433 to 443 ma	South of project area
Si	Intrusive igneous rocks 82920	Unspecified igneous intrusive rock, including porphyry dykes, gabbro, aplite, dolerite, biotite granite, felsic intrusions, granite, leucogranite, quartz diorite, tonalite	Lachlan Orogen	416 to 423 ma	South of project area
DCs	Mulga Downs Group	Quarzitic fluvial and alluvial sedimentary rocks; arenites and quartzites, minor conglomerate, shale	Cobar Supergroup	372.5 to 410 ma	East of project area
Dg	Leeton Igneous Complex	Plutonic, dominantly silicic; includes altered porphyritic leucocratic granite with quartz, feldspar and biotite crystals in a matrix of perthite-microcline, and greisen granites composed of quartz and feldspar with miarolitic cavities and sulfides	Lachlan Orogen	385 to 397 ma	Within project area
EPs	Sedimentary rocks 82934	Sili-clastic shale, siltstone, quartzite, tuff and limestone	*Undefined*	251 to 385 ma [1]	Within project area
Ps	Coorabin Coal Measures	Upward-fining sequence of conglomerate, sandstone, siltstone, mudstone, carbonaceous clay and coal	Oaklands Basin	252.5 to 299 ma	South of project area

Notes:

1. Inferred to overly the Leeton Igneous Complex

5.4 Hydrogeology

A review of hydrogeological information was undertaken through the Geoscience Australia Geoportal. Three groundwater provinces were identified within 50 kilometres of the project area boundary shown in Table 5-9.

Table 5-9 Hydrogeological landscapes summary

Groundwater Province	Distance from Project	Major aquifers	Salinity	Water level
Murray Basin	Within project area	Shepparton Formation, Pliocene Sands, Renmark Group (unconsolidated sediments in palaeo-valleys, alluvial, fluvial and connected sediments). Aquifer connectivity largely supported through primary porosity (pore spaces) Murray Group (carbonate, limestone, karst)	707 µS/cm (5th percentile) to 58,800 µS/cm (95th percentile)	1.1 m bgs to 36.9 m bgs
Darlin Basin	~ 30 km north	Ravendale Formation; Mulga Downs Group. Aquifers connectivity supported through primary and secondary porosity (pore spaces and fractures)	418 µS/cm (5th percentile) to 70,363 µS/cm (95th percentile)	1.6 m bgs to 38.8 m bgs
South-east Australian Fractured Rock Province	~ 37 km east	Lachlan Orogen sedimentary and igneous facies. Aquifers largely supported through secondary porosity (fractures, joints, bedding planes and cavities)	160 µS/cm (5th percentile) to 14,168 µS/cm (95th percentile)	*No data*

Notes:

bgs = below ground surface

The project area is located within porous and highly productive aquifers namely the Lower Murrumbidgee Shallow/Deep Groundwater Sources part of the Murrumbidgee alluvial groundwater sources 2020 water sharing plan, where previous project experience has indicated upwards of 50 litres per second (L/s) production rates within these groundwater sources. Surrounding groundwater landscapes to the west and south of the project area have porous aquifers of low to moderate productivity. A summary of hydrogeological parameters has been provided in Table 5-10. The project area hydrogeological landscape is spatially represented in Figure A-4.

Table 5-10 Hydrogeological parameters of groundwater sources (within project area)

Geology	Aquifer type	Estimated hydraulic conductivity (m/d)	Inferred aquifer thickness (m)	Calculated transmissivity (m^2/d)	Estimated porosity (%)
Shepparton Formation	Unconfined to semi-confined	48.3 [1]	Up to 200	9,651	42

Notes:

1. Assuming an even distribution of clay and sand

5.5 Groundwater bores

A review of registered bores at the project area sourced from WaterNSW and MinView was undertaken to assess the potential impact to groundwater users from the withdrawal of groundwater for project use within the project area and within 2 kilometres of the project boundary and have been summarised in Appendix B – Table B-1 and Table B-2. Project area groundwater bores are spatially represented in Figure A-5.

5.6 Groundwater dependent ecosystems

Ecosystems that rely on groundwater for all or some of their requirements are classified as groundwater dependant ecosystems (GDEs) and inflow dependent ecosystems (IDEs). When introducing changes to the hydrological regime at the project area, GDEs and IDEs may suffer detrimental impacts. The Australian Government's Atlas of Groundwater Dependent Ecosystems (BoM, 2024b) is a spatial tool used to identify three types of GDEs within the site boundary. These GDEs include:

- Aquatic Ecosystems – GDEs that require surface expression of groundwater such as wetlands and springs.
- Terrestrial Ecosystems – GDEs that rely on the presence of groundwater, including all vegetations ecosystems.
- Subterranean Ecosystems – Subterranean factors that rely on the presence of groundwater, such as stygofauna or cave systems.

Potentially impacted GDEs and IDEs within and approximately 2 kilometres radius of the project boundary have been summarised in Table 5-11 and Table 5-12.

Table 5-11 Project area and surrounds GDEs and IDEs (north area)

GDE name	Supplied ecosystem	GDE potential	IDE likelihood (out of 10)	River region	Groundwater management area
Aquatic GDEs					
Yanco Creek	River (watercourse)	Low (national assessment)	8	Billabong-Yanco Creeks	NSW Murray Darling Basin Porous Rock Groundwater Sources - Oakland
Delta Creek	River (watercourse)	Low (national assessment)	4 to 6	Billabong-Yanco Creeks	NSW Murray Darling Basin Porous Rock Groundwater Sources - Oakland
Delta Creek	River (connector)	Low (national assessment)	2 to 4	Billabong-Yanco Creeks	Lower Murrumbidgee Groundwater Sources – Shallow and NSW Murray Darling Basin Porous Rock Groundwater Sources - Oakland
Unnamed	Wetland (floodplain waterbody)	Low (national assessment)	2 to 7	Billabong-Yanco Creeks	NSW Murray Darling Basin Porous Rock Groundwater Sources – Oakland and Lower Murrumbidgee Groundwater Sources - Deep
Terrestrial GDEs					
Forb-rich spear-grass	Vegetation	Low (regional studies)	2 to 3	Billabong-Yanco Creeks	NSW Great Artesian Basin Shallow Groundwater – Surat and NSW Great Artesian Basin Groundwater - Surat
River red gum [1]	Vegetation	High (regional studies)	3 to 7	Billabong-Yanco Creeks	North-Western Unregulated and Fractured Rock, NSW Great Artesian Basin Shallow Groundwater – Central and NSW Great Artesian Basin Groundwater - Central
River red gum [2)]	Vegetation	High (regional studies)	2 to 7	Billabong-Yanco Creeks	NSW Murray Darling Basin Porous Rock Groundwater Sources - Western Murray, Lower Murray Darling Unregulated and Alluvial
River red gum [3]	Vegetation	High (regional studies)	3 to 7	Billabong-Yanco Creeks	NSW Murray Darling Basin Porous Rock Groundwater Sources - Western Murray, Lower Murray Darling Unregulated and Alluvial
River red gum [4]	Vegetation	High (regional studies)	3 to 6	Billabong-Yanco Creeks	NSW Murray Darling Basin Porous Rock Groundwater Sources - Western Murray, Lower Murray Darling Unregulated and Alluvial

GDE name	Supplied ecosystem	GDE potential	IDE likelihood (out of 10)	River region	Groundwater management area
River red gum [5]	Vegetation	High (regional studies)	4 to 7	Billabong-Yanco Creeks	NSW Murray Darling Basin Fractured Rock Groundwater - Adelaide Fold Belt and NSW Murray Darling Basin Fractured Rock Groundwater - Kanmantoo Fold Belt
Shallow marsh wetland/ floodplain[6]	Vegetation	High (regional studies)	2 to 6	Billabong-Yanco Creeks	Lower Murray Shallow Groundwater, Lower Murray Groundwater Source, Murrumbidgee Unregulated and Alluvial Water Source - Billabong Creek
Swamp wetland/ grassland	Vegetation	Low (regional studies)	2 to 3	Billabong-Yanco Creeks	NSW Great Artesian Basin Shallow Groundwater – Surat and NSW Great Artesian Basin Groundwater - Surat

Notes:

1. River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
2. River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm)
3. River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion
4. River Red Gum - Warrego Grass - Couch Grass riparian tall woodland wetland of the semi-arid (warm) climate zone (Riverina Bioregion and Murray Darling)
5. River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion
6. Shallow marsh wetland of regularly flooded depressions on floodplains mainly in the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Bioregion)

Table 5-12 Project area and surrounds GDEs and IDEs (south area)

