

Tandegin Wind Farm

Water Resources Impact Assessment

Collgar Renewables Pty Ltd

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Executive summary

Project objective and overview

The objective of this assessment is to characterise existing surface water and groundwater conditions; estimate water demand and identify feasible supply options; assess potential impacts on water resources during construction, operation and decommissioning; and recommend management and mitigation measures to protect water availability, water quality, hydrological processes and sensitive receptors in accordance with relevant regulatory requirements.

Collgar Renewables Pty Ltd proposes to develop the Tandegin Wind Farm approximately 20 km south-east of Merredin, in Western Australia's eastern Wheatbelt. The Project comprises up to 50 wind turbine generators with a combined capacity of up to 310 MW, a battery energy storage system (BESS) (or other system stability equipment) of up to 1,800 MWh, a 220 kV transmission line connecting to the Collgar Terminal and associated access roads, substations, electrical reticulation, operations facilities, temporary construction compounds and water management infrastructure. The approximately 12,894 ha Project Area is predominantly cleared agricultural land used for cropping and sheep grazing. Construction is expected to occur over approximately 30 months, followed by an operational life of about 30 years and subsequent decommissioning or potential repowering.

Existing environment

The Project Area lies in the semi-arid eastern Wheatbelt, where summers are hot and dry, winters are mild, and rainfall is low and highly variable. The landscape comprises broad valleys, gently undulating plains and low stony ridges and is predominantly cleared for cropping and sheep grazing. The site is within the Yilgarn River catchment and is traversed by two unnamed tributaries of the Belka River. Watercourses are generally ephemeral or intermittent, with low or no flow for extended periods and short-duration flows following significant rainfall. Infrequent, larger regional events can generate substantial flows in some years. Surface water availability is therefore seasonal and unreliable, and available water is commonly saline.

Soils reflect the agricultural Wheatbelt setting and include broad valley and upland soil-landscape units with local susceptibility to salinity and erosion. Acid sulfate soil risk is low. Groundwater occurs within weathered and fractured bedrock and local alluvial materials, but available bore data indicate variable yields, levels and generally saline quality, limiting its suitability without further investigation or treatment. There are mapped wetlands within the Project Area, which are defined as "granite outcrops" according to the Wheatbelt Wetlands dataset. The current design layout does not overlap with mapped wetland extents. However, as the conservation significance and management requirements are unknown, there is potential that buffer zones could be required which may impact the design layout.

Water demand and supply

Project water demand will be highest during the construction phase, principally for concrete production, dust suppression, road and hardstand construction, equipment wash-down and staff amenities. Operational demand will be substantially lower and will primarily support staff amenities and vehicle wash-down. Decommissioning demand is expected to be temporary and mostly used for dust suppression, equipment wash-down and revegetation. Current estimates are preliminary and will be refined as the design, construction methodology, workforce profile and programme develop.

The water strategy is constrained by the region's low and variable rainfall, ephemeral surface water flows, uncertain and seasonal farm-dam yields, limited local groundwater data, potentially low bore yields and generally saline water quality. A staged and mixed approach is likely to be required, with secure potable supply reserved for drinking and amenities and verified non-potable sources used for construction and other lower-quality demands where feasible. Further investigation is being undertaken to develop the water strategy in response to these constraints.

Potential construction impacts

Construction presents the greatest potential for short-term effects on water resources as it involves

- Earthworks
- Vegetation clearing
- Construction of roads, hardstands, turbine foundations and other permanent infrastructure
- Concrete production
- Increased vehicle movements

Potential impacts include

- Increased erosion and sediment-laden runoff
- Local changes to drainage pathways
- Disturbance of watercourse beds and banks
- Introduction of contaminants into surface water and groundwater

Water abstraction could also reduce availability for existing users or environmental values if sources are not appropriately confirmed and managed.

With the proposed controls, the assessment indicates these risks can be reduced to acceptable residual levels. Decommissioning would involve risks similar to construction, but generally over a shorter period and with rehabilitation of disturbed areas forming a key mitigation outcome.

Potential operational impacts

Operational impacts are expected to be substantially lower than construction demand. Potential impacts include:

- Minor changes to runoff from permanent roads, hardstands and foundations
- Erosion or blockage at drainage structures
- Contamination from maintenance activities, waste, chemicals or the battery energy storage system
- Localised effects associated with ongoing water abstraction

Provided drainage assets and water-management controls are maintained, operational impacts are expected to be limited and manageable.

Management and mitigation measures

Construction impacts will be managed through a Construction Environmental Management Plan (CEMP), an Erosion and Sediment Control Plan (ESCP) and an Emergency Response Plan (ERP). The CEMP will stipulate compliant wash-down facilities, containment of concrete wash-water and require toxic and hazardous substances to be stored in suitable facilities away from water resources. The ESCP will document the erosion and sediment controls for the construction phase and the Emergency Response Plan will address the storage, transport, handling and use of chemicals, wastes and other substances that could contaminate water resources.

The conservation significance and management requirements of mapped Wheatbelt Wetlands will be confirmed with the Department of Biodiversity, Conservation and Attractions. If required buffers intersect infrastructure, an ecologist will determine the management criteria and appropriate buffer distance, and the infrastructure layout will be adjusted accordingly.

Operational risks will be managed through an Operational Environmental Management Plan (OEMP) and an Operational Emergency Response Plan (OERP). A Decommissioning and Rehabilitation Plan will manage decommissioning risks and site rehabilitation, with the construction-phase measures also applying during decommissioning.

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1 Introduction

1.1 Project summary

Collgar Renewables is seeking approval to develop the Tandegin Wind Farm (the Project), located approximately 20 km south-east of the town of Merredin. The Project is entirely within the Shire of Merredin, in the wheatbelt region of Western Australia (refer Figure 1-1).

The Project includes the construction of up to 50 wind turbines (WTGs), with a generation capacity of up to 310 MW, and also incorporates a Battery Energy Storage System (BESS) (or other system stability equipment) with a capacity of up to 1,800 MWh, a 220 kV Transmission line, along with associated infrastructure. The Project is situated within a designated Project Area of approximately 12,894 hectares (ha), encompassing the Wind Farm Development Envelope, Transmission Line easement and substation access to existing Collgar Terminal.

The location was selected due to its predominantly cleared landscape, historical use for agriculture, and low population density. The Project is intended to contribute to Western Australia's clean energy transition and emissions reduction targets. These objectives are aligned with the priorities outlined by the Western Australian Government, supporting the shift towards a sustainable and low-carbon energy future.

1.1. Objective of this report

The objective of this Water Resources Impact Assessment (WRIA) is to evaluate the potential water-related considerations associated with the proposed project. Specifically, this report aims to:

- Characterise the existing surface water and groundwater conditions within the study area
- Assess the potential water demand throughout the project's lifecycle, including construction, operation, and decommissioning phases and identify feasible water supply options to meet the Project's needs
- Assess the potential impacts of the Project on the surface water and groundwater environment throughout the project lifecycle
- Propose management and mitigation measures to minimise potential adverse effects on the surface water and groundwater environment in accordance with relevant regulatory requirements.

1.2 Scope of study

This WRIA addresses the potential water-related aspects of the Project across all phases of development, including construction, operation, and decommissioning. The scope of the study includes:

- Characterisation of the existing environment, including climate, surface water, groundwater, soils, and identification of sensitive receptors and water-dependent ecosystems within the Project Area.
- Description of the environmental values of the surface water and groundwater environments.
- Estimation of the project's water demand and disposal for each phase of development, considering key assumptions regarding construction, operation and decommissioning activities.
- Identification and evaluation of potential water supply sources, including a preliminary assessment of supply feasibility and constraints and recommend a water supply strategy.
- Qualitative assessment of the potential impacts of the project on inland waters, including potential changes to surface water flows, groundwater levels, surface and groundwater quality, and the availability of water for other users.
- Identification of management and mitigation measures to avoid, minimise, or offset potential impacts on inland waters, in accordance with regulatory and policy frameworks.

- Provision of recommendations to guide future investigations, water management planning, and environmental approval processes.

1.3 Assumptions, limitations and exclusions

Preparation of this document has relied on the following assumptions, limitations, and exclusions:

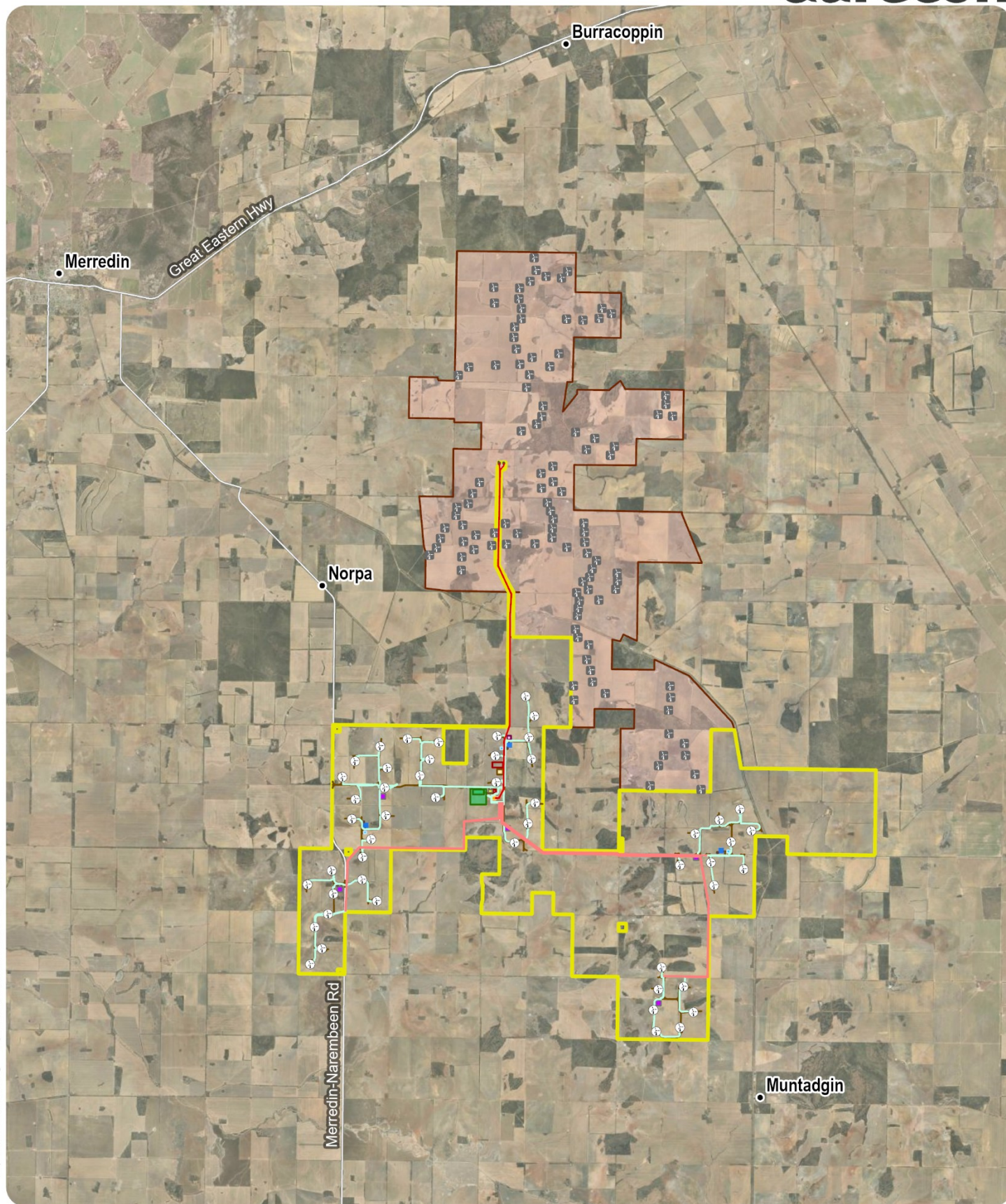
- The assessment is based on the project design communicated to Aurecon as at 09/02/2026, including the proposed maximum number and locations of WTGs, infrastructure layout, and associated project components. Any changes to the project design after this date may affect the findings of this report.
- Flood impacts are addressed separately in the Tandegin Windfarm Flood Modelling Memo.
- The assessment of existing soil, groundwater and surface water contamination is not part of this assessment.
- No site visits or field investigations were conducted to support this preliminary assessment. The study is based on desktop analysis and publicly available datasets.
- Preliminary engagement with landholders, Water Corp and Shire of Merredin have taken place to understand potential water availability. No consultation with Traditional Owners (TOs), or other stakeholders was undertaken at this stage. Further engagement may be required as the project progresses.
- Water demand estimates are preliminary and based on typical construction and operational assumptions for projects of this nature. These figures may be refined as project planning advances.

These assumptions and limitations should be considered when interpreting the findings and recommendations of this report.

1.3.1 Information gaps

No surface water or groundwater features were inspected or monitored. Some publicly available water quality data was available for the Yilgarn River and Belka River, however, this was limited. Flow gauge data was available for the Yilgarn River, but not for the Belka River which is closer to the Project Area. Very limited groundwater quality and levels data was available for the Project Area. As such various information gaps exist, these include:

- Surface water gauging for Belka River
- Recent water quality data for Yilgarn River and Belka River near the Project Area
- Groundwater quality data
- Groundwater levels
- Freshwater availability in nearby farm dams.



Map Author: Carmen Liang Export Date: 13/08/2026 7:46 PM Revision: A

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|---|--|---|---|
| <ul style="list-style-type: none"> Proposed Turbine Location Existing Turbine Location Existing Collgar Wind Farm Boundary Project Area | Proposed Transmission Line <ul style="list-style-type: none"> 220 kV 33kV Proposed Cable Arrays Proposed Infrastructures <ul style="list-style-type: none"> BESS Camp Accommodation | <ul style="list-style-type: none"> Civil Laydown Area Concrete Batching Area Elec and OEM Laydown Area O and M building Hazard Area Sediment Pond | <ul style="list-style-type: none"> Stockpile Site Office Compound Substation Central Terminal Extension Water Storage Proposed Access Roads |
|---|--|---|---|

Sources: Aurecon, Esri Basemap, Landgate



Project: P529171 Issued: 24/08/2026
Projection: GDA2020 MGA Zone 50



Tandegin Wind Farm WRIA Report

Figure : Project Overview

2 Project description

The Project involves the construction, operation, and eventual decommissioning of the Tandegin Wind Farm, a renewable energy generation facility located within the Shire of Merredin, Western Australia. The project is situated predominantly on previously cleared agricultural land and aims to support the transition to clean energy in Western Australia.

2.1 Key components

The Project includes the following physical and operational elements:

- Wind farm infrastructure:
 - Installation of up to 50 WTGs, located within a defined Project Area of 12,893.90 ha.
 - Construction of turbine foundations and hardstands.
 - Development of internal and external access roads and service corridors.
 - Associated power poles, hardstands, and overhead power reticulation throughout the wind farm site.
 - Electrical connections, substations, and grid connection infrastructure.
 - Control room, operational and maintenance facilities, and permanent meteorological masts.
 - BESS (or other system stability equipment) with a storage capacity of up to 1,800 MWh.
 - Communication towers.
 - Temporary infrastructure including civil laydown areas, concrete batching facilities, stockpiles, workers accommodation and utilities for the duration of construction.
- Transmission infrastructure:
 - Construction of a 220 kV overhead transmission line to connect the Project's substation to the Collgar Terminal approximately 13 km away.
- Water supply and management:
 - Water required for construction, operation and decommissioning.
 - Water transfer and storage systems across the site, as required.
 - Surface water management infrastructure to manage onsite drainage.
- Other supporting infrastructure:
 - Two concrete batching plant(s) with a minimum output capacity of 170 m³/hr (construction phase only).
 - Fuel storage area including a mobile self-bunded storage system within a maintenance yard.
 - Fencing and firebreaks installed along the site perimeter.

2.2 Project phases

The project will be implemented in the following phases:

- Construction phase:
 - Estimated duration of 30 months.
 - Includes earthmoving, site preparation, installation of project infrastructure, and temporary construction facilities.
 - Land clearing of up to 47.44 ha of native vegetation.

- Use of plant and equipment.
- Operational phase:
 - The operational life of the project is anticipated to be 30 years.
 - The project will supply renewable energy to the Western Power network, supporting the decarbonisation of the State's energy grid.
- Decommissioning phase:
 - Occurs at the end of the operational life or lease term.
 - Options include full decommissioning or potential repowering with upgraded turbine models.
 - Decommissioning activities will include the removal of turbines, BESS (or other system stability equipment) units, ancillary infrastructure, and rehabilitation of disturbed areas in consultation with stakeholders and landowners.

2.3 Environmental considerations

The Project has been designed to minimise environmental impacts by:

- Locating the majority of infrastructure on previously cleared agricultural land.
- Limiting native vegetation clearance to a maximum of 47.44 ha, with the final footprint expected to be refined during detailed design.
- Layout avoids mapped wheatbelt wetlands and waterways.
- Buffer zones have been applied to mallee fowl mounds location identified on site to minimise disturbance.

3 Legislation and policy

3.1 Relevant legislation and regulation

Table 3-1 summarises the applicable Commonwealth and State legislation and regulation deemed relevant for the WRIA.

Table 3-1 Relevant Commonwealth and State legislation

Authority	Legislation	Approval required	Activity/impact
Department of Water and Environmental Regulation (DWER)	<i>Environmental Protection Act 1986</i> (EP Act)	The EP Act is the principal environmental legislation governing environmental protection and impact assessment in Western Australia. Part IV Division 1, administered by DWER for the EPA, assesses proposals with potential significant environmental impact. Proposals are referred to the EPA under Part IV if they could significantly impact environmental factors as defined by the EPA.	Construction, operation and decommissioning of the Wind Farm and supporting infrastructure
Department of Climate Change, Energy, the Environment and Water (DCCEEW)	<i>Environmental Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	The EPBC Act is the Commonwealth legislation, administered by DCCEEW, that provides a legal framework to protect Matters of National Environmental Significance (MNES). MNES include world heritage properties, national heritage places, international wetlands, threatened species and ecological communities, migratory species, Commonwealth marine areas, water resources related to coal seam gas and large coal mining activities, the Great Barrier Reef Marine Park, and nuclear actions. Controlled Actions, defined in Section 67, are those likely to significantly impact MNES and require approval under the EPBC Act.	Construction, operation and decommissioning of the Wind Farm and supporting infrastructure
DWER	<i>Rights in Water and Irrigation Act 1914</i> (RIWI Act)	The Project is not located within a Proclaimed Groundwater Area under RIWI Act. Therefore, if groundwater abstraction is required, a Section 5C licence (water abstraction permit) is not necessary. It is understood that water for the Project will be sourced from existing farm dams and/or bores. Water for concrete would be the responsibility of the concrete supplier. The Project is located within a Proclaimed Surface Water Area under the RIWI Act. If any works are required off-tenure, potential impacts may need to be assessed through the Bed and Banks permit process, which could involve a new section 11, 17 or 21A permit to interfere with bed and banks, or an amendment to an existing one.	Construction of a bore and dewatering Interference with, or taking water from a watercourse

3.2 Relevant policies and guidelines

Table 3-2 provides a summary of the relevant policies and guidelines considered in this assessment.