GDE name	Supplied ecosystem	GDE potential	IDE likelihood (out of 10)	River region	Groundwater management area
Aquatic GDEs					
Turn Back Jimmy Creek	River	Low (national assessment)	2 to 3	Billabong-Yanco Creeks	NSW Murray Darling Basin Porous Rock Groundwater Sources - Oakland
Unnamed	Wetland (floodplain waterbody)	Low (national assessment)	5	Billabong-Yanco Creeks	NSW Murray Darling Basin Porous Rock Groundwater Sources - Oakland
Terrestrial GDEs					
Canegrass[1]	Vegetation	Low (regional studies)	3 to 4	Billabong-Yanco Creeks	NSW Murray Darling Basin Porous Rock Groundwater Sources - Western Murray
Cotton bush[2]	Vegetation	Low (regional studies)	3	Billabong-Yanco Creeks	NSW Great Artesian Basin Shallow Groundwater - Surat
Forb-rich spear-grass[3]	Vegetation	Low (regional studies)	2 to 4	Billabong-Yanco Creeks	NSW Great Artesian Basin Groundwater – Surat, NSW Great Artesian Basin Shallow Groundwater – Surat, NSW Great Artesian Basin Groundwater - Eastern Recharge and Castlereagh River (below Binnaway) Unregulated and Alluvial
Lignum shrubland[4]	Vegetation	Low (regional studies)	3 to 5	Billabong-Yanco Creeks	Greater Metropolitan Region Groundwater Sources - Sydney Basin - Richmond Sandstone, North Coast Fractured and Porous Rock Groundwater Sources and Hunter Unregulated and Alluvial
Nitre goosefoot[5]	Vegetation	Low (regional studies)	4	Billabong-Yanco Creeks	NSW Great Artesian Basin Groundwater – Warrego and NSW Great Artesian Basin Shallow Groundwater - Warrego

GDE name	Supplied ecosystem	GDE potential	IDE likelihood (out of 10)	River region	Groundwater management area
Plains grass[6]	Vegetation	Low (regional studies)	4	Billabong-Yanco Creeks	NSW Murray Darling Basin Fractured Rock Groundwater - Kanmantoo Fold Belt
Red river gum[7]	Vegetation	High (regional studies)	2 to 6	Billabong-Yanco Creeks	Lower Murray Darling Unregulated and Alluvial and NSW Murray Darling Basin Porous Rock Groundwater Sources - Western Murray
Red river gum[8]	Vegetation	High (regional studies)	2 to 6	Billabong-Yanco Creeks	Lower Murray Darling Unregulated and Alluvial and NSW Murray Darling Basin Porous Rock Groundwater Sources - Western Murray
Red river gum[9]	Vegetation	High (regional studies)	2 to 5	Billabong-Yanco Creeks	Lower Darling Alluvium, Lower Murray Darling Unregulated and Alluvial and NSW Murray Darling Basin Porous Rock Groundwater Sources - Western Murray
Swamp grassland[10]	Vegetation	Low (regional studies)	2 to 4	Billabong-Yanco Creeks	NSW Great Artesian Basin Shallow Groundwater – Surat and NSW Great Artesian Basin Groundwater - Surat
Weeping myall[11]	Vegetation	Low (regional studies)	2	Billabong-Yanco Creeks	Clyde River Unregulated and Alluvial Water Sources
Yellow box[12]	Vegetation	Low (regional studies)	3	Billabong-Yanco Creeks	NSW Murray Darling Basin Fractured Rock Groundwater - Inverell Basalt and NSW Murray Darling Basin Fractured Rock Groundwater - New England Fold Belt
Red river gum[9]	Vegetation	High (regional studies)	2 to 5	Billabong-Yanco Creeks	Lower Darling Alluvium, Lower Murray Darling Unregulated and Alluvial and NSW Murray Darling Basin Porous Rock Groundwater Sources - Western Murray

Notes:

1. Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains
2. Cotton Bush open shrubland of the semi-arid (warm) zone
3. Forb-rich Spear-grass - Windmill Grass - White Top grassland of the Riverina Bioregion
4. Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Bioregion)
5. Nitre Goosefoot shrubland wetland on clays of the inland floodplains
6. Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western
7. River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Bioregion)
8. River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion
9. River Red Gum - Warrego Grass - Couch Grass riparian tall woodland wetland of the semi-arid (warm) climate zone (Riverina Bioregion and Murray Darling Bioregion)
10. Swamp grassland wetland of the Riverine Plain
11. Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion
12. Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion

Aquatic GDEs identified within the project area are considered to have a relatively low dependence on groundwater. Terrestrial GDEs identified within the project area are considered to have a low to high dependence on groundwater and may have a higher potential of being disturbed as a result of reducing groundwater levels, high potential terrestrial GDEs include the river red gum (and sub-species) and the shallow marsh wetland / floodplain, supplied through vegetation ecosystems.

The risk to IDE has been assessed as ranging from 1 to 10 within the project area. The IDE scale reflects the degree to which a particular ecosystem is inflow-dependent and relies on an additional water source other than rainfall. This additional source may come from soil moisture, surface water and groundwater. The risk to IDE is inferred to be generally low to moderate based on the assessment presented in Table 5-11 and Table 5-12. Since the project area is located within or in the vicinity of floodplain areas, IDE dependency is inferred to be generally seasonal.

6 On-site water supply options

This section explores the potential water supply options (for both groundwater and surface water) within the site boundary including:

- applicable legislation and licences,
- allocation available through the legislation and licences,
- storage and supply options on-site.

6.1 Water Licenses and Approvals

6.1.1 Water supply work/use approvals

Water supply work/use approvals allow the user to take and/or use water from a river, lake or groundwater source via a pump, bore, well or dam. A water supply work approval authorises its holder to construct and use a specified water supply work at a specified location and approvals cannot be traded to another property or location. A water use approval allows the holder to use water on owned land. Examples of water uses that require approvals include irrigation, town water supply, power generation and mining. A water use approval is to ensure water use activities do not cause land degradation, affect the long-term productivity of land and cause negative impact to water sources, dependent ecosystems and other water users. As stated in Section 2.1, approved SSDs do not require water supply work and use approvals providing the works and impacts are assessed in the EIS or subsequent Modifications. Separate or additional water supply works approvals could be obtained outside the SSD process through the standard application processes.

6.1.2 Water Access Licenses

A WAL allows the user to take a specified volume of water from a pre-determined water source under the terms of the license. There are different types of WALs, which control the access to and use of the water. A specific purpose WAL may be sought after for commercial purposes. A specific purpose WAL must be terminated when the license activities cease. Additionally, the licence is restricted and cannot be traded. One type of specific purpose WAL is a major utility licence which could include water taken for power generation. Based on advice from other Projects and consultation with Department of Climate Change, Energy, the Environment and Water (DCCEEW), wind farms would not qualify for a special purpose WAL.

Other types of WALs include stock and domestic, groundwater, general security and high security and unregulated river WALs - of which there are Class A and B licences.

The NSW Government can make a direct allocation of water to an entity, however this occurs rarely as most water sources are fully allocated. Water trading is permitted and WAL holders can trade all or some of their allocation temporarily or permanently. Generally, when a new water demand is generated, the proponent would either purchase an existing WAL or apply for a zero share WAL.

A zero share license is a water allocation account with no shares (0 ML) but allows the holder to trade for water allocations which are then credited to the WAL. Upon issue of a zero share WAL or the purchase of an existing WAL, the license holder can purchase or lease shares from other license holders within the same water source – or potentially adjacent water sources. WAL transactions are referred to as WAL dealings and are managed by WaterNSW (DPIE, 2025). The timeframe for water access license dealings can take up to 45 working days.

6.1.3 NSW Aquifer Interference Policy

The NSW Aquifer Interference Policy (Department of Primary Industries (DPI), 2012) outlines the water licensing and assessment requirements for aquifer interference activities under the WM Act and other relevant legislative frameworks. Aquifer interference is either: the penetration of an aquifer, interference with water in an aquifer, the obstruction of the flow of water in an aquifer, the taking of water from an aquifer in the course of carrying out specific activities (including commercial and industrial) and the disposal of water taken from an aquifer in the coursing of carrying out specific activities (including commercial and industrial). A WAL is required under the WM Act (unless exempt or taken from basic landholder right) if water is removed from a water source, movement of water from one part of an aquifer to another part of an aquifer, movement of water from one water source to another water source, such as from an aquifer to an adjacent aquifer, from an aquifer to a river/lake or a river/lake to an aquifer. As per the policy, groundwater sources are categorised as highly productive or less productive, where highly productive groundwater is defined as having total dissolved solids of less than 1,500 mg/L and contains water supply works that can yield water at a rate of greater than 5 L/s. Highly productive groundwater sources are grouped as either alluvial, coastal sands, porous rock or fractured rock. Less productive groundwater sources are grouped as either alluvial, porous rock or fractured rock. Based on the desktop review of the project area, the groundwater source is considered to constitute of highly productive alluvial aquifer. As such the minimal impact considerations for such groundwater sources are provided in Table 6-1.

Table 6-1 Highly productive alluvial groundwater sources minimal impact consideration for aquifer interference activities

Water table	Water pressure	Water quality
Less than or equal to a 10% cumulative variation in the water table, allowing for typical climatic 'post-water sharing plan' variation, 40 m from any: ■ High priority groundwater dependent ecosystem; or ■ High priority culturally significant site Listed in the schedule of the relevant water sharing plan or a maximum of 2 m decline cumulatively at any water supply work.	A cumulative pressure head decline of not more than 40% of the 'post-water sharing plan' pressure head above the base of the water source to a maximum of a 2 m decline, at any water supply work. If the predicted pressure head decline is greater than the requirement above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply.	(a) Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity. (b) No increase of more than 1% per activity in long-term average salinity in a highly connected surface water source at the nearest point to the activity. Redesign of a highly connected surface water source that is defined as a 'reliable water supply' is not an appropriate mitigation measure to meet considerations above. (c) No mining activity to be below the natural ground surface within 200 m laterally from the top of high bank or 100 m vertically beneath (or the three dimensional extent of the alluvial water source - whichever is the lesser distance) of a highly connected surface water source that is defined as a 'reliable water supply'. (d) Not more than 10% cumulatively of the three dimensional extent of the alluvial material in this water source to be excavated by mining activities beyond 200 m laterally from the top of high bank and 100 m vertically beneath a highly connected surface water source that is defined as a 'reliable water supply'.

Water table	Water pressure	Water quality
If more than 10% cumulative variation in the water table, allowing for typical climatic 'post-water sharing plan' variations, 40 m from any: ■ High priority groundwater dependent ecosystem; or ■ High priority culturally significant site Listed in the schedule of the relevant water sharing plan, then appropriate studies will need to demonstrate to the Minister's satisfaction that the variation will not prevent the long-term viability of the dependent ecosystem or significant site. If more than 2 m decline cumulatively at any water supply work then make good provisions should apply.	A cumulative pressure head decline of not more than 40% of the 'post-water sharing plan' pressure head above the top of the relevant aquifer to a maximum of a 3 m decline, at any water supply work. If the predicted pressure head decline is greater than the requirement above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the affected water supply works, unless make good provisions apply.	■ If condition (a) above is not met, then appropriate studies will need to demonstrate to the Minister's satisfaction that the change in groundwater quality will not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works. ■ If conditions (b) or (d) above are not met, then appropriate studies are required to demonstrate to the Minister's satisfaction that the River Condition Index category of the highly connected surface water source will not be reduced at the nearest point to the activity. ■ If conditions (c) or (d) above are not met, then appropriate studies are required to demonstrate to the Minister's satisfaction that: there will be negligible river bank or high wall instability risks; during the activity's operation and post-closure, levee banks and landform design should prevent the probable maximum flood (PMF) from entering the activity's site; and low-permeability barriers between the site and the highly connected surface water source will be appropriately designed, installed and maintained to ensure their long-term effectiveness at minimising interaction between saline groundwater and the highly connected surface water supply.

Source: DPI (2012)

6.2 Harvestable rights policy

Based on the approximate mid-point location of the landholding subject to harvestable rights in the central-inland draining catchments area and an approximate landholding of 250 km^2 between 8 landowners, a maximum harvestable rights dam capacity was calculated at **1,250 ML/year** (WaterNSW, 2024). This assumes an agreement with landowners to benefit from landholder's harvestable rights within the extent of the project area.

Harvestable rights permit the capture of rainfall runoff moving naturally across the landscape. Dams built to capture and store harvestable rights water do not require a water access license, water supply work/use approval (DPIE, 2024). However, the installation of channels and runoff diversion to capture and transfer rainfall runoff into a harvestable rights dam are not provided under a harvestable right, as such would require an appropriate WAL prior to construction (DPIE, 2024).

It is noted that in central inland-draining catchment areas certain provisions apply to mixed-rights dams (dams storing harvestable rights water any other water that has been lawfully taken from a water source such as groundwater), where a WAL may be required.

6.3 Existing bores

Based on landowner consultation, Origin has identified existing irrigation bores within the project area that could be used towards supplying the Project's water demands.

It is noted that the documented borehole yields are estimates made by drillers from airlift yields and are often overestimated. Reported Standing Water Levels (SWLs) are relatively consistent across the identified bores. Salinity at identified bores indicates groundwater is of freshwater and potentially potable water quality, though salinity reported is indicative and thus should be considered to have relatively low confidence.

6.4 Existing approvals and WALs in project area

A summary of the existing approvals and WALs within the project area is presented in Appendix C.

A summary of existing WAL share components and their associated approvals in the project area are provided in Table 6-2.

Table 6-2 Summary of WAL share components and associated approvals in project area

WAL #	Water source	Tenure	Share components (ML)	Approval(s) #
11880	Lower Murrumbidgee Deep Groundwater Source	Continuing	105.0	50CA504007
11881	Lower Murrumbidgee Deep Groundwater Source	Continuing	1,464.0	50CA503964 50CA503970 50CA504010
11873	Lower Murrumbidgee Deep Groundwater Source	Continuing	100.0	50CA503989

It is noted that inter-state processing times for water allocations and license transfers assignments are generally processed within 10 to 20 business days of submission of application.

6.5 Existing on-site storage

The preferred temporary storage options include turkey nests and bladders with a minimum 2 ML daily storage capacity for peak construction demands. Four temporary storage locations have been pre-selected within the Project Area, with three in the north (N1, N3 and N5) and one in the south (S1). These storage options have been strategically selected near existing bores and infrastructure to manage raw water supply for the project. Figure 6-1 and Figure 6-2 show the location of the proposed temporary storage locations.

The estimated non-potable water needs per storage area have been summarised in Table 6-3.

Table 6-3 Water needs by storage area

Storage area	Non-potable water volume (ML)
N1	127
N3	108
N5	124
S1	71
Total	**430**

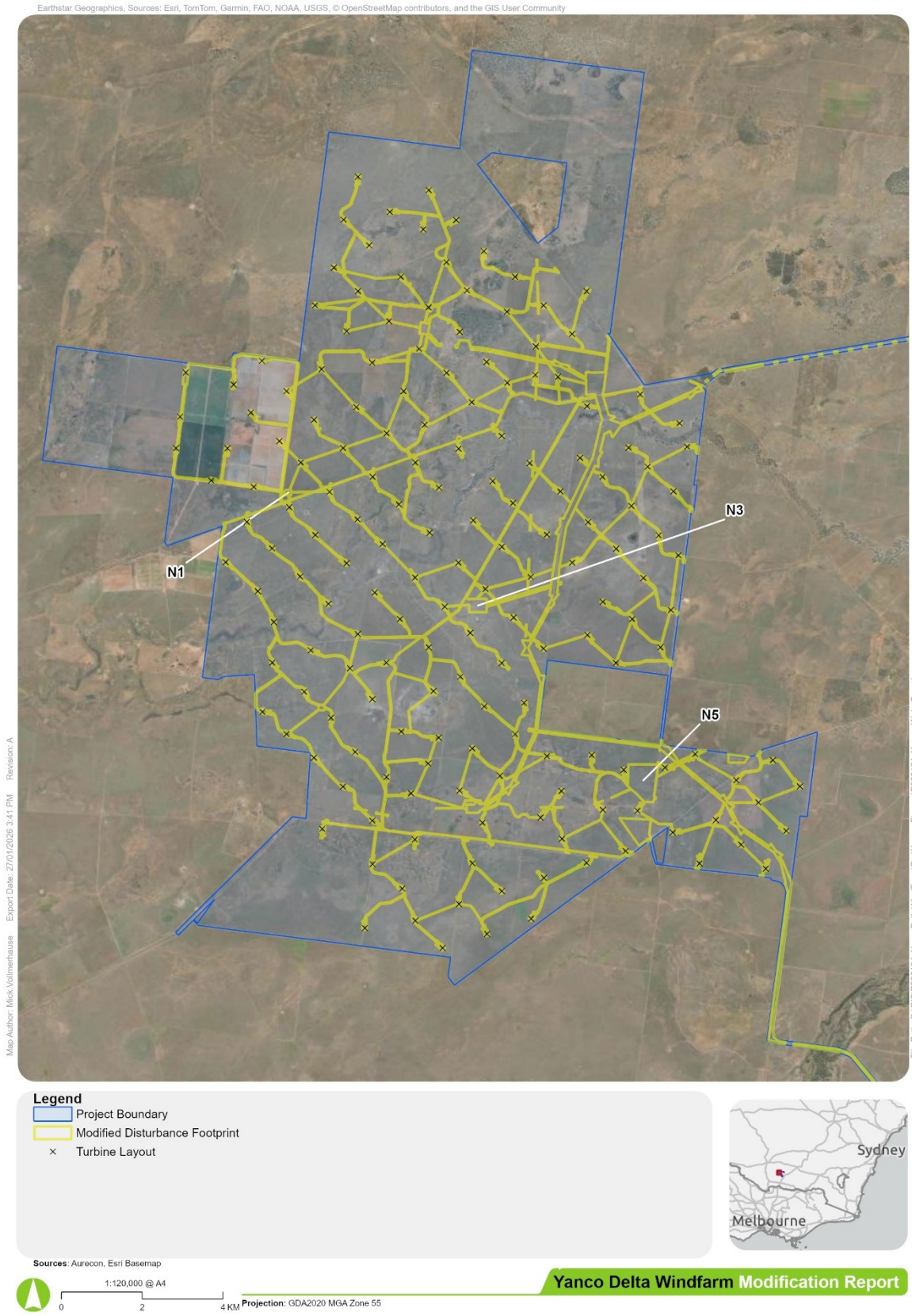

Figure 6-1 Temporary storage location in northern portion of Project Area

Figure 6-2 Temporary storage location in the southern portion of the Project Area