Table 3-2 Relevant policies and guidelines

Authority	Document	Relevance to this assessment
Environmental Protection Authority (EPA)	Environmental Factor Guideline – Inland Waters	This guideline provides guidance on what information is required by the EPA regarding water hydrology and water quality impacts for an Environmental Impact Assessment (EIA) in Western Australia. It highlights the need to understand, avoid, minimise, and manage any impacts from all phases of the project lifecycle supported by detailed baseline data, impact modelling, and adaptive management in conformity with EPA expectations.

Authority	Document	Relevance to this assessment
EPA	Statement of environmental principles, factors, objectives and aims of EIA	This EPA Statement offers general guidance relevant to what should be included in an Environmental Impact Assessment for projects in Western Australia; and how it will be assessed by the EPA. It outlines broad environmental principles and objectives to be considered during assessment and encourages a structured approach to evaluating potential impacts throughout a project's lifecycle, including implementation of mitigation hierarchy; consideration of cumulative, off-site and long-term effects; and incorporation of rehabilitation and adaptive management measures to meet the State's environmental protection objectives.
DWER	Water Quality Protection Note 6: Vegetation buffers to sensitive water resources	This document offers essential strategic principles and practical recommendations on retaining, maintaining or re-establishing vegetated buffer zones between land use activities and sensitive water resources. The objective is to protect water quality and ecosystem health by managing runoff, reducing erosion, and mitigating contamination risks through appropriately designed and maintained vegetation buffers.
DWER	Water Quality Protection Note 30: Groundwater monitoring bores	The document provides detailed recommendations on the siting, construction, and maintenance of groundwater monitoring bores designed to measure groundwater levels and quality, should monitoring bores need to be constructed for this project.
DWER	Water Quality Protection Note 13: Dewatering of soils at construction sites	The document provides general guidance on managing the environmental risks associated with short-term dewatering activities during the construction phase of a project. It outlines potential impacts on surface water and groundwater and sets out preferred options and quality criteria for disposing of extracted groundwater.
DWER	Water Quality Protection Note 68: Mechanical equipment wash down	The document provides general guidance on managing the risks of water contamination from mechanical equipment wash down activities, which is relevant primarily to the construction phase of the project where equipment cleaning may occur. It highlights potential risks to surface water and groundwater from contaminants and provides guidance on location constraints for wash down facilities.
DWER	Water Quality Protection Note 65: Toxic and hazardous substances	The document offers guidance on the storage, handling, and management of toxic and hazardous substances (THS) to protect surface water and groundwater quality.
DWER	Water Quality Protection Note 18: Information the Department of Water requires to assess a proposed development or activity	This document specifies the information requirements of the Department of Water for assessing proposed developments or activities near sensitive water resources to ensure protection of surface water and groundwater quality. The note outlines a comprehensive list of data that proponents must provide, including technical and environmental data, project activity details, water use and management, contaminant handling and mitigation, stormwater and drainage management, and monitoring and contingency.
DWER	Water Quality Protection Note 10: Contaminated spills - emergency response plan	The document provides comprehensive guidance on preparing and implementing an Emergency Response Plan (ERP) to manage and mitigate contaminant spills that could impact surface water and groundwater quality.
DWER	Water Quality Protection Note 3: Using water quality protection notes	The document provides Water Quality Protection Notes (WQPNs) which are the Western Australian Department of Water's recommendations for best practice guidance to minimise contamination risks to surface water and groundwater, supporting sustainable water resource management.
DWER	Water Quality Protection Note 14: Statutory approvals	The document outlines the key statutory approvals and relevant Western Australian legislation that developers must consider ensuring protection of surface water and groundwater.

4 Methodology

4.1 Assessment approach

The WRIA was implemented in accordance with the EPA Inland Water Environmental Factor Guideline and included the following tasks:

- Desktop review of documents and data including:
 - Review of project description and design information (Section 2)
 - Legislation, policy and guidelines (Section 3)
 - Review of publicly available data (Section 4.3)
- Description of the existing condition including climate, topography, land use, soils, surface water environments, geology, soils, hydrogeology and sensitive surface water and groundwater receptors, based on the desktop review (Section 5).
- Water demand and supply assessment. This includes an estimate of water demands during construction, operation, decommissioning/rehabilitation. This assessment provides a preliminary understanding of the availability and reliability of water sources and associated constraints for use (Section 6).
- Qualitative assessment of impacts to surface water quality, surface water quantity, geomorphology and groundwater during construction (Section 7), operation (Section 8) and decommissioning (Section 9). The residual risk of each impact was assessed based on the criteria listed in Section 4.2 with consideration to the proposed management or mitigation measures.
- Description of management or mitigation measures to eliminate or reduce the identified potential impacts.

4.2 Risk assessment criteria adopted

A qualitative risk assessment was undertaken of potential impacts identified for construction and operational phases according to an assessment of likelihood and consequence. The likelihood has been defined as per Table 4-1 and the consequence as per Table 4-2.

Table 4-1 Risk matrix – likelihood descriptor

Descriptor	Frequency	Probability
Almost Certain	Twice or more per year	Event would occur during the Proposal/period under review.
		High number of known incidents.
Likely	Once per year	Event likely to occur during the Proposal/period under review.
		Regular incidents known.
Possible	Once in 5 years	Event may occur in some instances during the Proposal/period under review.
		Occasional incidents known
Unlikely	Once in 10 years	Event is not likely to occur during the Proposal/period under review.
		Some occurrences known
Rare	Once in 20 years	Event would occur in exceptional circumstances during the Proposal/period under review
		Very few or no known occurrences.

Table 4-2 Consequence descriptor

Insignificant	Minor	Moderate	Major	Severe
Negligible change to soil quality, erosion, hydrological/ hydrogeological processes, water availability or water quality.	Short-term modification of soil quality, erosion, hydrological/ hydrogeological processes, water availability and quality within proposal tenure, but no change in beneficial use.	Medium-term modification of soil quality, erosion, hydrological/ hydrogeological processes, water availability and water quality within proposal tenure, but no change in beneficial use. Short-term modification of hydrological processes, water availability and water quality outside proposal tenure, but no change in beneficial use.	Long-term modification of soil quality, erosion, hydrological/ hydrogeological processes, water availability and water quality within proposal tenure, but no change in beneficial use. Medium-term modification of hydrological processes, water availability and water quality outside proposal tenure, with change in beneficial use.	Long-term or permanent modification of soil quality, erosion, hydrological/ hydrogeological processes, water availability or water quality outside proposal tenure, with impacts to a water dependent environmental value and/or change in beneficial use.

The likelihood and consequence were then combined as per the risk assessment matrix in Table 4-3. Each risk level is qualitatively described below.

- Low: Potential adverse impact could result in a minimal/not noticeable decline in the resource/quality of a surface water or groundwater resource in the study area.
- Medium: Potential adverse impact could result in a decline in the resource/quality of a surface water or groundwater resource in the study area. Impact can often be managed through standard safeguards.
- High: Potential adverse impact could result in a decline in resource/quality of a surface water or groundwater resource to lower than-baseline/worse-than-baseline. Impacts would require specific management as impact could have large community/environmental issues.
- Very high: Potential adverse impact could result in significant decline in the resource/quality of a surface water or groundwater resource to significantly lower-than-baseline/worse-than-baseline condition. Impacts would require specific management as impact would have significant community/environmental issues.

Table 4-3 Qualitative risk assessment

Likelihood	Most credible consequence level				
	Negligible	Minor	Moderate	Major	Severe
Almost Certain	Low	Medium	High	Very high	Very high
Likely	Low	Medium	High	High	Very high
Possible	Low	Low	Medium	High	High
Unlikely	Low	Low	Low	Medium	High
Rare	Low	Low	Low	Medium	Medium

4.3 Data sources

Table 4-4 lists the data sources used for analysis in this report.

Table 4-4 Data sources

Data	Source
Aerial Imagery	■ Esri Geoscience Australia Topographic Basemap
Topography and land use	■ Cadastre (Polygon) (LGATE-217) ■ Reserves (LGATE-227) ■ Generalised agricultural land use of Western Australia (DPIRD-003) ■ Pastoral Stations (DPLH-083)

Data	Source
Climate data (daily rainfall, potential evapotranspiration)	BoM Climate data online
Geology	1:500 000 State interpreted bedrock geology (DMIRS-016) 1:500 000 State linear structures layer (DMIRS-015) - Linear structures 1:100 000 (DMIRS-053)
Soils and landforms	- Acid Sulfate Soil Risk Map 50K (DWER-049) - Interim Biogeographical Regionalisation for Australia (IBRA) Regions (v7) - Soil Landscape Mapping – Best Available (DPIRD-027) - Soil Landscape Mapping – Rangelands (DPIRD-063) 2 metre contours (DPIRD-072)
Groundwater Bores	- Australian Groundwater Explorer (BoM) - The Australian Groundwater Explorer provides access to a wide range of groundwater data, including around 900 000 bore locations, bore logs, groundwater levels, salinity, hydrochemistry, 3D groundwater models, groundwater management areas and landscape characteristics. - Bore locations within the groundwater study zone have been taken from this source. - Baseline bore assessments (undertaken during the fieldworks)
Watercourses and water bodies	- EPA Environmental Factor Guideline – Inland Waters 2018 - Wild Rivers (DWER-087) - Groundwater Salinity Statewide (DWER-026) - Hydrographic Catchments - Basins (DWER-027) - Hydrographic Catchments - Catchments (DWER-028) - Hydrographic Catchments - Divisions (DWER-029) - Hydrographic Catchments – Sub-catchments (DWER-030) - Hydrography, Linear Hierarchy (DWER-031) - Public Drinking Water Source Areas (DWER-033) - RIWI Act, Groundwater Areas (DWER-034) - RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037) - Waterways Conservation Act Management Areas (DWER-072) - WRIMS – Groundwater Subareas and Areas (DWER-083, DWER-085) - WRIMS – Groundwater Resources (DWER-084) - WRIMS – Surface Water Subareas and Areas (DWER-080, DWER-082) - WRIMS – Surface Water Resources (DWER-081)
Wetlands	- Directory of Important Wetlands in Australia - Western Australia (DBCA-045) - Ramsar Sites (DBCA-010) - Wheatbelt Wetlands Stage 1 (DBCA-021)
Floodplain	FPM Floodplain Area (DWER-020)
Flora and Vegetation (including GDEs)	- Groundwater Dependent Ecosystems Atlas (BoM) - Threatened and Priority Flora (DBCA-036) - Threatened Ecological Communities (DBCA-038) - Groundwater Dependent Ecosystem (GDE) Atlas (BOM, 2025)
Subterranean Fauna	- EPA Environmental Factor Guideline – Subterranean Fauna 2016 - Regolith of WA – 500 metre grid (DMIRS-017) - Groundwater Dependent Ecosystem (GDE) Atlas (BOM, 2025)

5 Existing environment

5.1 Climate

The project is situated within the Shire of Merredin in the eastern wheatbelt of Western Australia. It is a semi-arid region with low and highly variable rainfall. The region experiences a climate characterised by hot, dry summers and mild winters with a mean maximum temperature of 25.2 °C and mean minimum temperature of 11.5°C (Bureau of Meteorology, 2026). The highest rainfall occurs predominantly in the winter months, while the summer months typically receive the lowest amount of rainfall. The average annual rainfall is 325 mm with 51 rain days (>1 mm) on average. However, there is considerable variability in annual rainfall, with annual amounts ranging between 130 mm and 570 mm since 1903 (as observed in Figure 5-1).

Local climate condition data was sourced from the Bureau of Meteorology's (BOM) Merredin weather station (no. 010092; Latitude 31.48°S; Longitude 118.28°E), which is approximately 22 km north-west of the Project Area. At this weather station, the highest mean maximum monthly temperature (34.1°C) occurs in January, while the lowest (16.4°C) occurs during July. The lowest mean minimum monthly temperature (5.6°C) occurs in July and August, while the highest occurs in February (18.1°C). The highest monthly rainfall is observed from May to August, with 39.8 mm in May, 48.3 mm in June, 50 mm in July and 39.7 mm in August. The least amount of monthly rainfall is observed in December with 13.7 mm.

Figure 5-2 provides a comparison between current (2025) climate data and historical data from BOM. As observed, in 2025 maximum temperatures were marginally higher than average historical maximum temperatures for most months and recent rainfall was considerably higher in August and lower in the summer months as compared to historical data.

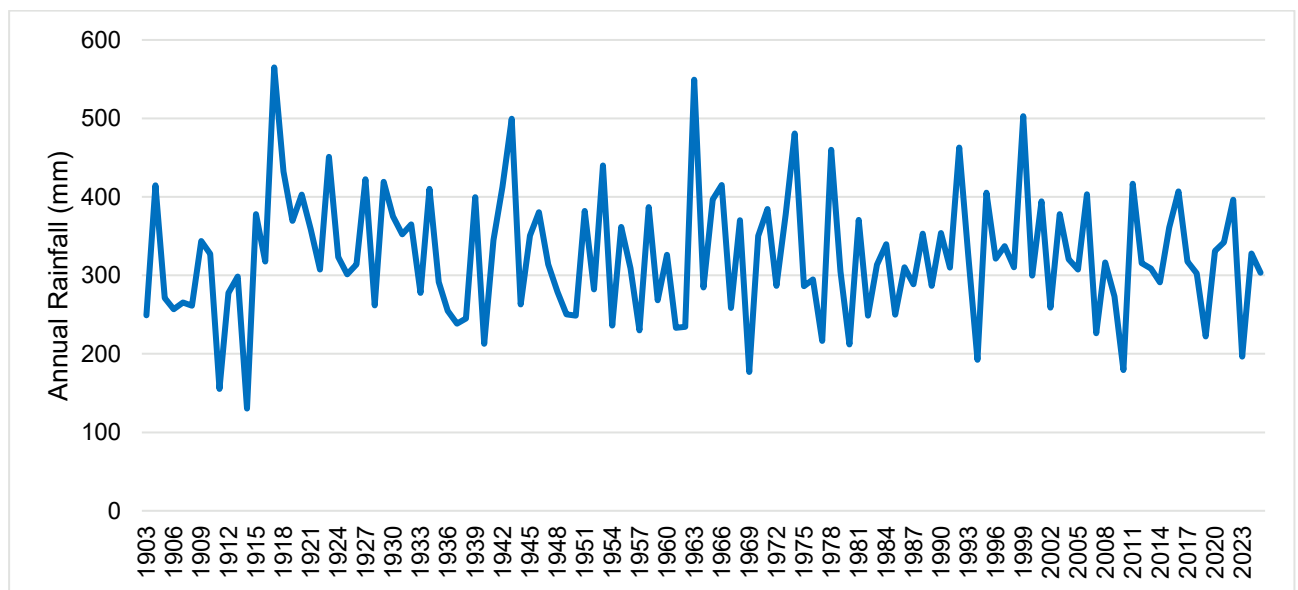


Figure 5-1 Annual Rainfall for Merredin Weather Station (010092)

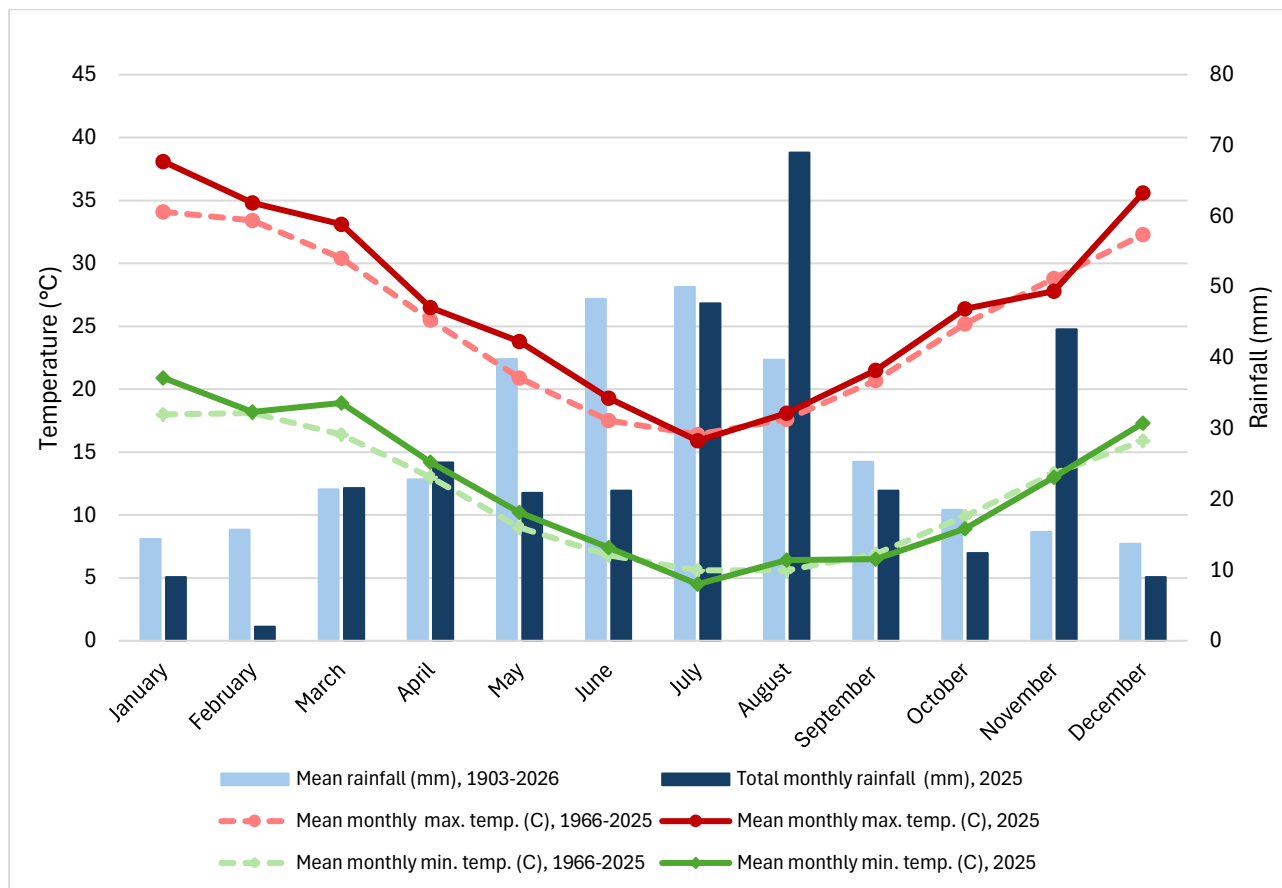


Figure 5-2 Comparison of current (2025) and historical climate data for Merredin Weather Station (010092)

5.2 Topography and land use

The landscape is characterised by broad valleys, gently undulating plains and gently sloping stony ridges. The Project Area sits within an elevation range of approximately 340 m to 420 m AHD. A valley runs through the centre of the site where elevations are lowest. The rest of the Project Area is made up of a series of gently undulating peaks.