7 Water supply strategy

7.1 Demand summary

As per the water demand information provided by the Contractor summarised in Table 3-1 and Table 3-2, the estimated volume of water needed for a four year construction period is 833 ML. The estimated yearly water demands per category have been summarised below:

- 41 ML/year (averaged) of non-potable water for dust suppression
- 66.5 ML/year (averaged) of non-potable water for soil/roadbase conditioning and compaction
- 19.5 ML/year (averaged) of potable water for concrete batching
- 199 ML/year (averaged) of potable water for accommodation camp and miscellaneous day use
- 3.8 ML/year (averaged) of potable water for hydro mulching
- 208.3 ML/year total water demand or 250 ML/year with a 20% margin of error

These figures are based on the current construction program and are subject to change as part of design adjustments. The Contractor is considering two water sourcing options, which include:

- Option A: water trucking from Coleambally Town Water Supply
- Option B: water sourcing from existing landowner groundwater bore with sufficient allocation.

7.2 Supply options

7.2.1 Option A – Off-site sourcing – trucking

Murrumbidgee Council (the Council) has been consulted on the Projects water sourcing requirements since May 2025 and the Council indicated that there is sufficient potable water supply from Coleambally Town Water Supply to meet the project's potable water demand. The water is sourced from a groundwater bore with a perpetual water allocation (though the exact available annual allocation is unknown) for Town Water Supply. The standpipe is located in Coleambally industrial area and is treated to potable standard at a nearby treatment facility.

Based on the water demand summary in Table 3-1 and Table 3-2, assuming a relatively conservative trucking volume of 15 kilolitre (kL) (0.015 ML), the following trucking frequency would need to be achieved to meet potable water demands by calendar year:

- Water trucking 2026: 4 trucks per day
- Water trucking 2027: 36 trucks per day
- Water trucking 2028: 32 trucks per day
- Water trucking 2029: 4 trucks per day

Should higher capacity trucks be used (such as 30 kL), the effective daily trucking may be halved, though larger capacity trucks would take longer to fill and mobilise.

7.2.2 Option B – On-site sourcing – accessing existing bores

Landowner discussions are underway to identify opportunities to access raw water from existing allocations. Bores currently used for irrigation purposes (located in the northern portion of the project area) have been identified as prospective bores. These are understood to be high yielding and sufficiently productive to meet the project's water demands. Further consultation is being carried out to identify such suitable licensing via water trade through a zero-share WAL.

Bore water testing

Although bore water is expected to be used only for non-potable use based on the project's current water strategy, water quality testing will need to be conducted to confirm water quality requirements for non-potable construction use which includes dust suppression and soil/roadbase conditioning for compaction. Although the existing bores have been identified as high yielding, pumping tests may be warranted to verify measurable yields and confirm groundwater availability during peak construction. It is recommended that potential bores are considered for groundwater take to avoid unforeseen project delays related to pump functionality or access.

Bore water treatment

Should bore water not meet water quality standards for non-potable use, pumped water may be treated on-site to meet the project's demands. Temporary mobile water treatment units may be sourced for the project to achieve the desired water quality. Based on the current understanding of water quality within the project area, water quality issues are expected to potentially relate to hardness, salinity and total dissolved solids, a mobile water softening plant can regulate pH, chlorine, iron, manganese and hardness. A MAK water softening plant -300 unit can treat up to 300 m^3 (300,000 L) of water per day, as such, two units would be required to meet the water demand target of 3.3 L/s and allow room for redundancy for pump servicing or increased demands during peak construction periods.

Bore water extraction

Water sourcing of non-potable water from groundwater would require a mean extraction rate of 3.3 L/s based on current estimates and a peak extraction rate of 6.2 L/s during peak construction in year 2028. It is recommended that a licensing requirement of 240 ML/year for groundwater take is adopted to account for peak demands during the construction period (inclusive of a 20% margin of error). In order to achieve sufficient flow a suitably robust submersible pump will be required to meet the project water demands. High flow rate pumps with sufficient uplift capacity are recommended to meet project water demands.

7.2.3 Option B – On-site sourcing – licensing of existing bores

Groundwater allocations could be purchased and transferred to the existing bores on site (as described in Section 6.1.2) with the following considerations:

- The yields from the existing bores may be insufficient to meet project needs even though sufficient allocation has been obtained
- The bores may need to be upgraded and additional infrastructure may need to be provided (e.g. pipelines, pumps)
- The bores may not be located in optimal locations for construction
- Approval for the change in water use from DCCEEW would be required.

8 Mitigation measures

Mitigation measures to be implemented prior, during and post the construction stage to meet project water demands through groundwater take have been summarised in Table 8-1.

Table 8-1 Groundwater take mitigation measures

Ref.	Mitigation measures	Timing
	Groundwater levels & flow	
SW29	**If water allocations are transferred from other bores to existing bores in or near the project area the following assessments will be undertaken:** ■ **Groundwater level monitoring to occur prior to construction to establish baseline levels (monitoring period should be undertaken for six months to capture seasonal fluctuations in groundwater levels).** ■ **Aquifer pumping tests to occur prior to construction groundwater take to assess production yields and establish sustainable pumping rates.** ■ **Groundwater take 'local impact area' as defined in the Lower Murrumbidgee Groundwater Source Water Sharing Plan is to be established to assess the impact to the subject aquifer and groundwater users.** ■ **Completion of a conceptual water supply study following ground truthing work to inform a preliminary groundwater conceptual site model of groundwater take. Development of a conceptual outline of water supply would assist both development design and also be utilised as a community engagement tool to illustrate the construction and operational water infrastructure required.** ■ **Groundwater take is to be monitored and in line with WAL allocations/term transfers.**	**Prior to construction, construction, operation**
	Groundwater quality	
SW30	■ **Groundwater quality monitoring to occur prior to construction to establish pre-development quality and requirements for potential on-site treatment.** ■ **Establishment of appropriate project specific controls and procedures to reduce the risk of potential spills and leaks entering waterways and leaching into the soil which may impact groundwater quality.**	**Prior to construction, construction, operation**

9 Conclusions and recommendations

9.1 Conclusions

The Project's current estimated water demand is 833 ML over the course of four years (48 months or 1,460 days). Project water demand can be broken down as follows:

- 41 ML/year (averaged) of non-potable water for dust suppression
- 66.5 ML/year (averaged) of non-potable water for soil/roadbase conditioning and compaction
- 19.5 ML/year (averaged) of potable water for concrete batching
- 199 ML/year (averaged) of potable water for accommodation camp and miscellaneous day use
- 3.8 ML/year (averaged) of potable water for hydro mulching
- 208.3 ML/year total water demand or 250 ML/year with a 20% margin of error

Two water sourcing options are being considered for the Project, which include:

- Option A: water trucking from Coleambally Town Water Supply
  - Off-site sourcing via trucking from Colleambally Town Water Supply has been identified as the preferred option for potable water sourcing. Colleambally Council communicated there are sufficient allocations to supply the Project during peak construction. Based on a conservative estimate of 15 kL per water truck, on average 19 trucks per day would be required to meet potable water demands during construction.
- Option B: water sourcing from existing landowner groundwater bore with sufficient allocation
  - Bores within the project site have been investigated and several bores (located in the northern portion of the project area) have been identified as prospective production bores that would partially meet water demands via groundwater sourcing.
  - The potential groundwater bores are used for irrigation purposes, as such suitable licensing via water trade through a zero-share WAL should be sought to access groundwater from existing bores for construction use.

Based on discussions with landowners, the total water demand is unlikely to be met solely through existing groundwater bores and would be sourced from a combination of imported water and utilising existing bores.

On-site temporary water storage options such as turkey nests and/or bladders with a minimum storage capacity of 2 megalitres per day have been identified as preferred options. Four pre-selected temporary storage locations have been identified at the project area.

The key findings from the desktop assessment included:

- Sufficient water allocations exist with the project area boundary, attributable to basic land holder rights, harvesting rights, existing approvals, WALs and WSP available allocations.
- There are significant water shares available across the Lower Murrumbidgee Shallow/Deep Groundwater Sources and the Murrumbidgee Unregulated River water sources, which constitute the main groundwater and surface water sources within and adjacent to the project area. However, it is noted that there is significant variability in water allocations year to year, evidenced by the overall locations of water in the Lower Murrumbidgee Deep Groundwater source during the 2024-2025 period (approximately -21,000 ML), while the 2023-2024 period experienced a surplus of approximately 100,000 ML
- Section 4.41 of the EP&A Act determines that approved State Significant Developments (SSDs) are exempt from Section 89 (water use), Section 90 (water management work) or Section 91 (controlled activities) approvals under the WM Act provided impacts are adequately assessed in the EIS or other planning approval submissions.
- The WALs may be transferred to Origin or appropriate Contractor from select sellers through the lodgement of a transfer application form (71M) with Land Registry Services.

- While harvestable rights dams can hold rainwater, they may not necessarily be applicable to mixed use, such as holding groundwater. As such, there is existing on-site containment capacity in existing dams which may require mixed rights licensing to hold both rainwater and groundwater. Suitable auxiliary water storage for construction may be required which may include turkey nests, tanks and bladders.
- A WAL for construction dewatering works is not expected to be required as groundwater levels (>15 m bgl) are anticipated to be greater than the depth of WTG foundations (approximately 4 m bgl and up to 12 m bgl in some locations).
- Potable water quality stored on-site should be regularly tested to meet the requirements for the Australian Drinking Water Guidelines by the National Health and Medical Research Council (2011).

9.2 Recommendations

Correspondence with regional water regulators is recommended to assess contemporary dynamics of water availability in the project area, and landholders who may be transitioning away from historical water-usage activities. Recommendations from this desktop assessment are as follows:

- Allocations available for water trade with the property owner should be determined as soon as practicable to confirm the allocations needed.
- Ongoing discussion with landholders and local water regulators for WAL term-transfers at existing prospective bores.
- Water quality requirements for water demands should be confirmed through field investigations at existing bores.
- If water allocations are transferred from other bores to the existing irrigation bores, a groundwater assessment and study to determine bore yields and whether continuous pumping at high flow rates significantly impact groundwater levels within highly productive alluvial groundwater sources in the project area would be required to satisfy the minimal impact consideration for aquifer interference activities as per the Aquifer Interference Policy.
- WAL applications and discussions with water regulators should be undertaken early.
- Given the variability in water availability, particularly in the Lower Murrumbidgee Deep Groundwater source, it is recommended to secure allocations in a timely manner to ensure sufficient allocations ahead of construction.

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11 Disclaimer

This report has been prepared by Aurecon at the request of Yanco Delta WF Project Pty Ltd exclusively for Yanco Delta WF Project Pty Ltd. Aurecon takes no responsibility and disclaims all liability whatsoever for any loss or damage that any party, other than Yanco Delta WF Project Pty Ltd, may suffer resulting from any reliance upon, or conclusions made, based on the report provided by Aurecon.