The project is located within Western Australia's wheatbelt and therefore the Project Area has predominantly been used for cropping and sheep farming. As a result, most of the Project Area has reduced conservation value due to prior disturbance associated with agricultural land use. The Project Area is adjacent to the existing Collgar Wind Farm and other renewable energy land uses are also nearby. There are also some small nature reserves nearby.

The local topography and surrounding land use are shown in Appendix A.

5.3 Surface water

5.3.1 Catchment and watercourses

The project sits within the Yilgarn River catchment area, located within Western Australia's eastern Wheatbelt region. The land use surrounding the project has been cleared and used for agriculture. However, a number of Crown reserves have been established for conservation within or close to the floodplain (Department of Water, 2009).

Two unnamed tributaries to the Belka River, which forms part of the Yilgarn River catchment, are located within the project footprint:

- A minor river, located at the northern extent of the Project Area, adjacent to the existing Collgar windfarm substation
- A significant stream, located within the valley through the centre of the project.

Limited information is available as to the condition or flow regime of these watercourses, but they are observed on aerial imagery to traverse through a series of farm dams and likely flow only following high rainfall for a short period of time.

Waterways within the vicinity of the project boundary include the Belka River, located to the south-west of the Project Area and the Yilgarn River, located north-west of the Project Area through Merredin and Hines Hill.

The Belka River is a tributary of the Yilgarn River, with their confluence located near Hines Hill. The characteristics of the Belka River system are like those of the Yilgarn River system (Department of Water, 2008) and as such, the river receives streamflow from groundwater seepage and larger rainfall events and has a variable flow regime. The Belka River is classified as a Level 2: Major River (Department of Water and Environmental Regulation, 2026).

The Yilgarn River is not considered to be a direct receiving waterway of the project, but instead a downstream waterway as it receives flow from the Belka River. As more information is known about the Yilgarn River, it is described below to provide an overview of the characteristics of the waterways and typical catchment management within the region.

The Yilgarn River originates north-east of the town of Southern Cross from water draining into Lake Seabrook and Lake Deborah. It then flows to the south-west past Merredin and through Hines Hill where it converges with the Belka River. It then continues south west to its confluence with the Lockhart River. It receives streamflow from groundwater seepage and numerous tributaries. The Yilgarn River system lies within the zone of ancient drainage, characterised by broad valley floors; chains of large, relatively flat salt lake systems; braided, discontinuous channels bordered by lunettes and flat to undulating saline plains (Department of Water, 2008). As such, the waterway does not flow as one linked system unless a major summer rainfall event occurs or there is a prolonged, wet winter. This means streamflow in the river is highly variable. The Yilgarn River is naturally saline, however, clearing has led to a rise in the water table and an increase in salinity. Rising groundwater risk affects approximately 27% of the Yilgarn catchment (Department of Water, 2009). Earthworks are used extensively in the Yilgarn River catchment for surface water management. Fresher flows are captured in dams for on-farm use, but significant amounts of saline surface water continue to be directed into tributaries and into the Yilgarn River (Department of Water, 2008). The Yilgarn River is classified as a Level 1: Mainstream (Department of Water and Environmental Regulation, 2026).

Surface water features are presented in Appendix A.

5.3.2 Flow and water regime

There is an active stream gauging station for the Yilgarn River, known as Gairdners Xing (station no. 615015). It is located 60 km west of the Project Area and has been recording river flows since 1976. Figure 5-3 shows the mean and median monthly flows at the Gairdners Xing Gauging Station. The considerable difference between the mean and median indicates a high variability in streamflow in the Yilgarn River. In general, the river experiences low or no flow during the summer and autumn months, and low flows during winter and spring. However, as indicated by the monthly mean flows in Figure 5-3 and annual river flows in Figure 5-4, the river occasionally experiences extreme flow events (over 10,000 ML/month) and large flow events (over 1,000 ML/month) which can occur during winter and summer. These large flows skew the mean monthly flow results and therefore the median is more representative of the typical flow regime for Yilgarn River, which is intermittent.

While the gauging location is a considerable distance from the Project Area, this flow data indicates the general trends for the Yilgarn River and its tributaries, which include the Belka River and smaller streams intersected by the Project Area. As such, it can be assumed that Belka River would also flow intermittently with its tributaries being either intermittent or ephemeral.

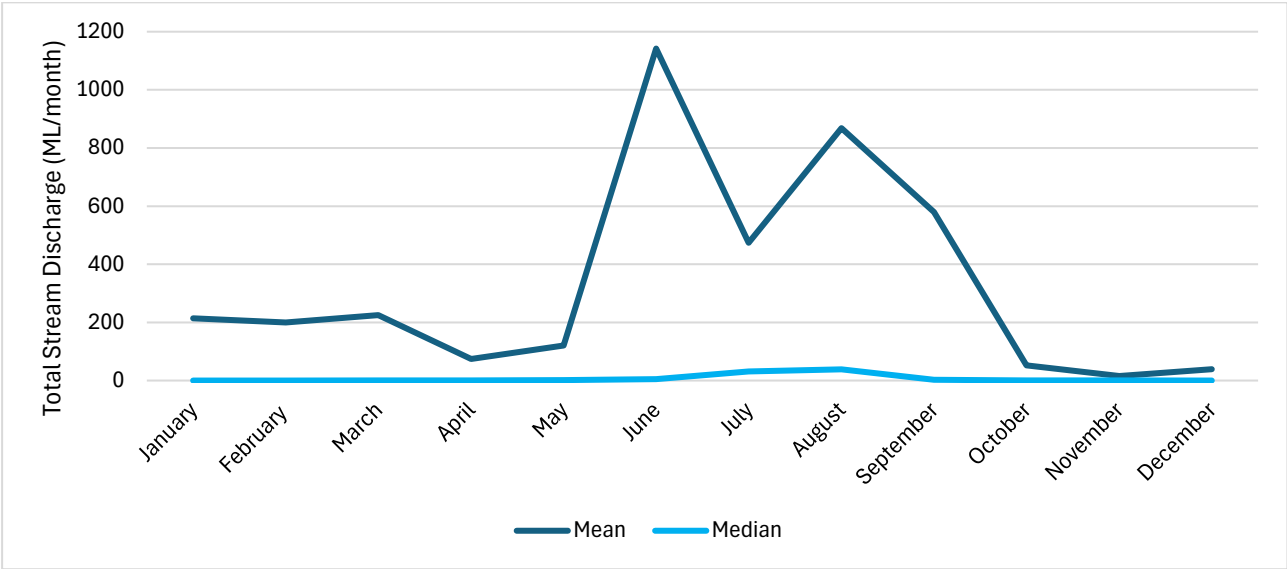


Figure 5-3 Monthly flows in Yilgarn River – Gairdners Xing Gauging Station (no. 615015)

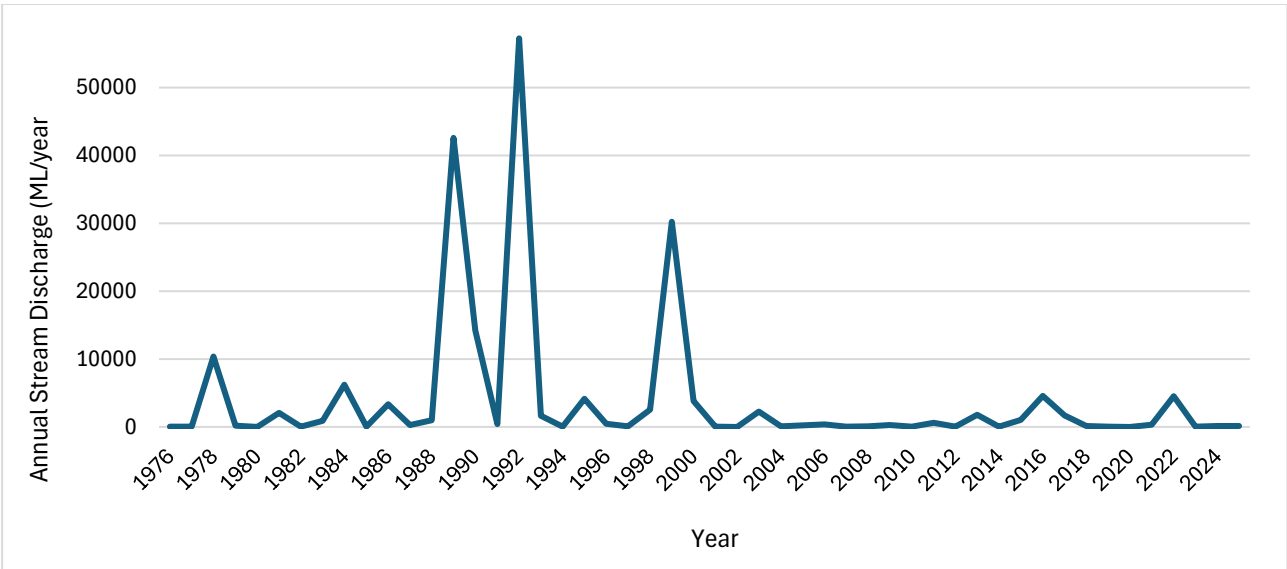


Figure 5-4 Annual River Discharge at Yilgarn River – Gairdners Xing Gauging Station (no. 615015)

5.3.3 Water quality

Water quality data has been sourced from the Water Information Reporting System (WIR), administered by the Department of Water and Environmental Regulation. This system is an online water science data service, providing data to the public on water science information and availability. Surface water data has been extracted for sampling sites along the Belka River, Yilgarn River (including near Hines Hill, Bandee Lake and near the Lake Campion Nature Reserve) and an unnamed tributary of the Yilgarn River. These sampling locations are shown in Appendix A.

The water quality data available is limited. Data is available for pH, salinity and nutrients between 2003 and 2009. The water quality data therefore provides a general understanding of historical quality in waterways adjacent to the Project Area.

Table 5-1 provides an overview of the water quality data gathered for five waterways. The median and the number of data points included in the median calculation are provided. The water quality data has been compared to the trigger values set by the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000). The values have been obtained from Table 3.3.6 from the guidelines for an upland river in South-west Australia. An upland river is defined as having an altitude of equal or above 150 m. The elevation of Hines Hill, situated near the most downstream monitoring location, is 255 m. Therefore, the ANZECC trigger values for upland rivers has been used for this assessment.

The results indicate that all waterways are classified as hyper-saline, which is likely due to saline groundwater discharge to the rivers. The salinity of the Belka River shows salinity levels similar to seawater and salinity increases as water flows downstream. This is likely to be caused by evaporation. The Yilgarn River and tributary have salinity levels higher than typical seawater levels, and extremely high salinity levels are found within the salt lakes at the Yilgarn River at Lake Campion nature reserve and Lake Baandee, again likely the result of high rates of evaporation.

Additionally, the results show that the waterways are strongly acidic with median results between pH 3.1 and pH 4.3. The Department of Water (2009) indicates that while surface water tends to be neutral to alkaline, groundwaters in the eastern wheatbelt and other areas with abundant salt lakes can be acidic, with pH readings of less than 4.5.

The salinity and pH levels indicate significant influence from groundwater into the waterways in the region. It is also observed that the highest salinity levels likely link to the concentration of flows and evaporation that occurs within the salt lakes.

In addition, the results indicate that nutrients are also high within the waterways, mostly exceeding the ANZECC trigger values. The high nutrients are likely attributed to agricultural land uses in the region, with fertiliser runoff commonly contributing phosphates and ammonia/ammonium to receiving waterways. The Department of Water (2008) provides a nutrient classification for TN and TP concentrations. The results in Table 5-1 show very high TN concentrations for the Belka River (median of 3,200 µg/L) and Yilgarn River around the convergence at Hines Hill (median of 3,400 µg/L). The other sites had median values over 4,000 µg/L which are classified as extreme concentrations. The median TP concentration for the Belka River is below the ANZECC trigger, whilst the other locations are only slightly above the trigger level. The TP concentrations are low (below 1,000 µg/L), although notably these still exceed the ANZECC trigger values.

The Department of Water (2008) indicated that turbidity in Yilgarn River at Gairdners Crossing gauging station between 1978 and 2006 ranged between 0.6 -1,650 NTU based on 105 readings. This large range indicates turbidity in the Yilgarn River is highly variable and likely attributed to rain events.

Table 5-1 Water quality median data for adjacent waterways

Water quality indicator	ANZECC (2000) trigger values	Belka River		Yilgarn River (Hines Hill)		Baandee Lake		Yilgarn River Tributary		Yilgarn River (Lake Campion Nature Reserve)	
pH (no. units)	6.5-8.0	3.45	(19 data points)	4.28	(9 data points)	3.56	(7 data points)	3.1	(20 data points)	3.37	(19 data points)
Temperature (°C)	-	15.3	(15 data points)	18.1	(7 data points)	21.8	(5 data points)	18.15	(10 data points)	18.85	(12 data points)
Total Nitrogen (TN) (µg/L)	450	3,200	(6 data points)	3,400	(7 data points)	11,100	(6 data points)	15,000	(7 data points)	5,400	(9 data points)
NH3-N/NH4-N (sol) (µg/L)	60	No data	-	4,100	(2 data points)	9,500	(2 data points)	4,600	(1 data point)	5,450	(2 data points)
Total Phosphorus (TP) (µg/L)	20	18.5	(4 data points)	15	(6 data points)	25	(6 data points)	27	(6 data points)	21	(8 data points)
Total Suspended Solids (TSS) (mg/L)	-	No data	-	11	(3 data points)	No data	-	No data	-	No data	-
PO4-P (sol react) (µg/L)	10	50	(3 data points)	15	(1 data point)	37	(2 data points)	159.9	(7 data points)	42	(5 data points)
Turbidity (NTU)	10-20	No data	-	13	(3 data points)	No data	-	No data	-	No data	-
Alkalinity (CaCO3) (µg/L)	-	<1000	(3 data points)	<1000	(3 data points)	<1000	(3 data points)	<1000	(3 data points)	<1000	(5 data points)
Dissolved Oxygen (DO) (% sat)	80-120%	No data	-	102	(3 data points)	No data	-	No data	-	No data	-
Conductivity@ 25°C (µS/cm)	120-300	54,117	(18 data points)	67,857	(9 data points)	215,000	(7 data points)	89,000	(16 data points)	128,691	(18 data points)
Total Dissolved Solids (TDS) (evap @180°C) (mg/L)	-	43,500	(2 data points)	51,300	(2 data points)	133,000	(1 data point)	75,700	(2 data points)	97,200	(3 data points)

5.3.4 Surface water availability

Surface water availability is expected to be sparse, particularly during summer months, when there is low rainfall and high evaporation. During summer, waterways within the Yilgarn River system typically have low or no flow. During other months, there may be some flows following rain events, but the smaller tributaries will likely remain dry outside of heavy rainfall. These rivers are also very saline and slightly acidic as a result of groundwater discharge and have high nutrient loads from runoff.

A review of the Government of Western Australia, Department of Water and Environmental Regulation (DWER) Water Register Geoportal confirmed there are no surface water licences within or nearby to the Project Area. The project is located within the broader Avon River System surface water area and is spatially shown in Appendix A.

Discussions with landowners has indicated that some surface water is collected in farm dams within the Project Area and may contain fresh water. It is likely the farm dams collect direct runoff. Farm dams within the Project Area will likely have small and inconsistent volumes due to the low rainfall and high evaporation over the summer months. There are approximately 60 farm dams located within the Project Area, estimated based on the spatial dataset '*Farm dams of the South West agricultural region of WA (DPIRD-083)*'. No further information is available on the quality and quantity of the water in the farms dams.

Surface water availability and opportunities for use within this region is therefore considered to be low.

5.4 Soils

5.4.1 Soil landscapes

A review of the Soil Landscapes mapping on Department of Primary Industries and Regional Development (DPIRD) Natural Resource Information (Western Australia) Geoportal shows the Project Area is located entirely within the Northern Zone of Ancient Drainage. The soil landscape zone is characterised as an ancient plain with low relief on weathered granite, with lateritic uplands dominated by yellow sandplain. There is a lack of hydrologic connection to any drainage system and salt lake chains within the zone occur as remnants of ancient drainage systems that only function in very wet years (DPIRD, 2025a).

Within the Northern Zone of Ancient Drainage, the soil landscape systems within the Project Area are as follows (DPIRD, 2025b):

- Tandegin System and Wadderin System comprise of highly weathered bedrock with limited internal drainage. These systems are characterised by thin, sandy or loamy surface soils overlying more compact, clay-rich subsoil layers that restrict vertical water movement and promote lateral groundwater flow. The Tandegin system is dominant throughout the western and eastern extents, while the Wadderin system dominates the central portion of the Project Area.
- Kellerberrin System encompasses broad, internally drained valleys dissected by low, gently undulating rises. Valley floors are commonly underlain by fine-textured, structured clay soils developed from alluvial and lacustrine sediments, which are prone to waterlogging and seasonal ponding under saturated conditions. These are isolated to soils in proximity to waterways, particularly the tributary to Belka River, that bisects the Project Area.

The various soil landscape systems are presented in Appendix A.

5.4.2 Acid sulfate soils

A review of the Australian Soil Resource Information System (ASRIS) Acid Sulfate soils (ASS) mapping indicated there is predominantly low to extremely low risk potential of ASS occurrence across the Project Area (Fitzpatrick, R. et al, 2011). It is noted however, that the mapping had low to very low confidence in the ASS probability within the Project Area. The acid soils profiles across the Project Area includes:

- Extremely low probability and very low confidence (C4) predominant across the majority of the Project Area where most infrastructure is sited
- Low probability and very low confidence (B4) predominant within the central portion of the Project Area and surrounding lands west of Project

The acid sulfate soils probability in relation to the Project are presented in Appendix A.

5.4.3 Soil salinity

The Project Area generally exhibits very low salinity risk according to statewide salinity mapping L1 classification, with less than 3% probability of moderate to high salinity risk or current salinity (DPIRD, 2025c). Notably, the soils within Kellerberrin System are located in valleys associated with watercourses and are have an elevated salinity risk. This is likely due to the combination of groundwater discharge and evaporation. These soils are characterised as H2 (50-70% chance of moderate to high salinity risk or current salinity), with soils surrounding the Kellerberrin System characterised as L2, with a 3-10% chance of moderate to high salinity risk or current salinity.

The salinity risk profiles of soils across the Project Area are presented in Appendix A.

5.4.4 Erosion

Statewide water erosion mapping indicates that the soils across have a very low probability of susceptibility to water erosion. These soils are predominantly classified as L1 (<3% chance of high to extreme water erosion risk). Pockets of soils classified as L2 (3- 10% chance high to extreme water erosion risk) are interspersed across northern portion of the Project Area (DPRID, 2026).

The water erosion risk profiles of soils across the Project Area are presented in Appendix A.

5.5 Groundwater

5.5.1 Regional geology and hydrogeology

The surface geology description is based on the Kellerberrin and Southern Cross geological maps (1:250,000). The surficial geology across the majority of the Project Area comprises unconsolidated sediments such as Quaternary-aged colluvium and alluvium, and Tertiary-aged laterite deposits in the valleys and outcropping bedrock granite and gneiss across the elevated areas. (DPME, 2026). The surface geology is presented in Appendix A..

The geological units present across the Project include:

- Quaternary colluvium and alluvium (Qc and Qa), comprising of quartz and sands, located within floodplains and drainage lines
- Cenozoic sandplain (Czs) overlying the Cenozoic lateritic deposits (Czl and TI), that comprises of heavily weathered bedrock
- Archaean granite and gneiss derived rocks (Agn and Ang) outcropping throughout the Project Area

The Project lies within the Youanmi Terrane of the Yilgarn Craton where the subsurface geology consists of the Archaean-aged granites and greenstones (DMPE, 2025a). The Yilgarn Craton is comprised of granite - gneiss terranes and elongated greenstone belts. The Youanmi Terrane is a major tectonic unit that makes up 58% of the Yilgarn Craton and forms the bedrock in this region (DMPE, 2025b). The bedrock geology is presented in Appendix A.

Other notable geological features throughout the Project Area include a fault and dykes. An exposed fault traverses through the western and northern portion of the Project Area. The fault trends southerly to north-easterly before joining the Koolanooka Fault, a major fault approximately 53 km north of the Project Area. Additionally, two Widgiemooltha deolirite dykes transects the Project laterally (DEMIRS 2022). These faults and dykes may displace the strata, leading to rock-fracturing.

The hydrogeology is dominated by the fractured bedrock aquifer. The overlying Quaternary and Tertiary sediments are very thin (typically less than 10 m) and present near waterways. These sediments are likely to hold a minor aquifer that is thin with a limited extent. These sediments are likely to be saturated in the valleys close to the waterways, however there is limited information to understand the extent of the surficial aquifer.

Statewide groundwater salinity mapping indicates that the groundwater resources are expected to be saline to hypersaline. The groundwater salinity throughout most of the Project Area is expected to be saline (14,000 to 35,000 mg/L Total Dissolved Solids (TDS)). Hypersaline groundwater (> 35,000 mg/L TDS) is expected to occur along the southern boundary and eastern portion of the Project Area (DWER, 2018). Fresher groundwater may exist in the shallow Quaternary Aquifer, however there is limited information to support this. The groundwater salinity across the Project is presented in Appendix A.

The groundwater area is classified as unproclaimed, and therefore the groundwater resources are not subject to *Rights in Water and Irrigation Act 1914* (RIWI Act). The groundwater resources are not managed under an allocation resource plan.

5.5.2 Local hydrogeology

A review of the National Groundwater Information System (NGIS) identified 56 observation bores within 1 km of the Project Area and 31 of these bores are located within the Project Area. The bores are registered for monitoring (10) or unknown purposes (46) (BoM, 2025).

Lithology logs from bores confirm the presence of thin surficial layer of Quaternary and Tertiary sediments (less than 5 m) or weathered granite at the surface, underlain by granite.

Limited publicly groundwater salinity were available from these bores, with only two bores recorded groundwater salinity at time of installation (1969 and 1970). Bore 61511823 intersects the Youanmi Terrane and measured saline groundwater ("greater than 14,300 mg/L TDS").

Bore 61511833 is 9 m deep and intersects the shallow Quaternary and Tertiary sediments. The bore is privately owned and recorded a salinity of "up to 1,992 mg/L TDS", suggesting brackish groundwater. There is limited information on the water level in this bore.

There are 7 bores that are less than 10 m deep and there is very limited information on these bores. The majority of bores range between 10 and 45 m, and these all intersect granite. The only information on groundwater levels on these bores are from the drilling notes during bore installation and water levels range between 16 and 46 m bgl. Many of the bores drilled did not intersect groundwater.

Based on the available groundwater data, the groundwater is most likely saline, and the water table is deep away from the waterways. The shallow Quaternary/Tertiary aquifer is likely to be present in the valleys close to the waterways and likely to have shallow fresher groundwater. The extent of this aquifer is not expected to be widespread.

Details of the groundwater bores are captured in Table 5-2 and presented in Appendix A. Groundwater availability

Limited information on groundwater yield is available publicly. However, groundwater quality is expected to be saline to hypersaline and would require further treatment if considered for project water supply.

The Project is within an unproclaimed groundwater resource area, and therefore not governed by the DWER. As such, groundwater extraction licences are not required.

Table 5-2 Groundwater bore summary within Project Area (including ~1 km buffer)

Bore ID	Drilled date	Bore depth (m)	Purpose	Easting	Northing	Within Project Area?
61511823	30/6/1970	26.8	Unknown	637639	6501197	No
61511824	30/6/1970	29.9	Unknown	640013	6501254	Yes
61511825	30/6/1970	24.4	Monitoring	640527	6500707	Yes
61511826	30/6/1970	22.9	Unknown	639071	6501119	Yes
61511827	30/6/1970	16.2	Unknown	639582	6501142	Yes
61511828	30/6/1970	25.0	Monitoring	640497	6500898	Yes
61511829	30/6/1970	29.0	Unknown	640051	6500830	Yes
61511830	30/6/1970	31.4	Unknown	638606	6500914	Yes
61511831	30/6/1970	24.4	Unknown	641455	6499589	No
61511832	30/6/1969	27.4	Unknown	639285	6492859	Yes
61511833	30/6/1969	9.1	Monitoring	637661	6491856	No
61511834	30/6/1969	29.3	Monitoring	637846	6493605	Yes
61511835	30/6/1969	21.3	Unknown	639639	6493324	Yes
61511836	30/6/1970	36.6	Monitoring	640203	6494560	Yes
61511839	30/6/1969	21.3	Unknown	636577	6493884	No
61511840	30/6/1969	27.4	Unknown	636593	6494138	No
61511841	30/6/1969	34.4	Unknown	637267	6492718	No
61511842	30/6/1969	21.3	Unknown	637222	6493721	No
61511843	30/6/1970	30.5	Monitoring	637475	6493734	No
61511844	30/6/1970	25.9	Unknown	634643	6494250	No
61511845	30/6/1970	42.7	Unknown	636449	6497768	Yes
61512355	30/6/1970	42.7	Unknown	646215	6490798	No
61512356	30/6/1970	36.6	Monitoring	644566	6494765	Yes
61512357	30/6/1970	45.7	Unknown	644536	6495059	Yes
61512361	30/6/1970	36.6	Unknown	649478	6497628	Yes
61512362	30/6/1970	45.7	Unknown	647544	6497688	Yes
61512363	30/6/1970	25.9	Unknown	649043	6497268	Yes
61512364	30/6/1970	30.5	Unknown	648742	6495264	Yes
61512365	30/6/1970	42.7	Unknown	648371	6492646	No
61512374	30/6/1969	22.9	Unknown	644681	6486804	No
61512375	30/6/1969	16.8	Unknown	644373	6486550	No
61512377	30/6/1970	42.7	Unknown	646602	6492285	Yes
61512378	30/6/1970	9.1	Monitoring	646898	6495029	Yes
61512379	30/6/1970	9.1	Monitoring	647182	6494786	Yes
61512380	30/6/1970	25.0	Unknown	646292	6498395	Yes
61512381	30/6/1970	41.1	Unknown	647114	6498414	Yes
61515905	-	-	Unknown	638931	6509528	No
61515906	-	21.3	Unknown	637467	6507944	No
61515913	30/6/1912	22.6	Unknown	641292	6489656	No
61515914	30/6/1912	37.5	Unknown	641134	6489526	No
61515915	30/6/1912	6.1	Unknown	641503	6489802	No

Bore ID	Drilled date	Bore depth (m)	Purpose	Easting	Northing	Within Project Area?
61515916	30/6/1913	23.2	Unknown	637094	6494352	No
61515917	30/6/1913	20.4	Unknown	637257	6494060	No
61515918	30/6/1913	17.4	Unknown	637481	6493922	No
61515919	30/6/1969	29.0	Unknown	640062	6493129	Yes
61515920	30/6/1969	6.1	Unknown	639917	6494102	Yes
61515924	30/6/1912	24.1	Unknown	629729	6493271	No
61515925	30/6/1912	24.7	Unknown	629726	6493272	No
61516931	-	-	Unknown	643423	6494856	Yes
61516932	30/6/1928	11.0	Unknown	643423	6494856	Yes
61516933	30/6/1928	15.5	Unknown	643423	6494856	Yes
61516934	30/6/1928	20.3	Unknown	643423	6494856	Yes
61516935	30/6/1928	14.0	Unknown	643422	6494851	Yes
61516936	-	16.5	Unknown	642503	6494860	No
61516939	30/6/1969	53.6	Unknown	645622	6486907	No
61516940	30/6/1970	6.4	Monitoring	647647	6494612	Yes

5.6 Sensitive receptors and groundwater dependent ecosystems

5.6.1 Wetlands

The project does not intersect with any nationally significant wetlands or Ramsar Wetlands, and there are no Ramsar Wetlands located downstream. There are numerous mapped wheatbelt wetlands within the Project Area, as seen in Appendix A. These are mapped under the Wheatbelt Wetlands Stage 1 dataset. Wheatbelt wetlands in Western Australia are critical, often ephemeral ecosystems located within ancient, flat river valleys and consist of chains of salt lakes that support diverse, yet threatened, flora and fauna. They face severe threats from altered hydrology, increased salinity, and agricultural clearing.

The key “wetland features” within the Project Area are the granite outcrops, which are a type of ecosystem that fall within the wheatbelt wetlands dataset and are found within the Project Area. The Department of Biodiversity, Conservation and Attractions has identified all granite outcrops as wetlands on the assumption that all outcrops have the capacity to hold water in the form of one or multiple pools and support small wetlands. The entire extent of the granite outcrop has been mapped as they can be important sites for numerous small wetlands (gnamma holes) with high biodiversity values, but these are too small to detect through the mapping process. Therefore, proportions of the mapped granite outcrop extents may be devoid of wetland vegetation, or any vegetation at all, however the full extent is included to ensure the areas that are important wetland sites are included in the mapping (Department of Environment and Conservation, 2008).

Granite outcrops create a variety of microhabitats for plants and provide seasonal resources and refuge for a range of fauna as the outcrops divert and store water in a central collection area in arid regions of Western Australia, where freshwater resources are scarce. Due to their isolated nature, these ecosystems are rich in biodiversity and support many endemic species (National Trust Western Australia, n.d.).

Within the Project Area, some of the granite outcrops have been historically impacted by agriculture and drainage activities. The historically impacted wetlands are within the eastern portion of the site, with most listed as minorly impacted and one listed as majorly impacted (as per the wheatbelt wetland dataset, Department of Environment and Conservation, 2008). Minor impacts are isolated and don't involve hydrology alteration. Major impacts indicate that hydrology of the wetland is very likely altered, and more than 30% of the surface of the wetland area is disturbed. The majority (and the largest) of the wetlands have not been impacted at all and remain in good condition.

Given the importance of these wetland ecosystems, it is imperative that they are not negatively impacted by the project. There is a *Wheatbelt basin and granite outcrop wetland evaluations dataset* that assigned conservation significance to these wetlands; however, it is not publicly available. This dataset was requested from the Department of Biodiversity, Conservation and Attractions but no response was received. The current design layout does not overlap with mapped wetland extents. However, as the conservation significance and management requirements are unknown, there is potential that buffer zones could be required which may impact the design layout. It is recommended that Collgar Renewables engage with the Department to ensure the design layout complies with management requirements for the mapped wheatbelt wetlands within the Project Area.

5.6.2 Groundwater dependent ecosystems

Ecosystems that rely on groundwater for all or some of their requirements are classified as Groundwater Dependant Ecosystems (GDEs). Local changes to the hydrological regime at the Project Area may impact sensitive GDEs.

The Australian Government's Atlas of Groundwater Dependent Ecosystems (BOM, 2025) is a spatial tool used to identify three types of GDEs within the proposed Project Area, based on Eamus et al (2006) functional classification framework as described in the Australian GDE toolbox (Richardson et al, 2011). These GDEs include:

- Subterranean Ecosystems (Type I) – Subterranean factors that rely on the presence of groundwater, such as aquifers (stygo fauna) or cave systems (troglo fauna).
- Aquatic Ecosystems (Type II) – GDEs that require surface expression of groundwater such as wetlands and springs.
- Terrestrial Ecosystems (Type III) – GDEs that rely on the presence of groundwater, including all vegetations ecosystems.

Potential GDEs within and surrounding the Project Area have been presented in Table 5-3 and Appendix A.

The aquatic GDEs within the Project Area and surroundings relate to wetlands that are predominantly considered to have low groundwater potential, however a few moderate to high aquatic GDEs are located around the central sections of the Project Area. The terrestrial GDEs identified throughout the Project Area and surrounding areas were identified to be shrublands and considered to have low potential of groundwater dependence.

No subterranean GDEs and spring sites were identified within the Project Area.

Table 5-3 GDEs within and surrounding the Project Area

GDE type	Ecosystem type	Ecosystem description	GDE potential
Aquatic	Wetland	Granite outcrops	Predominantly low (sparse moderate and high)
Terrestrial	Vegetation	Shrublands; Medium woodland; salmon gum and gimlet/York gum and Eucalyptus sheathiana mallee scrub	Low
	Vegetation	Shrublands; Allocasuarina campestris thicket	Low
	Vegetation	Shrublands; mallee scrub, Eucalyptus longicornis and E. sheathiana	Low
	Vegetation	Shrublands; thicket, acacia-casuarina alliance	Low

GDE type	Ecosystem type	Ecosystem description	GDE potential
	Vegetation	Shrublands; York gum and Eucalyptus sheathiana mallee scrub	Low
	Vegetation	Shrublands; Medium woodland; salmon gum and gimlet/York gum and Eucalyptus sheathiana mallee scrub	Low
	Vegetation	Shrublands; Allocasuarina campestris thicket	Low

6 Water demand and supply

6.1 Project water demand

A preliminary estimate of construction, operation and decommissioning water demands has been developed. The estimate was based on the inputs provided by Collgar Renewables, the current project infrastructure footprint, standard assumptions and with consideration to demands estimated for similar projects. These estimates are indicative only and do not constitute an exhaustive list of water demands. The demands should be updated and refined during further design stages when further details have been determined. All water demand volumes have been rounded to the nearest 100 kL.

6.1.1 Key assumptions

Table 6-1 provides the assumed footprint of key infrastructure elements which were used to estimate water demand.

Table 6-1 Key assumptions

Item	Assumed total value	Units	Source
WTG foundations	60,000	m ³	Assumed WTG foundation volume requirements (50 WTG at 1,200 m ³ each)
Central Substation	2.25	ha	Tandegin Wind Farm Concept Design
Site Compound	1.5	ha	Tandegin Wind Farm Concept Design
O&M Facilities	1.5	ha	Tandegin Wind Farm Concept Design
BESS (or other system stability equipment)	36	ha	Tandegin Wind Farm Concept Design
Meteorological mast foundations	0	ha	Assumed pre-cast concrete is used for the foundations based on drawings provided
Access roads (unsealed)	38	ha	Tandegin Wind Farm Concept Design
Turbine hardstand area	22.5	ha	Tandegin Wind Farm Concept Design
Total Permanent Infrastructure Footprint	104	ha	

6.1.2 Construction

The inputs to construction water demand estimate is outlined in Table 6-2. The construction period has been assumed to be 2.5 years based on provided information. Key construction activities that require water demand include:

- Dust suppression
- Workforce potable water use
- Concrete construction demand
- Concrete wash-down
- Vehicle wash-down
- Road (unsealed) construction demand
- Hardstand construction demand

Key considerations for further development and refinement of the construction water demands includes but is not limited to:

- A dust suppression risk assessment and dust management plan should be carried out to determine dust suppression requirements during construction. Dust suppression demands should be refined based on the risk assessment.
- Refinement of workforce demand based on varying workforce numbers throughout construction period
- Refinement of concrete requirements for WTG foundations and infrastructure during further design stages
- Refinement of the vehicle wash down requirements based on further details about vehicle numbers and wash down requirements on site

Table 6-2 Construction water demand

Item	Number	Units	Assumption
Dust suppression demand			
Access roads area	380,640	m ²	Dust suppression assumed for access roads only. A typical width of 6 m was assumed.
Rate of work	2.5	L/m ² /day	Estimation based on professional experience.
Number of days requiring dust suppression	375	Days	Dust suppression assumed necessary for hot, windy weather. Dust suppression assumed to be required each day between November and March, or 150 days/year.
Daily Dust suppression demand	238	kL/day	Demand estimated per day when dust suppression required. Assumes 25% of roads require dust suppression on any one day.
Total Dust Suppression Demand	89,200	kL	Total demand estimated for dust suppression for construction period.
Workforce potable demand			
Potable Water Demand for Construction Compound	180	L/person/day	Typical potable water consumption rate.
Workforce	250	Persons	Peak workforce (Collgar RFI 09-02-2026).
Duration of construction	840	Days	Collgar RFI 09-02-2026 (2.5 years, assuming 4 weeks of annual leave per year).
Daily potable workforce demand	45	kL/day	Daily workforce demand estimated
Total Potable Water Demand	37,800	kL	Total workforce demand estimated for construction period
Concrete construction water demand (Concrete demand assumed for permanent infrastructure only – temporary buildings excluded)			
WTG foundations	60,000	m ³ of concrete	Estimated based on professional experience and equivalent to 1200 m ³ /WTG.
Depth of slabs (building foundations)	0.3	m	No information provided, typical depth assumed.
Central substation (foundations)	3,375	m ³ of concrete	Estimated based on total footprint - assuming 50% of the area requires concrete foundations
Site compound (foundations)	2,250	m ³ of concrete	Estimated based on total footprint - assuming 50% of the area requires concrete foundations
O&M facilities (foundations)	4,500	m ³ of concrete	Estimated based on total footprint
BESS (or other system stability equipment)	11,600	m ³ of concrete	Estimation based on professional experience
Total Volume of concrete required	81,700	m ³	Total volume based on above concrete requirements
Volume of water per m ³ of concrete	0.2	kL/m ³	Typical water demand for concrete batching assumed

Item	Number	Units	Assumption
Total volume of water required for concrete	16,300	kL	Estimate of total water demand for project concrete requirements
Concrete wash-down			
Concrete wash-down demand	0.125	kL/per m ³ of concrete poured	Estimation based on professional experience
Concrete wash-down demand	10,200	kL	Estimated based on the above total volume of concrete poured.
Vehicle wash down water demand			
% of wet days in a year	20%		BoM - Between 1907 and 2025, there were an average of 72 days of rainfall (20% of days in 1 year). Rainfall data extracted from Merredin Station (no. 010092).
% of dry days in a year	80%		BoM - Between 1907 and 2025, there were an average of 293 days of no rainfall (80% of days in 1 year). Rainfall data extracted from Merredin Station (no. 010092).
Vehicle wash down water demand (wet days)	10	kL/day	Estimation based on professional experience
Vehicle wash down water demand (dry days)	5	kL/day	Estimation based on professional experience
Total	5,500	kL	Estimated based on wet and dry day demand over the construction period
Road construction demand			
Water demand for unsealed road construction	19	L/m ² of road	Estimation based on professional experience
Total volume of water for road construction	7,200	kL	Estimated based on total road area and indicative demand for unsealed road construction
Turbine hardstand construction demand			
Water demand for hardstand construction	423	kL/WTG	Estimation based on professional experience
No. of turbines	50	WTGs	Upper limit assumed.
Total volume of water for hardstand construction	21,200	kL	Estimated based on above demand and number of turbines
Total construction water demand			
Total water demand	187	ML	Estimate of total project construction demand
Total water demand (daily average)	0.21	ML/day	Estimated average daily construction demand. Note this will vary based on weather and construction phase.