Appendix A
Figures

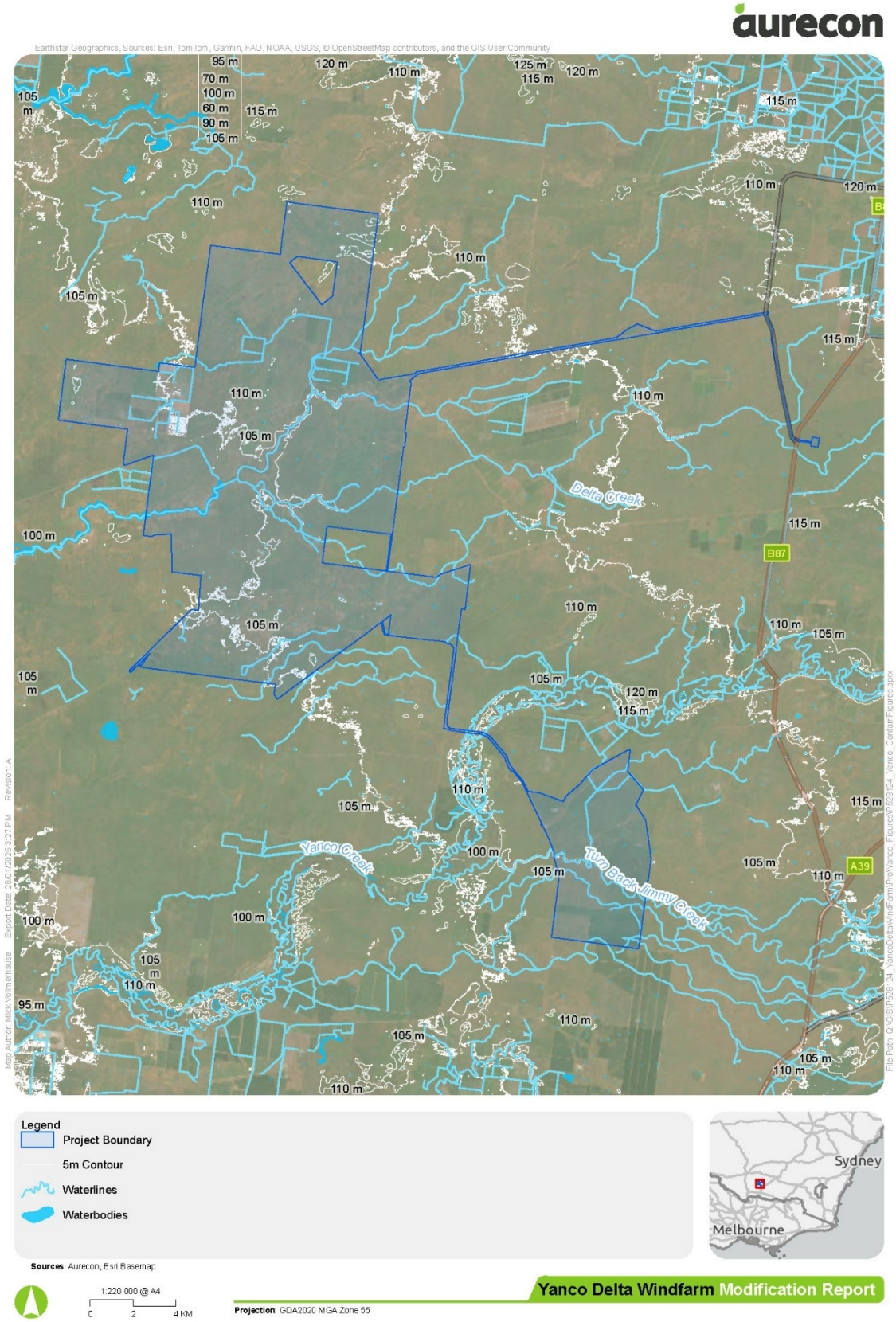

Figure A-1 Project area hydrology

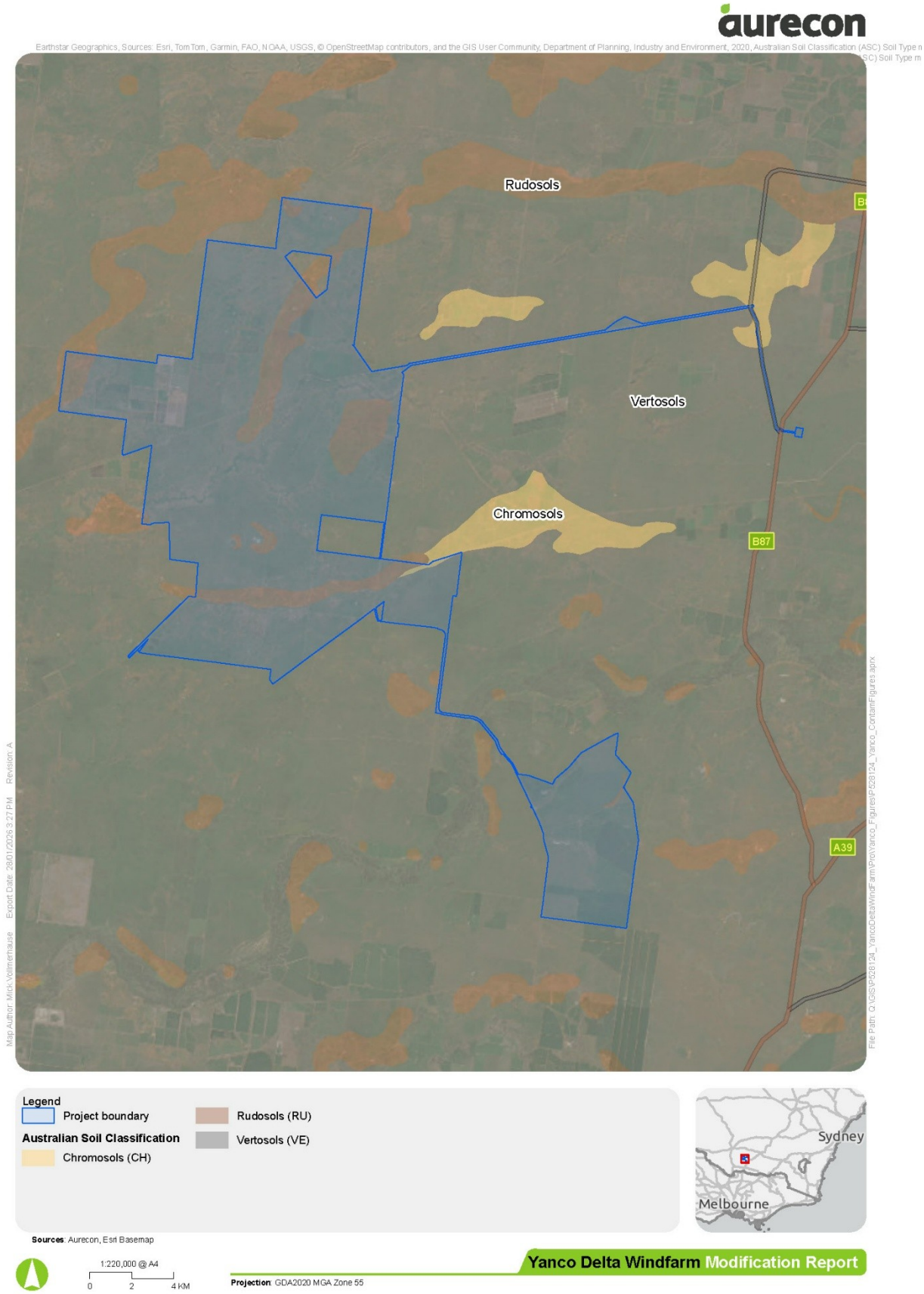

Figure A-2 Project area surface soil classification

Figure A-3 Surface geology

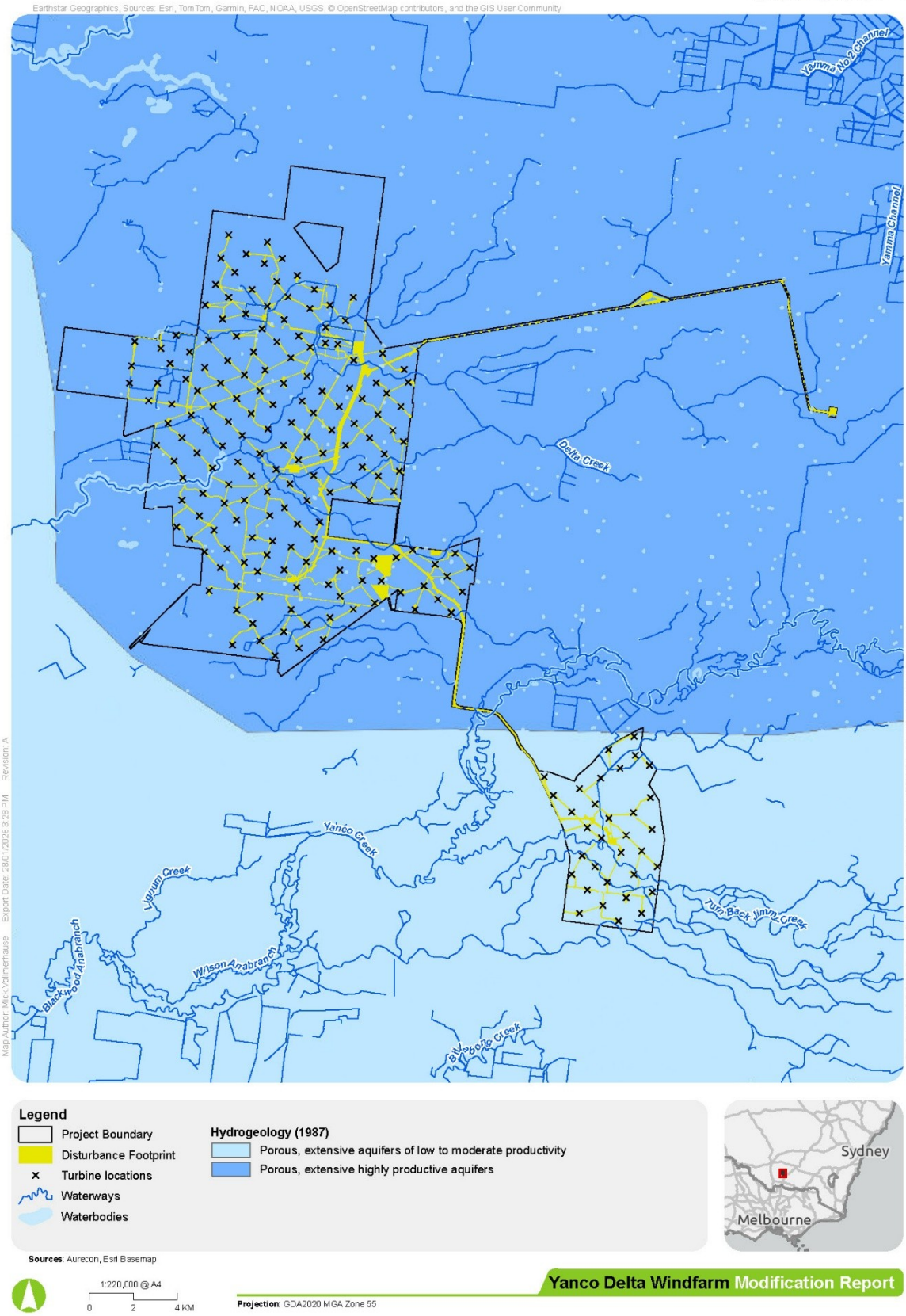

Figure A-4 Project area hydrogeological landscape

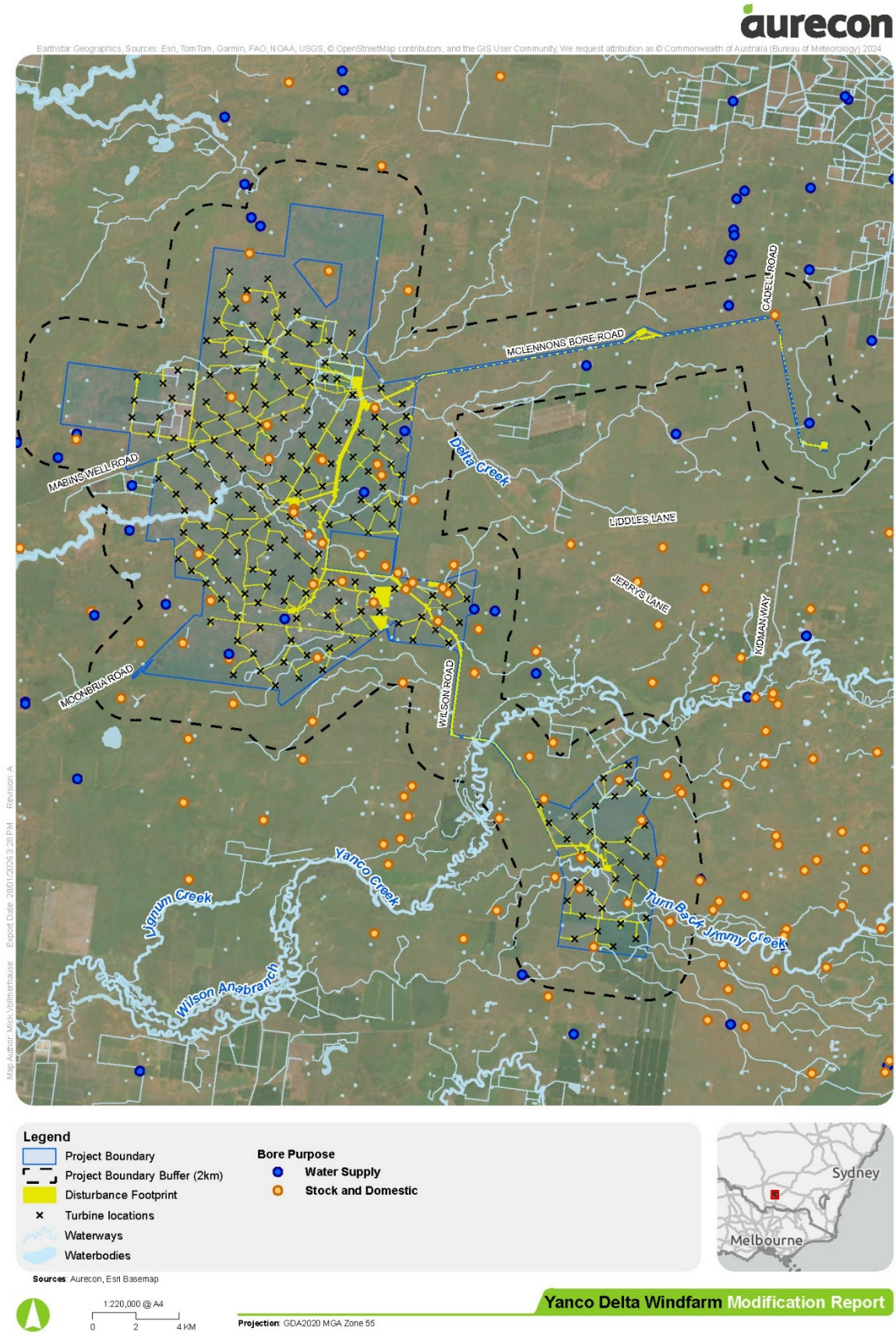

Figure A-5 Project area groundwater bores

Appendix B
Registered Bores

Table B-1 Registered bores (north area)