6.1.3 Operation

The inputs considered to develop the operational water demand can be viewed in Table 6-3. Key operational activities that require water demand include:

- Workforce potable water use
- Vehicle wash down

Key considerations for further development and refinement of the operational water demands includes but is not limited to:

- Refinement of potable workforce demand, dependent on workforce water needs
- Refinement of vehicle use on site during operation. This will be much lower than construction demands and wash down requirements and volume may vary greatly from what is included below.

Table 6-3 Operational water demand

Item	Number	Units	Source
Workforce potable demand			
Potable Water Demand for Operations	180	L/person/day	Typical potable water consumption rate.
Workforce	15	Persons	Operational workforce estimate (Collgar RFI 09-02-2026).
Duration of operation per year	365	Days	Assume 24/7 operation
Total annual potable water demand	0.99	ML	Estimated based on typical consumption rate per person per year
Vehicle wash down water demand			
% of vehicles operating as compared to construction phase	20%		Estimation based on professional experience
Total annual vehicle wash down demand	0.44	ML	Estimated based on wet and dry day demand over the operational period
Total operational water demand			
Operational life	25	years	Operational lifetime estimate (Collgar RFI 09-02-2026).
Total water demand	36	ML	Estimated total operational demand
Total water demand (annual)	1.42	ML/year	Estimated annual operational demand

6.1.4 Decommissioning

The inputs used to calculate a water demand for the decommissioning phase of the project can be viewed in Table 6-4. Key decommissioning activities that require water demand include:

- Dust suppression
- Workforce potable water use
- Vehicle wash down
- Vegetation re-establishment.

Key considerations for further development and refinement of the decommissioning water demands are similar to the construction demands and includes but is not limited to:

- A dust suppression risk assessment and dust management plan should be carried out to determine dust suppression requirements during decommissioning. Dust suppression demands should be refined based on the risk assessment.
- Refinement of workforce demand based on varying workforce numbers throughout decommissioning period
- Refinement of the vehicle wash down requirements based on further details about vehicle numbers and wash down requirements on site
- Identification of native vegetation removal, revegetation requirements and irrigation demand for establishment of vegetation.

Table 6-4 Decommissioning water demand

Item	Number	Units	Source
Dust suppression demand			
Area of access roads	380,640	m ²	Dust suppression assumed for access roads only. Typical road width of 6 m assumed.
Rate of work	2.5	L/m ² /day	Estimation based on professional experience
Number of days requiring dust suppression	214	Days	Assume same proportion of time requires dust suppression as the construction period.
Daily Dust suppression demand	238	kL/day	Demand estimated per day when dust suppression required. Assumes 25% of roads require dust suppression on any one day
Total Dust Suppression Demand	51,000	kL	Total demand estimated for dust suppression for decommissioning period
Workforce potable demand			
Potable Water Demand for Construction Compound	30	L/person/day	Estimation based on professional experience. Assuming no workers living onsite.
Workforce	83	persons	Assume 1/3 of workforce as what was required for construction.
Duration of decommissioning	504	Days	Collgar RFI (up to 1.5 years, with 4 weeks of annual leave).
Total Potable Water Demand	1,300	kL	
Vehicle wash down demand (assumed to be the same as construction)			
% of wet days in a year	20%		BoM - Between 1907 and 2025, there were an average of 72 days of rainfall (20% of days in 1 year). Rainfall data extracted from Merredin Station (no. 010092).
% of dry days in a year	80%		BoM - Between 1907 and 2025, there were an average of 293 days of no rainfall (80% of days in 1 year). Rainfall data extracted from Merredin Station (no. 010092).
Vehicle Wash Down Water Demand (wet days)	10	kL/day	Estimation based on professional experience
Vehicle Wash Down Water Demand (dry days)	5	kL/day	Estimation based on professional experience
Total	3,300	kL	Estimated based on wet and dry day demand over the decommissioning period
Vegetation re-establishment			
Area of cleared native vegetation	474,400	m ²	As provided by the Flora and vegetation Reconnaissance Survey by Emerge.
Irrigation demand for re-vegetation	0.3	kL/m ²	Research indicates 100-300 mm of irrigation for the first year of re-vegetation to ensure establishment. Assumed native species and planting timing aligned with seasons.
Total rehab demand	142,320	kL	Calculated as irrigation demand per m² of cleared native vegetation.
Total decommissioning water demand			
Number of decommissioning days for whole project	547.5	days	Assumed up to 1.5 years
Total water demand for decommissioning:	198	ML	Estimated total decommissioning demand
Total water demand (daily average)	0.36	ML/day	Estimated average daily decommissioning demand

6.1.5 Demand summary

A summary of the water demand across the life of the project can be viewed in Table 6-4. It is expected that water demand will peak during the construction phase, when concrete production is occurring. Water demand will be low and consistent during the operational phase. The demand will again increase when the decommissioning begins, with a peak when irrigation is required to re-establish native vegetation where it was previously cleared.

Table 6-5 Demand summary

Project phase	Estimated timeframe	Total demand (ML)	Total demand (ML/year)
Total construction demand	2.5 years	187	75.0
Total operational demand	30 years	36	1.2
Total decommissioning demand	1.5 years	198	131.9
Total project demand	34 years	421	-

6.2 Water supply options

Desktop research indicated that agricultural activities in the region typically rely on irrigation from groundwater sources (where not brackish or saline), scheme water from the Goldfields and Agricultural Region Water Supply Scheme (GAWS), and small on-farm dams. Surface water and groundwater availability is expected to be low and of poor water quality.

There are four potential water supply options:

- Potable water supply from Goldfields and Agricultural Region Water Supply Scheme (GAWS)
- Groundwater – new groundwater bores with desalination
- Water captured onsite in farm dams and sediment basins
- Wastewater recycling.

These options are described in more detail below.

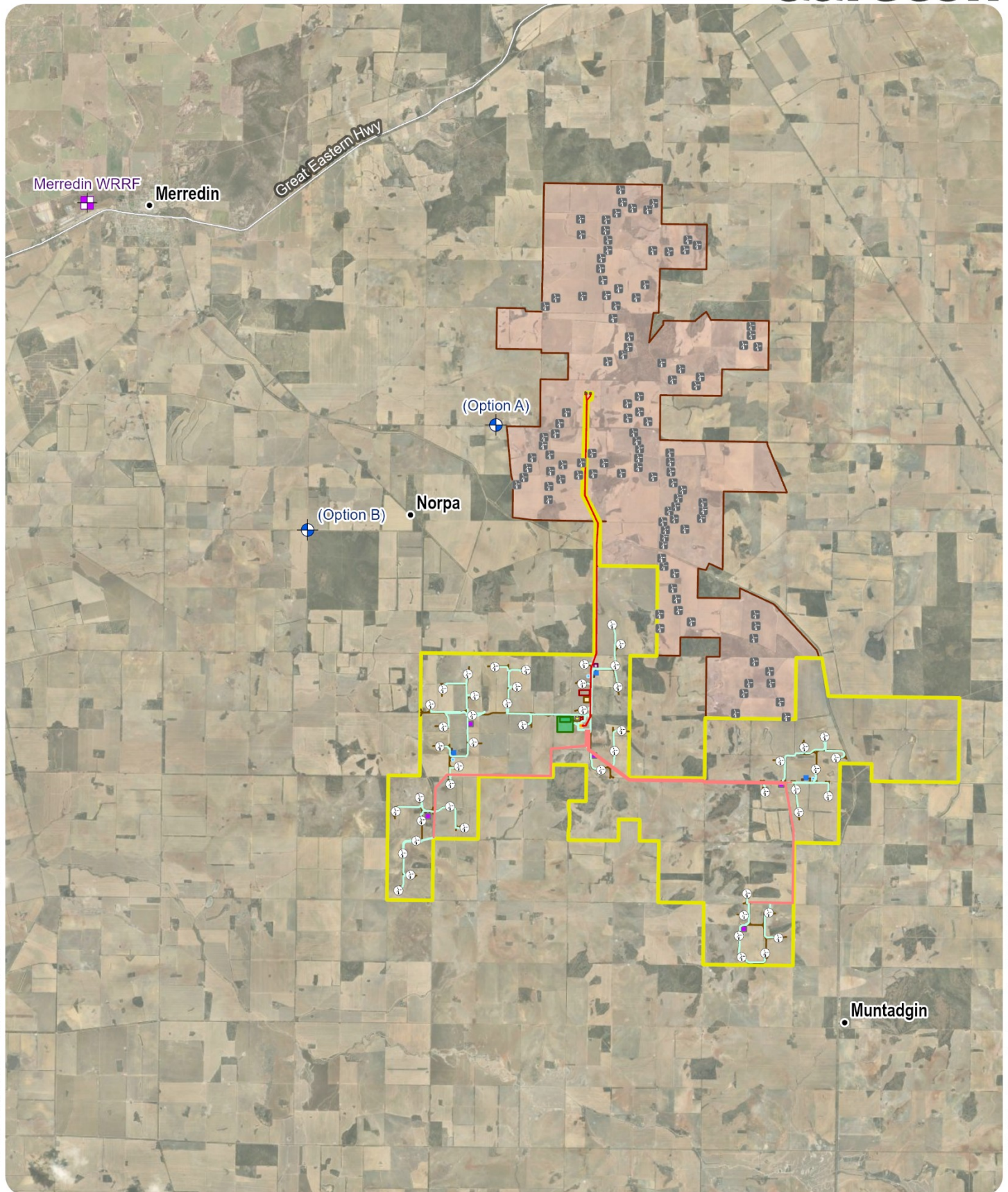
6.2.1 Potable water supply from Goldfields and Agricultural Region Water Supply Scheme

GAWS conveys water from Mundaring Weir near Perth to Kalgoorlie. Groundwater and surface water resources in this region are typically saline, and surface water supply is intermittent. The main conduit is one of the longest freshwater pipelines in the world and supplies reticulated potable water to more than 100,000 customers, farms, mines and other enterprises (Water Corporation, 2026). The pipeline is primarily built for town and regional water supply rather than for agriculture or other uses, however, there is a possibility that the scheme could supply water for the Tandegin Wind Farm if a bulk water supply agreement could be arranged with Water Corporation and/or licensing was obtained. The pipeline runs through Merredin, which is 18 km from the Project Area.

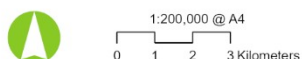
If water was to be sourced from the GAWS, it would need to be trucked to site and stored onsite in tanks or turkey nest dams. Alternatively, a 18 km pipeline could be constructed to connect to Water Corp's existing reticulation. Both options would have implications on cost and potential impacts due to the distance, transport and infrastructure requirements.

Engagement with Water Corporation has begun which indicates that water supplied from this scheme is available on a seasonal basis. No water is available at this stage during December – February. Engagement with Water Corporation would need to determine if a bulk water supply agreement can be arranged.

Potential pipe connection points to the existing Water Corporation infrastructure and the Merredin WRRF are presented in Figure 6-1.



Sources: Aurecon, Esri Basemap, Landgate



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Figure : Water Corp Infrastructure

6.2.2 Groundwater

This option would involve the construction of one or more production bores to meet project water demands. The Project is not located within a proclaimed groundwater area, so there is no requirement for a groundwater extraction licence. The construction of a new bore will require a bore construction licence and production bores should be constructed in line with minimum bore construction standards. Licensed bores may require flow meters to report water usage.

The Department of Primary Industries and Regional Development has initiated the WaterSmart Farms project which supports the adoption of on-farm desalination plants in Western Australia's Wheatbelt and Great Southern regions to process brackish groundwater into a suitable resource and increase water security in the region.

A similar onsite desalination plant could be a possibility to supply water for the Tandegin Wind Farm given the saline nature of the groundwater. It is expected there would be a high energy and infrastructure cost associated with this option. A brine disposal strategy would also need to be developed.

6.2.3 Farm dams

This option would involve using water captured onsite in farm dams and sediment basin/s to be used as a non-potable water source. However, the farm dams are unlikely to be a consistent or stable source of water due to the climate and low rainfall and the water quality is also unknown. Within the sediment basins, there is potential for poor water quality, particularly during rainfall events. It is also unlikely to be reliable due to the high variability of rainfall.

This option may be considered to supplement another water source option during higher rainfall months.

Engagement and agreement with property owners for use of farm dams for the project would need to be sought.

6.2.4 Recycled wastewater

This option involves using wastewater from nearby from treatment plants or mine sites. A potential option for this would be the Merredin Water Resource Recovery Facility (WRRF) which has the capacity to treat up to 0.75ML of wastewater per day. The licence currently indicates that the treated wastewater is discharged to Cohn Creek. The WRRF is located approximately 30 km from the proposed Tandegin Wind Farm. This distance to this option is a constraint as it would involve additional infrastructure or trucking of water which would have cost implications and potential impacts associated.

This option would not be potable water quality and therefore would only be considered appropriate for some project uses such as dust suppression and/or hardstand and road construction. The water quality would need to be determined prior to progressing with this option.

Engagement with Water Corporation is required to understand availability, logistics and water quality.

6.3 Water supply strategy

A preliminary estimate of construction, operational and decommissioning demands for the project have been summarised in the above section. Freshwater is a scarce resource in this region of Western Australia, and therefore there is not a clear water supply strategy for this project. Further investigation into the water supply strategy is currently underway.

Both groundwater and surface water resources are hyper-saline. Surface water within the rivers in this region are also highly seasonal and often cease to flow. Rainfall is highly variable, and relatively low, meaning onsite capture and reuse cannot be solely relied upon as a water source, however this is an option for supplementary supply. The GAWS pipeline supplies potable water to Merredin for urban use, and connection into this network is an option. However, preliminary discussions with Water Corp has indicated that the network is highly constrained in peak season (December-February) and no new connections to the network can be supplied during these months until stage 1 upgrades take place. The earliest this could happen is in 2028, but there is currently no guarantee that the section of network that Merredin is part of would be included in stage 1. Given the large array of constraints for water supply in this region, there are two main options that could be explored for the water supply strategy:

- Option 1: Alterations to the construction schedule, such that water intensive periods of the construction timeline do not occur during the peak season. Construction activities with low water demand could continue to occur with supply via water carting from the main conduit in Merredin. This would require further liaison with Water Corp and assessment of allowable supply volumes during peak season. If workforce potable water demand cannot be supplied during peak season, the temporary worker accommodation would need to be vacated during these three months. There is potential for this option to extend the construction period. Outside peak season, storage tanks could be constructed at locations next to Water Corp's existing reticulation. One of these potential locations is within the boundary of the existing Collgar Wind Farm. Water can then be delivered to site via water carting or through a private pipe connection that would need to be constructed.
- Option 2: Groundwater desalination using a mobile reverse osmosis plant. The feasibility of this option would need to be investigated in terms of cost and scale. The energy source for powering the desalination plant would also need to be considered as this can be associated with high costs and greenhouse gas emissions. Research into groundwater desalination for agricultural use in this region is underway and the technology is being trialled by the Department of Primary Industries and Regional Development for on-farm use. This could be leveraged to understand the potential for use of similar technology for this project. A strategy for brine disposal would also need to be developed if this option was to be implemented.
- Supplementary water supply options:
 - Recycled wastewater from site could be used for dust suppression and/or compaction for road and hardstand construction. This would require onsite treatment to a certain water quality before use.
 - Recycled wastewater from Merredin could be carted to the Project Area to be used for dust suppression and/or compaction for road and hardstand construction. This would involve engagement with Water Corp and is dependent on water quality.
 - Groundwater can be used for dust suppression; however, this is dependent on salinity levels.
 - Freshwater stored in farm dams. Given the rainfall and surface water supply constraints in this region, it is unlikely that nearby farm dams would have enough water to service the entire project demand. However, if negotiations with nearby landowners determined some level of freshwater from farm dams could be supplied, this source of water could supplement the overall supply. Collgar Renewables has indicated a mapping layer that shows nearby farm dam freshwater resources.

7 Construction impacts

7.1 Potential impacts

Construction activities may adversely impact the surface water and groundwater environment, if not managed appropriately. Potential impacts associated with these construction activities include:

- Water quantity and hydrology impacts from changes in hydrological regimes (including volumes, rates and frequency) and flow paths as a result of:
 - Water extractions from farm dams to satisfy construction water demands (dust suppression, workforce potable demands, concrete batching, vehicle washdown, etc), reducing water availability
 - Earthworks (such as excavations and stockpiling of materials) and infrastructure installation altering surface water flow paths
- Water quality impacts from spill of hazardous chemicals, materials, and sediment laden runoff released to receiving water features (farm dams or Belka River tributary through centre of project) and groundwater recharge during rainfall events from:
 - Clearing of vegetation, earthworks and stockpiling of materials may lead to increase in sedimentation within receiving water features
 - Materials from transport of spoil or from unsealed road areas may enter receiving water features
 - Spills, vehicle and equipment use (including vehicle washdown) releasing harmful substances (fuels, heavy metals, etc)
 - Concrete activities such as installation of project components (masts, facilities, and buildings, foundation works and WTG) and concrete washdown, releasing cement laden runoff
- Erosion and scour resulting from changes to hydrological regimes impacting aquatic ecosystems, GDEs and habitats in waterways and waterbodies from:
 - Clearing of vegetation, excavations and stockpiling of materials altering minor flow paths and increasing sedimentation within receiving water features
 - Construction across waterways for the 33 kV underground cable may disturb and destabilise bed and bank of tributary to Belka River
 - Progressive increase in impervious areas associated with access tracks, hardstands and buildings, increasing runoff volumes, rates and frequency
- Impacts to groundwater levels and flow paths from excavations, which may affect groundwater availability to nearby GDEs.

7.2 Qualitative assessment

An assessment of construction impacts and their potential effect on receiving environments, and how this can be managed, is shown in Table 7-1. Brief details on suggested management measures are shown in Table 7-1, with more detailed information on management and mitigation measures for construction activities located in Section 10.1.

Table 7-1 Construction impact and qualitative risk assessment

Potential effect on receiving environment	Receptor(s)	Infrastructure	Assessed potential impact and risk	Suggested management measures	Assessed residual risk
Water quantity impacts					
Changes to hydrological regimes impacting aquatic ecosystems, GDEs and habitats in waterways and waterbodies from: ■ water extraction for construction water demands ■ Earthworks including excavations and stockpiling ■ Progressive increase in hardstand areas	Farm dams	All construction sites	Moderate; possible Medium risk	■ Surface water extraction from farm dams will be minimal and as agreed with landowners. No extraction is proposed at this stage from waterways. ■ Erosion and Sediment Control Plan (ESCP) which details erosion and sediment control measures ■ Construction Environmental Management Plan (CEMP), identifying temporary drainage measures and scour protection; ■ Stormwater management for final hardstands and access tracks to be designed in accordance with the <i>Stormwater management manual for Western Australia</i> (Department of Water and Environmental Regulation, 2022)	Low
	Belka River tributary (significant stream)	33 kV transmission cables	Moderate; possible Medium risk		Low
	Wheatbelt wetland (High potential GDE)	33 kV transmission cables	Moderate; unlikely Low risk		Low
Water quality impacts					
Increased sedimentation and turbidity in water bodies and waterways impacting aquatic life and ecosystem health from: ■ Clearing of vegetation, earthworks and stockpiling ■ Materials from transport of spoil and unsealed road areas	Wheatbelt wetlands	33 kV transmission cables	Moderate; unlikely Low risk	■ Erosion and Sediment Control Plan (ESCP) which details erosion and sediment control measures ■ Construction Environmental Management Plan (CEMP)	Low
	Belka River tributary (significant stream)	33 kV transmission cables	Moderate; possible Medium risk		Low
Introduction of harmful substances into surface and groundwater leading to habitat degradation in downstream waterways and water bodies from: ■ Spills, vehicle and equipment use (including vehicle washdown) ■ Concreting activities from installation of project components	Wheatbelt wetlands		Moderate; possible Medium risk	■ Storage of toxic and hazardous (THS) in accordance with Water Quality Protection Note 65: Toxic and hazardous substances (Department of Water, 2015) ■ Emergency Response Plan in accordance with <i>Water Quality Protection Note 10: Containment spills – emergency response plan</i> (Department of Water, 2020) ■ Provision of adequate wash down facilities in accordance with <i>Water Quality Protection Note 68: Mechanical equipment wash down</i> (Department of Water, 2013) ■ Appropriate containment of concrete wash-water	Low
	Belka River tributary (significant stream)	33 kV transmission cables	Moderate; possible Medium risk		Low
	Wheatbelt wetland – granite outcrop (High potential GDEs)	33 kV transmission cable	Moderate; possible Medium risk		Low

Potential effect on receiving environment	Receptor(s)	Infrastructure	Assessed potential impact and risk	Suggested management measures	Assessed residual risk
Geomorphology, erosion and scour					
Alteration of surface water flow paths and hydrology from: ■ Clearing of vegetation, excavations and stockpiling of materials ■ drainage works ■ progressive increase in impervious areas	Belka River tributary (significant stream)	All sites	Moderate; possible Medium risk	■ Erosion and Sediment Control Plan (ESCP) ■ Construction Environmental Management Plan (CEMP), identifying temporary drainage measures and scour protection; ■ Stormwater management for final hardstands and access tracks to be designed in accordance with the <i>Stormwater management manual for Western Australia</i> (Department of Water and Environmental Regulation, 2022)	Low
Direct disturbance of bed and banks due to installation of underground 33 kV cables across Belka River tributary		33 kV transmission cable	Minor; likely Medium risk	Waterway crossing to be designed appropriately to minimise disturbance to the bed and bank upstream and downstream and provide adequate erosion/scour protection as required. Directional boring should be employed at the preferred method of cable installation under the watercourse. Horizontal directional drilling (HDD) to be used at waterway crossing with Belka River tributary, mitigating need for excavations.	Low

8 Operational impacts

8.1 Potential impacts

Operational activities at the site have the potential to adversely impact surface water and groundwater environments if not managed correctly. This includes:

- Water quantity impacts from:
 - water use for operational needs, reducing water local availability for nearby water users
 - increased runoff to the catchment due to increased impervious surfaces
- Water quality impacts from:
 - increased pollutant loading from runoff from operational areas to receiving waterways from increase in impervious areas
 - accidental spills of chemicals or fuels from maintenance activities that may lead to contaminants being mobilised into waterways.
 - routine wash down and maintenance of mechanical equipment at the site may pose ongoing contamination risks.
 - inadequate management of wastewater and stormwater can be released into runoff and degrade receiving water quality (i.e. Belka River tributary).
 - insufficient buffers to wetlands leading to direct stormwater discharges to the wetlands, degrading water quality
- Erosion and scour impacts from:
 - increased runoff volumes, rates and frequency from increased impervious areas, leading to changes in hydrology in receiving waterways.
 - insufficient buffers to wetlands leading to direct stormwater discharges to the wetlands, causing erosion.

8.2 Qualitative assessment

An assessment of operational impacts and their potential effect on receiving environments, and how this can be managed, is shown in Table 8-1. Brief details on suggested management measures are shown in Table 8-1, while more detailed information on management and mitigation measures for operational activities is shown in Section 10.2.

Table 8-1 Operational impact and qualitative risk assessment

Potential effect on receiving environment	Receptor(s)	Infrastructure	Assessed potential impact and risk	Suggested management measures	Assessed residual risk
Water quantity impacts					
Changes to hydrological regimes impacting aquatic ecosystems, GDEs and habitats in waterways and waterbodies from increased impervious areas.	Belka River tributary		Moderate; unlikely Low risk		Low
Water quality impacts					
Introduction of harmful substances into surface and groundwater leading to habitat degradation in downstream waterways and water bodies from: - Accidental spills of chemicals or fuels from maintenance activities - Vehicle and equipment use (including vehicle washdown) - Inadequate management of wastewater and stormwater can degrade adjacent water quality. - Insufficient buffer to wetlands	Wheatbelt wetlands	BESS (or other system stability equipment)	Moderate; possible Medium risk	- Storage of THS in accordance with Water Quality Protection Note 65: Toxic and hazardous substances (Department of Water, 2015) - Emergency Response Plan in accordance with Water Quality Protection Note 10: Containment spills – emergency response plan (Department of Water, 2020) - Provision of adequate wash down facilities in accordance with Water Quality Protection Note 68: Mechanical equipment wash down (Department of Water, 2013)	Low
	Belka River tributary	O&M building Substation	Moderate; possible Medium risk		Low
	GDE	WTG	Moderate; unlikely Low risk		Low
Geomorphology, erosion and scour					
Increased sedimentation and turbidity in water bodies and waterways (wheatbelt wetlands, Belka River tributary) impacting aquatic life and ecosystem health from: - Increased runoff volumes, rates and frequency from increased impervious areas - Insufficient buffers to wetlands, leading to direct stormwater discharges to wetlands	Wheatbelt wetlands	BESS (or other system stability equipment) O&M building Substation WTG	Moderate; possible Medium risk	- Erosion and Sediment Control Plan (ESCP) which details erosion and sediment control measures; Operational Environmental Management Plan (OEMP); Routine maintenance of drainage system. - Stormwater management and final drainage design in accordance with the <i>Stormwater management manual for Western Australia</i> (Department of Water and Environmental Regulation, 2022). - Maintenance of permanent drainage, scour protection and control measures, and maintenance of access tracks - Engagement with the Department of Biodiversity, Conservation and Attractions to understand buffer requirements for mapped wetlands.	Low
	Belka River tributary		Moderate; unlikely Low risk		Low

9 Decommissioning impacts

Various impacts to surface water and groundwater are possible during the decommissioning phase of the project if not managed appropriately. It is expected that these impacts would be similar to those expected during the construction phase of the project, as described in Section 7.17.1 and managed with measures described in Section 7.2.

Through management and mitigation measures (as discussed in Section 10.3), the residual impacts are considered to be a low risk to the surface water and groundwater environment.

10 Management and mitigation

10.1 Construction measures

During the construction phase, there are potential surface and groundwater impacts that may occur due to clearing and removal of vegetation, earthworks, land disturbance and discharge of runoff. It is expected that all management impacts can be managed through the development and implementation of the following. These documents will establish the locations and nature of key environmental controls and pre-construction works for mitigating environment risks across the Project Area and include:

- Construction Environmental Management Plan (CEMP) to manage any environmental risks caused by construction activities. Including:
 - Adequate wash down facilities shall be provided to contain, treat and then dispose of waste residues at an appropriate location away from water resources in accordance with *Water Quality Protection Note 68: Mechanical equipment wash down* (Department of Water, 2013).
 - Containment of concrete wash-water such that pollutants cannot escape to the environment under any foreseeable conditions.
 - Toxic and hazardous substances (THS) shall be stored in appropriate storage facilities situated away from water resources to prevent chemical and fuel run-off or leaching from causing significant or persistent environmental harm in accordance with *Water Quality Protection Note 65: Toxic and hazardous substances* (Department of Water, 2015). Facilities shall be constructed so that THS cannot escape to the environment under any foreseeable conditions.
- Erosion and Sediment Control Plan (ESCP) to document the erosion and sediment controls for the construction phase.
- Emergency Response Plan (ERP) for storage, transport, handling and use of chemicals, wastes and other substances that could cause harm to receiving environments. This should include accordance with *Water Quality Protection Note 10: Containment spills – emergency response* plan (Department of Water, 2020). The plan shall detail a plan for storage, transport, handling and use of chemicals, wastes or other substances that could contaminate water resources of the environment.

In addition, it is recommended that the conservation significance and associated management requirements for the mapped wheatbelt wetlands within the Project Area be confirmed with the Department of Biodiversity, Conservation and Attractions. If buffer zones are required and intersect with infrastructure, an assessment shall be undertaken by an ecologist to determine management criteria and appropriate buffer distance. The infrastructure layout shall then be adjusted accordingly.

10.2 Operational measures

Management and mitigation measures will be undertaken to minimise the impact of operational activities on surface and groundwater environments. It is expected that the majority of potential impacts can be managed through the development and implementation of operational mitigation measures, including:

- Operational Environmental Management Plan (OEMP) to manage any environmental risks caused by operational activities.
- Operational Emergency Response Plan (ERP) to reflect the operational phase.

10.3 Decommissioning measures

A Decommissioning and Rehabilitation Plan (DRP) to manage environmental risks associated with decommissioning activities and ensure the project site is rehabilitated appropriately.

As decommissioning impacts are expected to be similar to construction impacts, mitigation measures described in Section 10.1 will also apply to the decommissioning phase.

11 Conclusion

The WRIA has considered the potential impacts of the project and appropriate measures to manage these impacts to ensure receiving surface and groundwater environments are not adversely affected.

The Tandegin Wind Farm is expected to have a minimal impact on water resources with the proposed management measures implemented.

Key potential issues relevant to the water resources impacts of the project are summarised below:

- Potential impacts to surface water and groundwater resources are primarily limited to the construction and decommissioning phases of the project. These can be mitigated in such a way that risk becomes low.
- During the operational phase, the key risk will be from increased stormwater runoff. With mitigation measures, the risk will be low.
- The conservation significance and management requirements for the mapped wheatbelt wetlands within the Project Area should be confirmed with the Department of Biodiversity, Conservation and Attractions. This can then inform whether any additional measures would be required to ensure the risk to wetland ecosystems is mitigated appropriately.
- The final water supply strategy will be defined at a later stage depending on the final calculated demand and options available at the time. Freshwater scarcity and low rainfall in the region and potable network are significant constraints during peak season (December-February). Further assessment of water demands, and supply options analysis is being undertaken to understand the most cost-effective and sustainable approach. Engagement with Water Corp is required to understand the quantity of potable water that could be supplied to the project during the peak season. If necessary, adjustments to the construction schedule may be required to ensure the water demand can be met.

Overall, impacts can be adequately mitigated through appropriate design and management measures that align with guidelines provided by the Western Australian Government's Department of Water.

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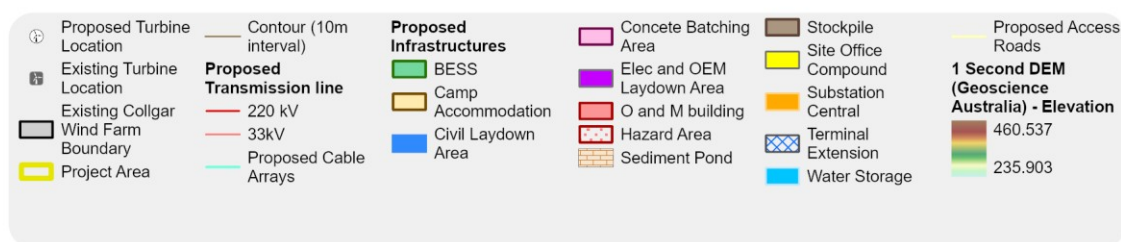
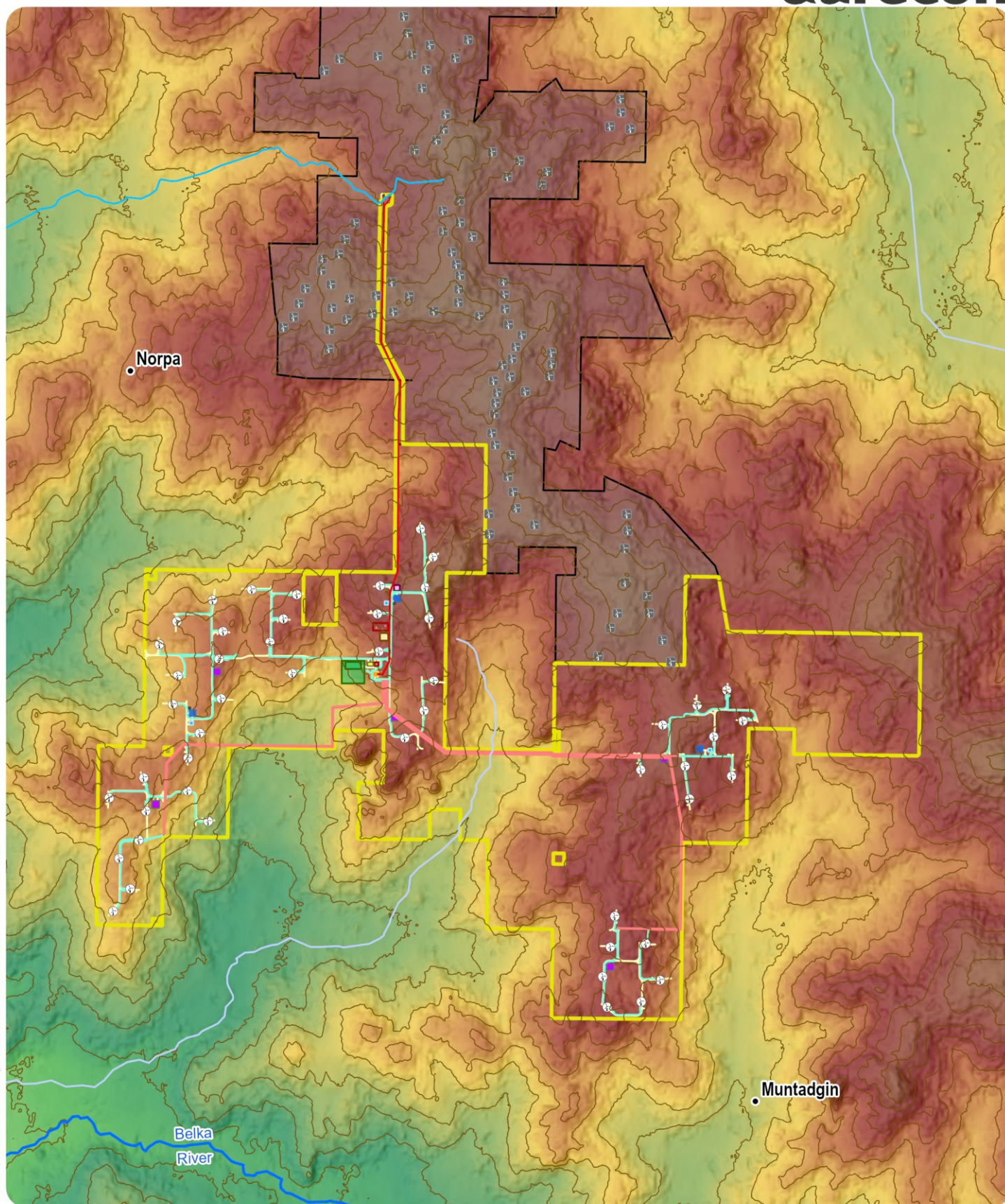
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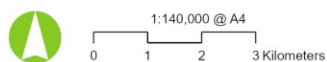
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Appendix A

Existing Environment Figures



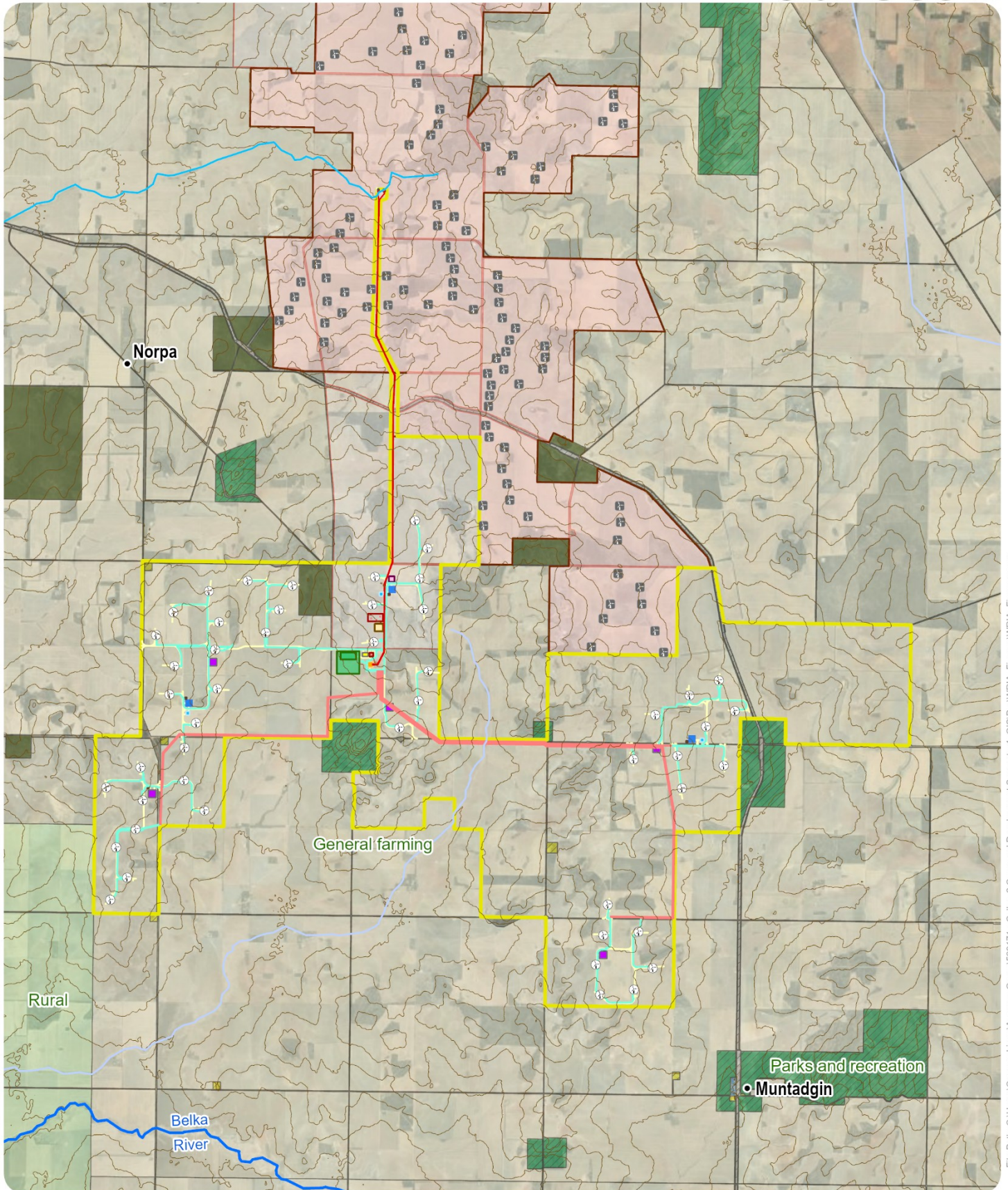
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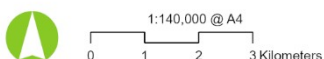
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Figure : Topography