Bore ID	Drilled date	Purpose	Bore depth (m)	Geology	Water level (m)	Yield (L/s)	Screen (m)	Quality	Distance from Project Area
GW060954	1985-07-01	Stock and Domestic	73.2	Clay, sand	24.4	0.63	-	Salinity: 1001 - 3000 ppm	Within project area
GW063528	1988-03-01	Stock and Domestic	52.4	Clay, sand	24.4	0.63	-	Salinity: 1001 - 3000 ppm, TDS: 1452 mg/L	Within project area
GW504944	1960-01-01	Stock and Domestic	45	-	-	-	-	-	Within project area
GW030946	1981-09-01	Irrigation	-	-	-	-	-	-	Within project area
GW049337	1979-04-01	Water Supply	48.2	Clay, sand	20.9	0.6	45.9 - 48.2	Salinity: 501 - 1000 ppm	1.62 km west
GW404535	1975-01-01	Stock and Domestic	20	-	16	0.03	-	-	360 m north
GW500964	1999-09-29	Irrigation	198	Clay, sand, coal	26.2	220	107 - 120, 165 - 176, 191 - 198	-	Within project area
GW505673	2014-02-06	Stock and Domestic	52	Clay, sand	22	3	49.8 - 51.3	Salinity: 800 mg/L	Within project area
GW012864	1956-01-01	Stock and Domestic	47.5	Decommissioned					550 m east
GW501831	2001-12-21	Water Supply	79.5	Clay, sand	-	-	76 - 79	-	Within project area
GW500504	1997-08-19	Irrigation	157	-	-	-	-	-	Within project area
GW500974	1997-05-01	Irrigation	198	Clay, sand, coal, siltstone	-	-	-	-	1.72 km west
GW028134	1967-09-01	Stock and Domestic	58.8	Clay, sand	22.6	0.38	-	Stock	1.63 km south-west
GW063601	1987-01-01	Stock and Domestic	36.6	Clay, sand	18.3	-	-	Good stock	240 m north
GW061157	1985-07-01	Stock and Domestic	42	-	-	-	-	-	2.83 km south
GW033799	1971-11-01	Stock and Domestic	40.3	Clay, sand	19.8	0.63	-	-	850 m south
GW050058	1979-10-01	Stock and Domestic	46.3	Clay, sand	19.8 - 24.4	0.38 - 0.51	-	Salinity: 1001 - 3000 ppm	940 m west
GW045660	1977-03-01	Stock and Domestic	41.2	-	18.9	0.63	-	Stock	Within project area
GW500469	1997-08-19	Irrigation	157	Clay, sand	20	-	109 - 118, 136 - 157	Salinity: 300 mg/L	Within project area

Bore ID	Drilled date	Purpose	Bore depth (m)	Geology	Water level (m)	Yield (L/s)	Screen (m)	Quality	Distance from Project Area
GW011206	1955-07-01	Stock and Domestic	40.2	Clay, sand	20	-	109 - 118, 136 - 154	Salinity: 300 mg/L	Within project area
GW504598	2011-05-20	Stock and Domestic	20	-	-	-	-	-	Within project area
GW505660	2014-06-17	Water Supply	204	Clay, sand	27	200	86.5 - 90, 95 - 116, 135.5 - 155, 180 - 182, 185.5 - 191, 194.5 - 204	-	880 m west
GW413978	2009-12-04	Stock and Domestic	30	Clay, sand	20	-	24 - 30	-	820 m north
GW030959	1981-11-01	Irrigation	-	Clay, sand, gravel, lignite	-	-	-	-	Within project area
GW055642	1982-02-01	Stock and Domestic	61.2	Clay, sand	23	0.5		Salinity: 0 - 500 ppm	Within project area
GW504552	2011-05-12	Stock and Domestic	25	-	18	-	-	-	Within project area
GW011053	1954-12-01	Water Supply	35.1	Clay, sand	18.9	0.63	33.2 - 35	Good stock	Within project area
GW051060	1979-07-01	Stock and Domestic	50.6	-	-	-	-	-	Within project area
GW504596	1972-05-01	Stock and Domestic	50	-	18	-	-	-	Within project area
GW504414	2002-12-11	Irrigation	204	Clay, sand, coal	-	-	-	-	Within project area
GW069099	1991-03-02	Water Supply	65.5	Clay, sand	19.6	2.5	58.5 - 61	Salinity: 1001 - 3000 ppm	Within project area
GW504942	1960-01-01	Stock and Domestic	20	-	21	-	-	-	1.22 km south-east
GW505480	1994-01-13	Stock and Domestic	52	-	-	-	-	-	Within project area
GW017783	1959-12-01	Stock and Domestic	50.3	Clay, sand	25.9	0.4	-	Very good stock	Within project area
GW404533	1950-01-01	Stock and Domestic	20	-	16	0.03	-	-	Within project area
GW504597	2011-05-20	Stock and Domestic	20	-	18	-	-	-	Within project area
GW504943	1960-01-01	Stock and Domestic	39	-	-	-	-	-	Within project area
GW023038	1965-12-01	Stock and Domestic	53.6	Clay, sand	20.1	0.38	-	Good stock	550 m east
GW504134	2010-10-13	Stock and Domestic	56	Clay, sand	23	3	53.5 - 55	Salinity: 1300 mg/L	Within project area
GW505682	2014-11-28	Stock and Domestic	59	Clay, sand	21	3	55 - 58	Salinity: 1400 mg/L	Within project area
GW400379	1994-07-20	Stock and Domestic	71.6	Clay, sand	23	2	64.5 - 66	Salinity: 700 mg/L	Within project area
GW416368	2013-09-11	Stock and Domestic	67	-	-	-	-	-	Within project area
GW400006	1995-06-30	*ND*	120	Clay, sand	-	-	108 - 120	-	Within project area

Bore ID	Drilled date	Purpose	Bore depth (m)	Geology	Water level (m)	Yield (L/s)	Screen (m)	Quality	Distance from Project Area
GW500968	1994-11-27	*ND*	152	Clay, sand, sandstone, coal	-	-	86.9 - 88.4, 95 - 96.6, 101.8 - 104.9, 106.7 - 109.7, 112.8 - 115.8, 129.8 - 132.9, 134.7 - 137.8, 140.8 - 143.9, 146.9 - 150	-	880 m west
GW505627	2012-10-18	Stock and Domestic	33	Clay, sandy clay, sand	18	0.5	29 - 33	-	1.54 km south-east
GW063047	1987-10-01	Irrigation	160.5	Clay, sand	17.2	-	78.3 - 83.8, 95.8 - 100.2, 103.3 - 112.3, 120.7 - 123.7, 135 - 142, 152.5 - 154, 157.5 - 159	Salinity: 0 - 500 ppm	Within project area
GW505650	2014-04-02	Stock and Domestic	55	Clay, sand	28	5	52.2 - 54	Salinity: 700 mg/L	Within project area
GW027400	1966-12-01	Stock and Domestic	35.1	Clay, sand	21.3	0.61	-	Good stock	Within project area
GW500971	1997-04-01	Irrigation	201	Clay, sand, coal	-	-	-	-	1.72 km west
GW027399	1966-12-01	Stock and Domestic	33.5	Clay, sand	21.3	0.61	-	Good stock	Within project area
GW004966	1959-01-01	Stock and Domestic	26.2	Clay, sand	18	0.61	-	Good stock	630 m east
GW049139	1978-12-01	Water Supply	144	Clay, sand	-	-	141.4 - 143.8	Salinity: 1001 - 3000 ppm	1.39 km west
GW039266	1982-06-01	Stock and Domestic	44	Clay, sand	22.4	0.4	-	Salinity: 501 - 1000 ppm	Within project area
GW401077	1999-04-01	*ND*	182	Clay, sand	-	-	-	-	Within project area
GW010437	1953-05-01	Water Supply	35.4	Clay, sand	19.8	0.76	-	-	Within project area
GW505577	2012-05-08	Stock and Domestic	92	Clay, sand	27	2	87 - 90	Salinity: 450 mg/L	Within project area
GW069098	1991-03-12	Stock and Domestic	64.9	-	-	-	-	-	Within project area
GW017615	1959-09-01	Stock and Domestic	63.4	Clay, sand	25.3	0.35	-	Good stock	1.57 km east
GW504599	2011-05-20	Stock and Domestic	33	-	-	-	-	-	Within project area
GW504687	1950-01-01	Water Supply	35	-	22	-	-	Good stock	450 m south
GW017769	1959-10-01	Water Supply	46.3	-	-	-	-	-	1.2 km north
GW065223	1988-10-20	Water Supply	54.5	-	21.9	0.6	53.5 - 54.5	Salinity: 0 - 500 ppm	1.44 km north