Sources: Aurecon, Esri Basemap, Landgate

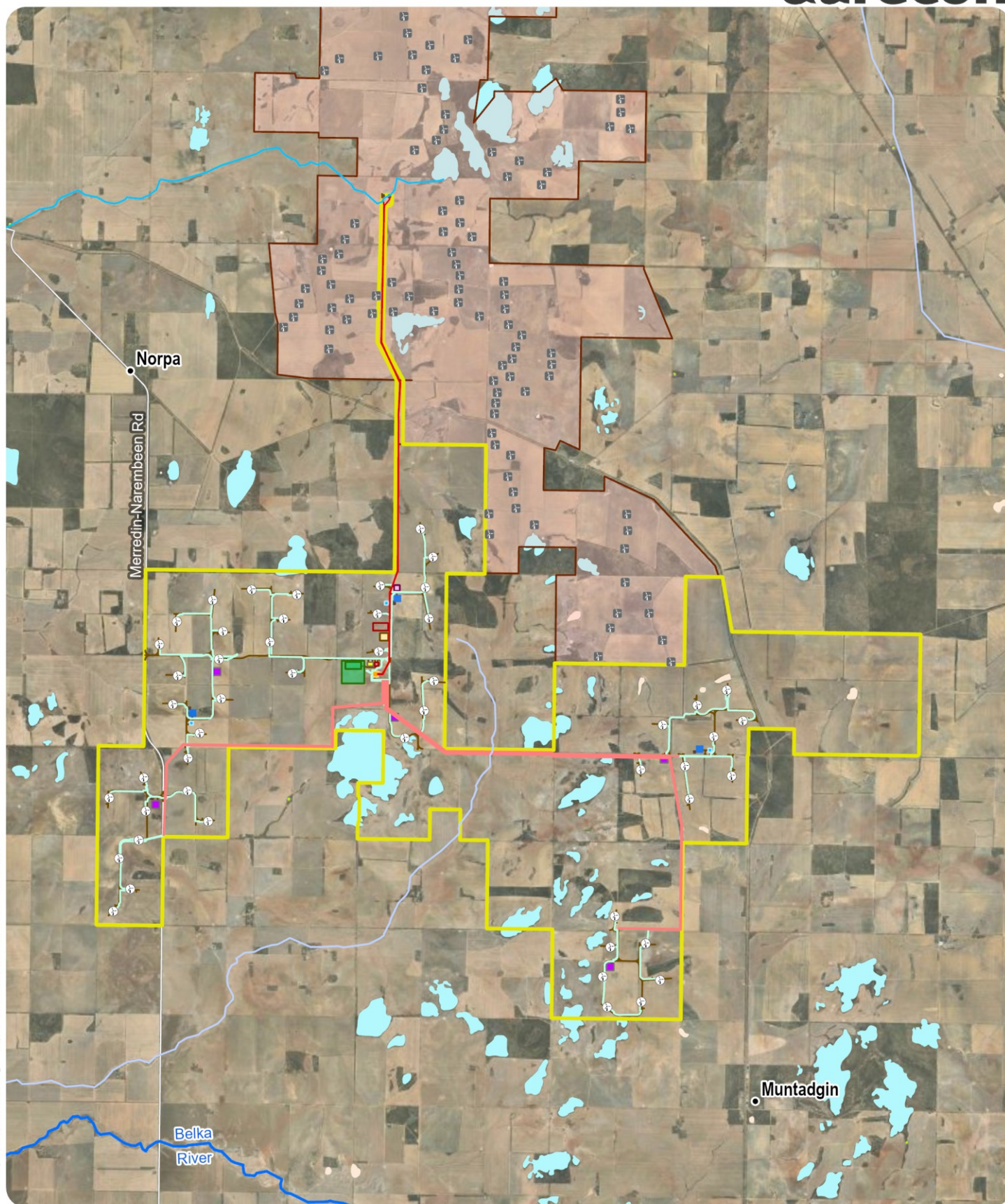


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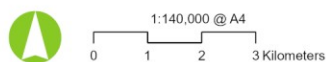
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Figure : Land Use





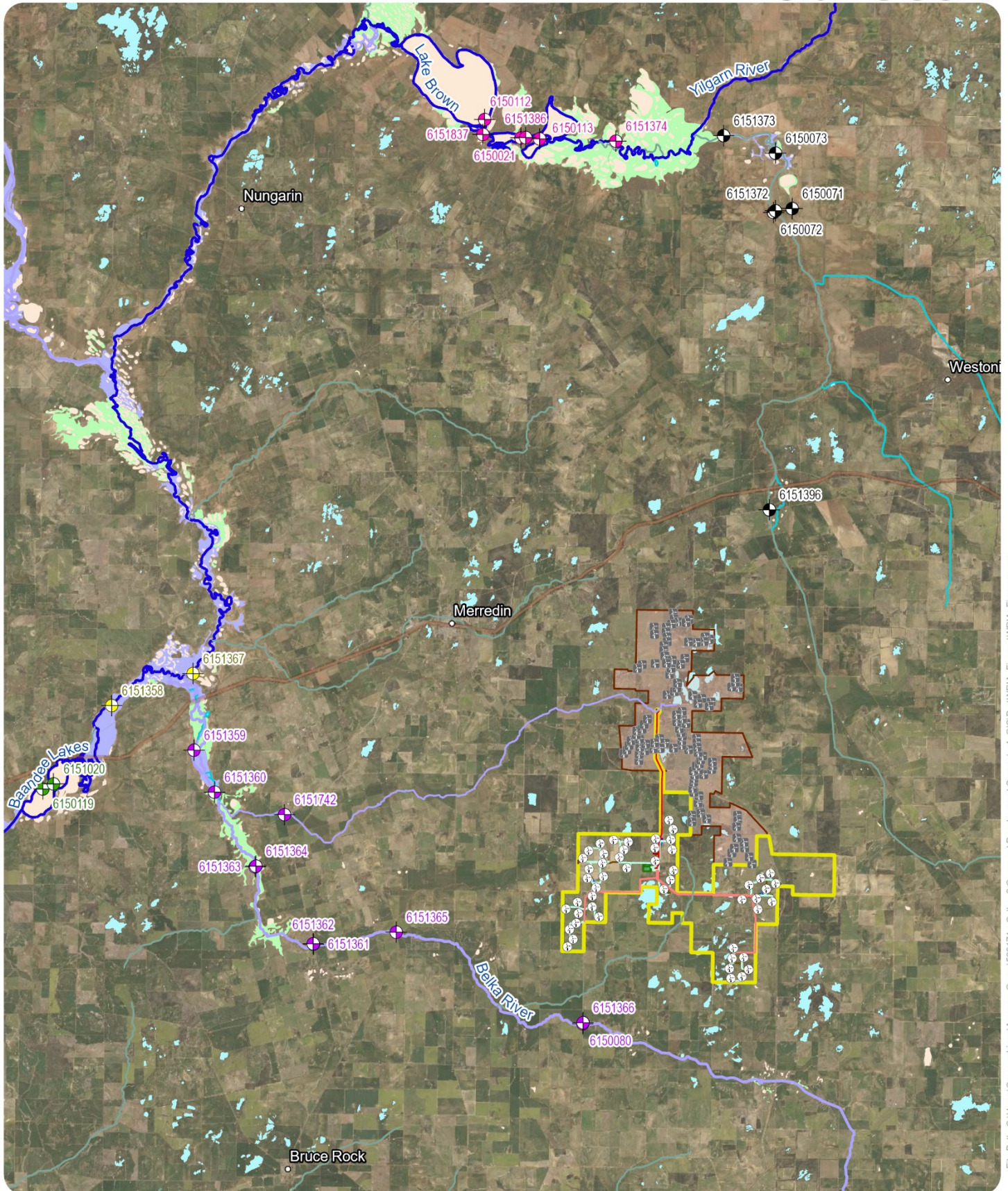
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Figure : Surface water features

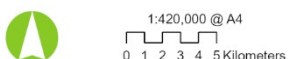


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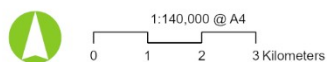
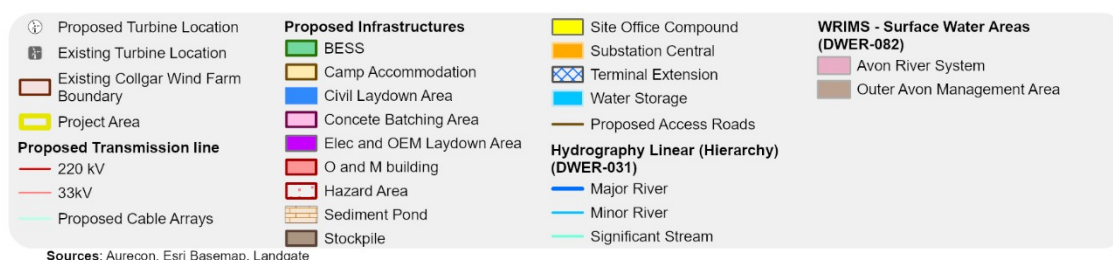
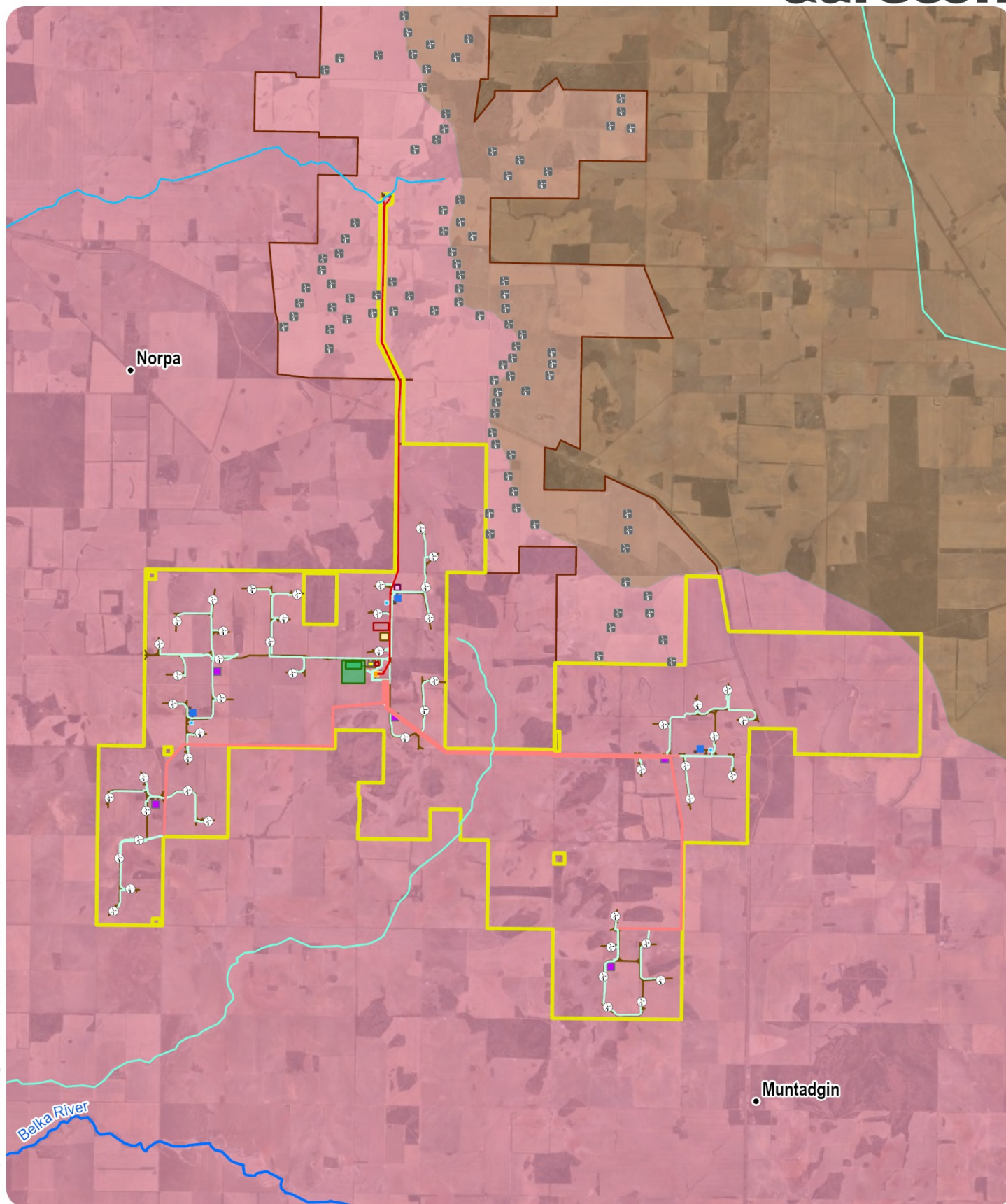


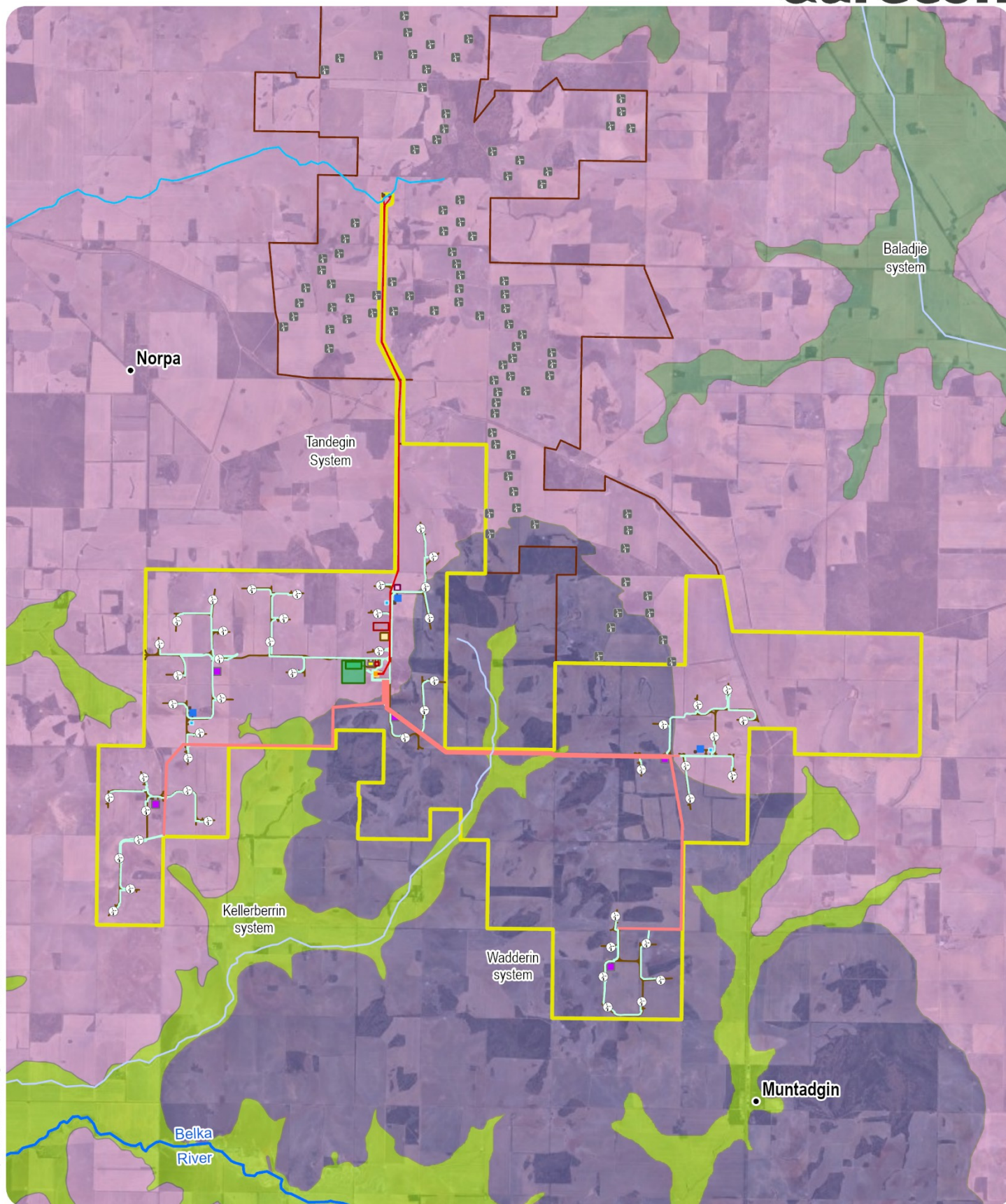
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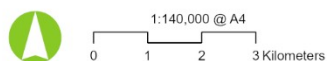
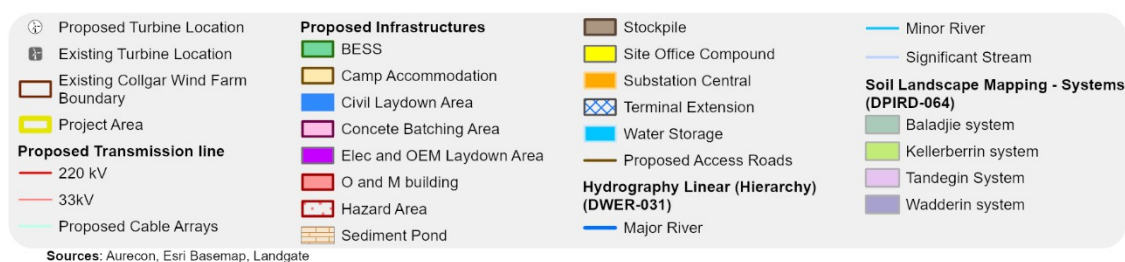
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Figure : Water quality monitoring locations