Bore ID	Drilled date	Purpose	Bore depth (m)	Geology	Water level (m)	Yield (L/s)	Screen (m)	Quality	Distance from Project Area
GW500942	1973-01-01	Water Supply	40	-	22	-	-	Good stock	1.84 km south-west
GW401702	2001-04-03	Irrigation	242	Clay, sand	-	-	-	-	1.74 km north-west
GW506176	2015-12-22	Stock and Domestic	-	-	-	-	-	-	730 m south

Table notes: **ND – no data**

Table B-2 Registered bores (south area)

Bore ID	Drilled date	Purpose	Bore depth (m)	Geology (m)	Water level (m)	Yield (L/s)	Screen (m)	Quality	Distance from Project Area
GW012529	1945-01-01	Stock and Domestic	70.7	-	-	-	-	-	Within project area
GW012525	1936-01-01	Stock and Domestic	39.6	-	-	-	-	-	857 m east
GW021745	1964-08-01	Stock and Domestic	41.8	Clay to sand clay	22.9	0.63	-	-	Within project area
GW415941	2012-02-08	Stock and Domestic	55	Clay, silt and sand	19.0	3.0	-	-	39 m east
GW012527	1956-01-01	Stock and Domestic	21	-	-	-	-	-	398 m west
GW056482	1982-03-01	Stock and Domestic	58.5	Clay	20.7	0.61	-	Good stock	Within project area
GW012535	1927-01-01	Stock and Domestic	39	-	-	-	-	-	Within project area
GW012526	1909-01-01	Stock and Domestic	43.9	-	-	-	-	-	Within project area
GW012530	1908-01-01	Stock and Domestic	41.8	-	-	-	-	-	Within project area
GW012531	1916-01-01	Stock and Domestic	21.9	-	-	-	-	-	Within project area
GW018406	1960-06-01	Stock and Domestic	56.7	Clay	23.8	0.61	-	-	85 m east
GW015806	1957-10-01	Stock and Domestic	51.2	Clay	-	0.3	-	-	398 m west
GW017204	1958-01-01	Stock and Domestic	58.8	Clay to sandy clay	21.0	0.38	-	-	Within project area
GW026634	1967-05-01	Stock and Domestic	32.3	Clay to sand clay	18.3	0.61	-	Fresh	Within project area
GW021744	1964-08-01	Stock and Domestic	50.3	Clay to sand clay	18.3	0.63	-	Salinity: 3000 to 7000 ppm	Within project area
GW021743	1964-08-01	Stock and Domestic	66.4	Clay to sandy clay	19.8	0.63	-	Stock	Within project area
GW012532	1915-01-01	Stock and Domestic	25.3	Decommissioned					

Appendix C
Approvals and WALs

Table C-1 Summary of approvals and WALs within project area

Approval / WAL #	Issue date	Type	Water Sharing Plan	Water source	Work type	Description
North area						
50CA504007 / 11880	01/10/2006 to 26/06/2031 (current)	Water supply works and water use for farming and irrigation	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (500 mm) Lot 42, DP 756334 Bore (406 mm) Lot 56, DP 756334 [1]
50CA503989 / 11873	01/10/2006 to 16/10/2029 (current)	Water supply works and water use for irrigation	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (300 mm) Lot 45, DP 756334 Lot 46, DP 756334 [2]
50CA503964 / 11881	01/10/2006 to 30/09/2029 (current)	Water supply works and water use for irrigation	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (450 mm) Lot 1, DP 756311 [3]
50CA503970 / 11881	01/10/2006 to 30/09/2029 (current)	Water supply works and water use for irrigation	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (450 mm) Lot 12, DP 756291 [4]
50WA504066	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (140 mm) Lot 11, DP 756334 Bore Lot 62, DP 756334
50WA512386	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore Lot 72, DP 756304
40WA415105	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (127 mm) Lot 73, 756304
40WA415655	14/01/2013 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Shallow Groundwater Source	Groundwater extraction works	Bore Lot 12, DP 756455
40WA416320	19/11/2014 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Shallow Groundwater Source	Groundwater extraction works	Bore (135 mm) Lot 12, DP 756455

Approval / WAL #	Issue date	Type	Water Sharing Plan	Water source	Work type	Description
50WA512384	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Shallow Groundwater Source	Groundwater extraction works	Bore Lot 39, DP 756455
50WA512382	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Shallow Groundwater Source	Groundwater extraction works	Bore (135 mm) Lot 90, DP 756455
40WA405571	25/11/2009 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Shallow Groundwater Source	Groundwater extraction works	Bore (140 mm) Lot 70, DP 756418
50WA512386	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Shallow Groundwater Source	Groundwater extraction works	Bore Lot 72, DP 756304
40WA415105	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Shallow Groundwater Source	Groundwater extraction works	Bore Lot 73, 756304
50WA512385	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Shallow Groundwater Source	Groundwater extraction works	Bore Lot 17, DP 756304
40WA415255	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Shallow Groundwater Source	Groundwater extraction works	Bore (160 mm) Lot 20, DP 756304
50WA512383	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Shallow Groundwater Source	Groundwater extraction works	Bore Lot 88, DP 756455
50WA512381	01/10/2006 (current)	Basic rights	NSW Murray-Darling porous rock groundwater sources 2020	Lower Murray Groundwater Source	Groundwater extraction works	Bore Lot 85, DP 756304
50WA512390	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (145 mm) x2 Lot 104, DP 756304
40WA415256	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Shallow Groundwater Source	Groundwater extraction works	Bore (168 mm) Lot 87, DP 756304
40WA415150	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Shallow Groundwater Source	Groundwater extraction works	Bore (125 mm) Lot 99, DP 756304

Approval / WAL #	Issue date	Type	Water Sharing Plan	Water source	Work type	Description
40WA415985	23/07/2013	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Shallow Groundwater Source	Groundwater extraction works	Bore (135 mm) Lot 99, DP 756304
50WA512386	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Shallow Groundwater Source	Groundwater extraction works	Bore Lot 72, DP 756304
40WA403935	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (127 mm) Lot 63, DP 756418
40WA403957	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (152 mm) Lot 51, DP 756418
40WA403952	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (152 mm) Lot 55, DP 756418
50WA512368	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Shallow Groundwater Source	Groundwater extraction works	Bore (135 mm) x2 Lot 61, DP 756418
50WA512368	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (135 mm) x2 Lot 61, DP 756418
40WA404323	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (127 mm) Lot 1, DP 229367
South area						
40WA404347 / 11881	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (152 mm) Lot 86, DP 756425
40WA404052	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (102 mm) Lot 30, DP 756425
40WA404280	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (102 mm) Lot 30, DP 756425
40WA404048	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (152 mm) Lot 5, DP 756454
40WA404287	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (152 mm) Lot 5, DP 756454
40WA404049	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (102 mm) Lot 15, DP 756454

Approval / WAL #	Issue date	Type	Water Sharing Plan	Water source	Work type	Description
40WA404198	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (152 mm) Lot 15, DP 756454
40WA404047	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (127 mm) Lot 4, DP 756454
40WA404044	01/10/2006 (current)	Basic rights	Murrumbidgee alluvial groundwater sources 2020	Lower Murrumbidgee Deep Groundwater Source	Groundwater extraction works	Bore (102 mm) Lot 86, DP 756425

Document prepared by

Aurecon Australasia Pty Ltd
ABN 54 005 139 873

Aurecon Centre
Level 8, 850 Collins Street
Docklands, Melbourne VIC 3008

PO Box 23061
Docklands VIC 8012
Australia

T +61 3 9975 3000
F +61 3 9975 3444
E melbourne@aurecongroup.com
W aurecongroup.com

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