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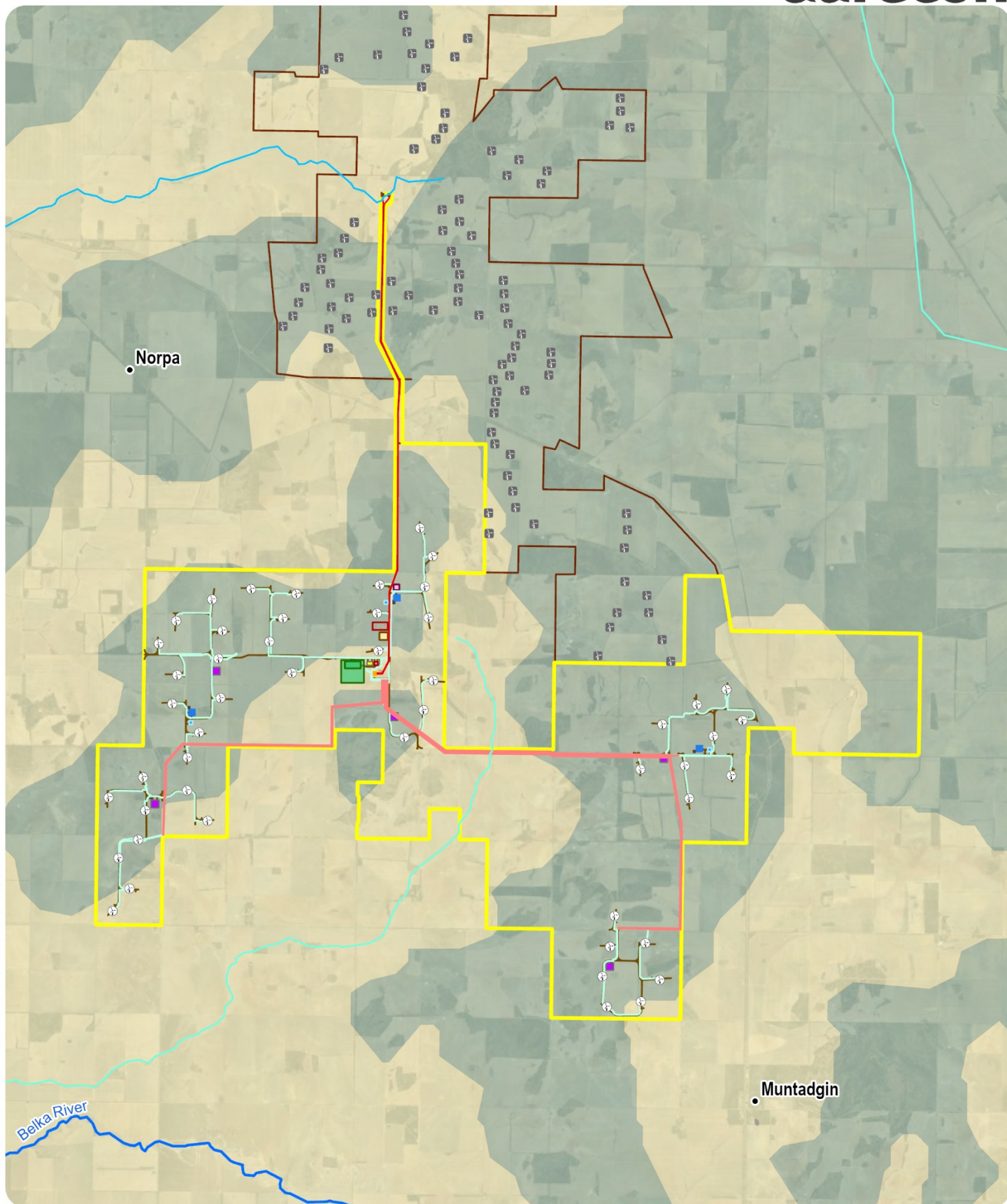
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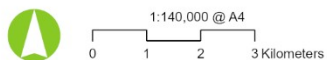
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Figure : Soil Landscapes



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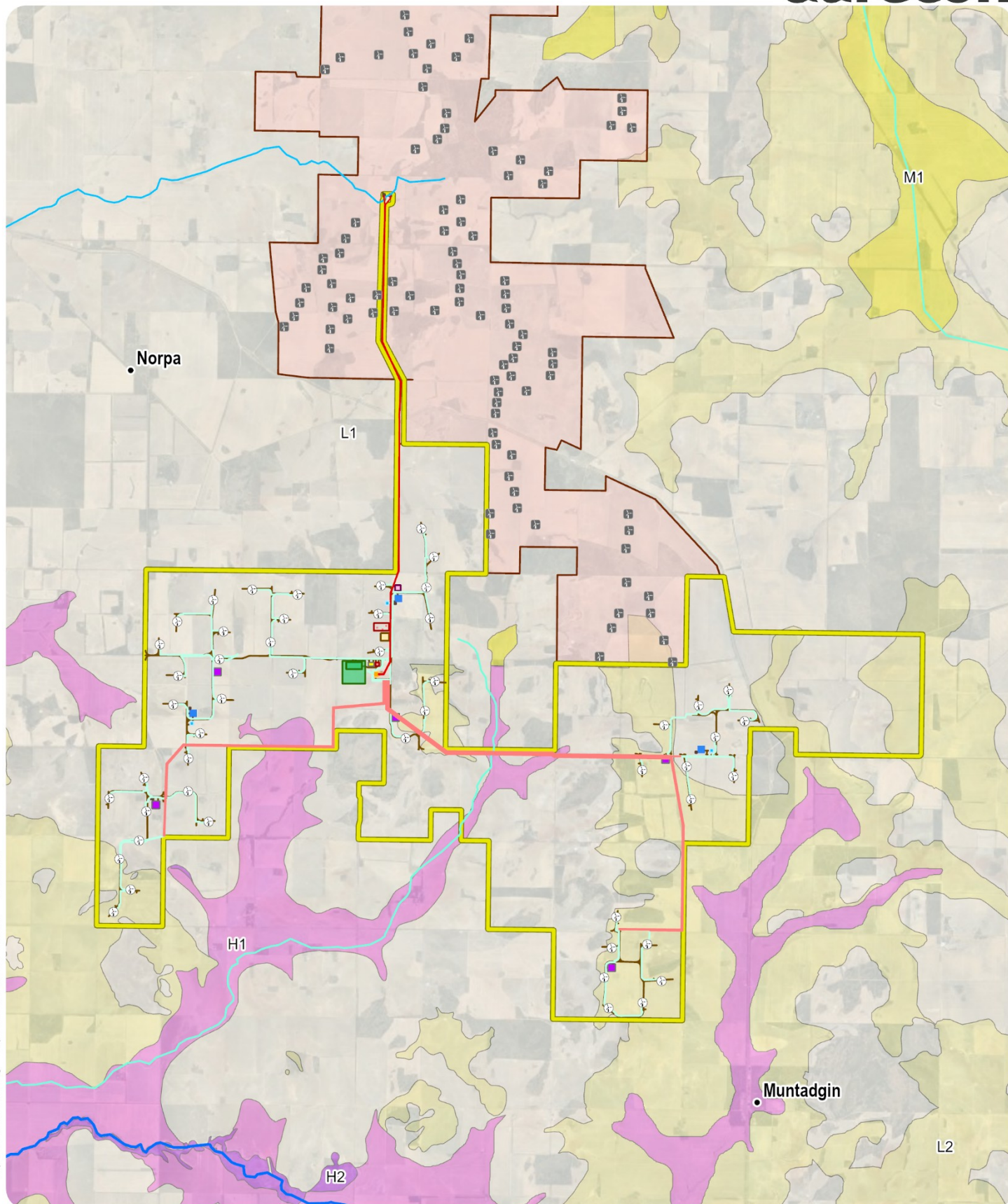
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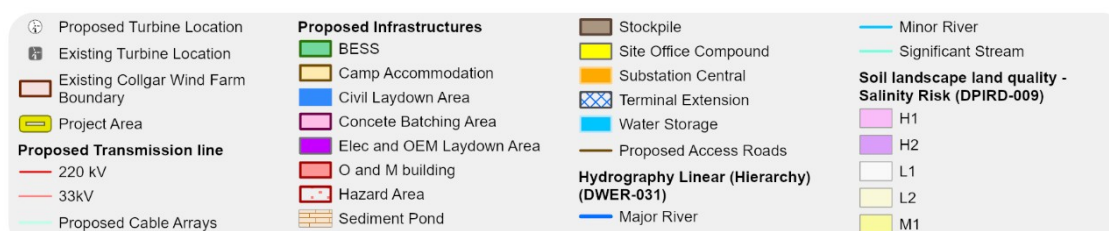
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Figure : Acid sulfate soils



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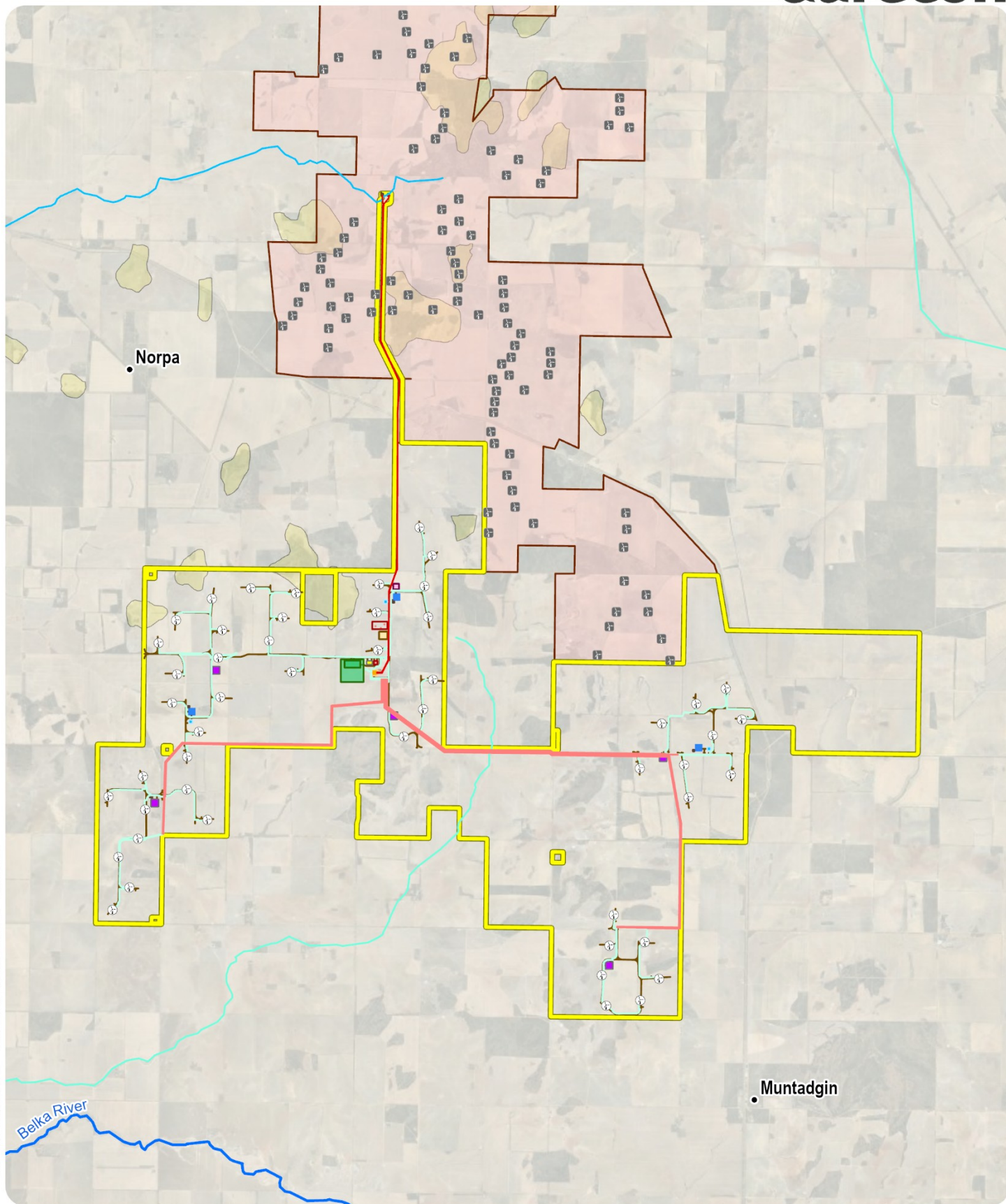
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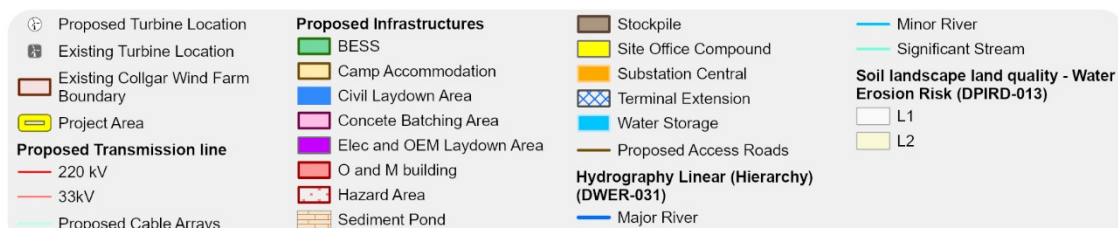
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Figure : Salinity risk



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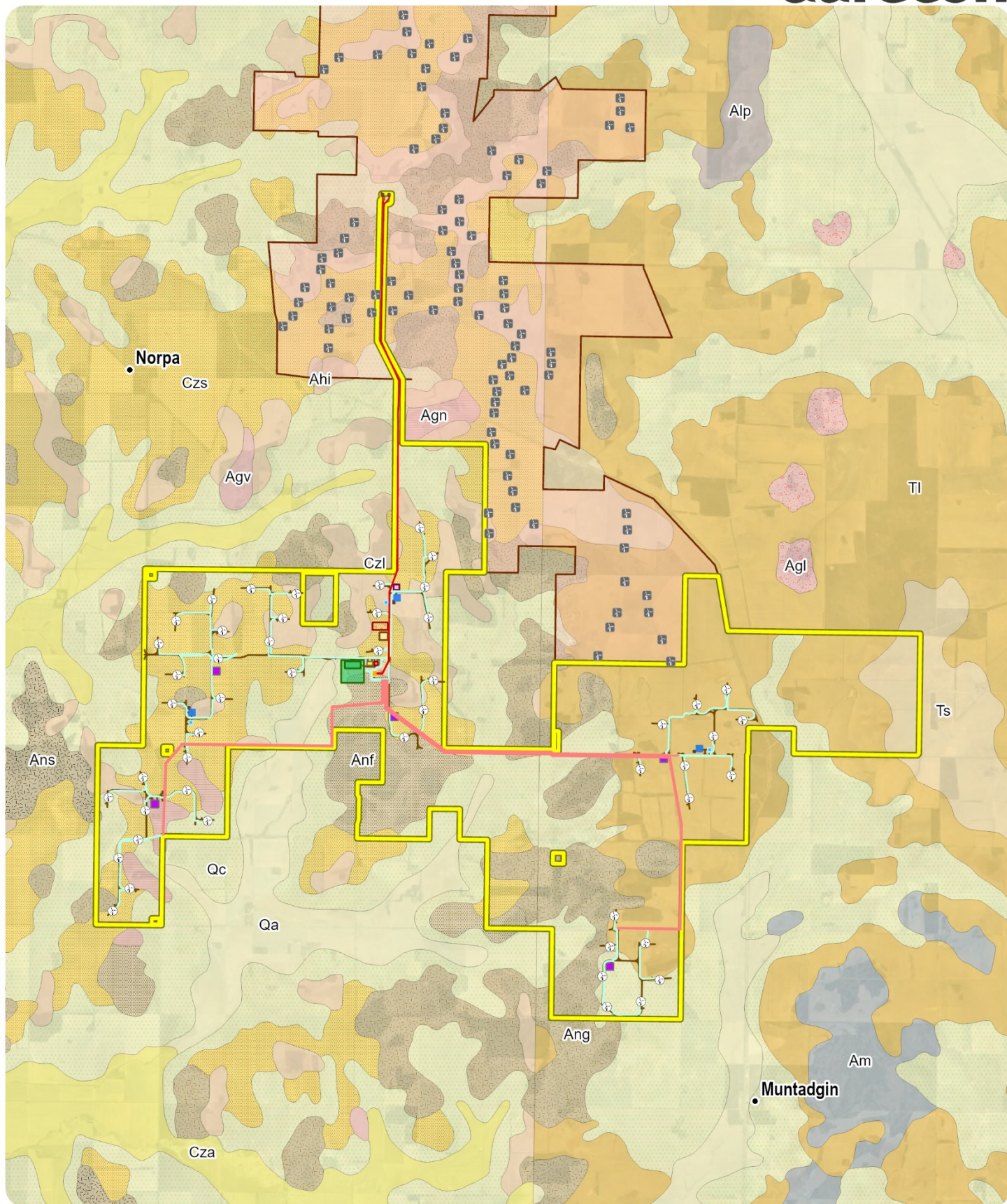
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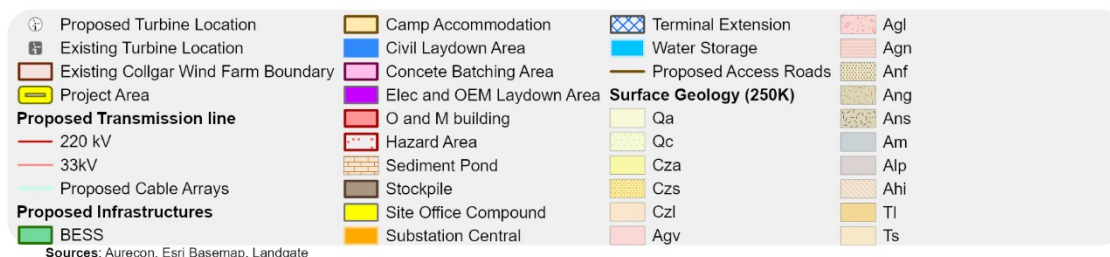
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Figure : Erosion risk



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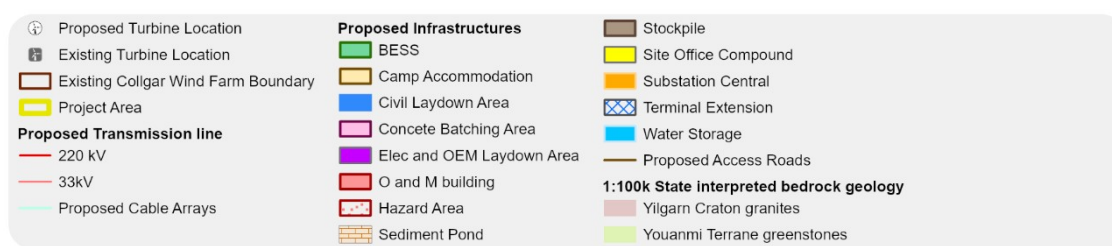
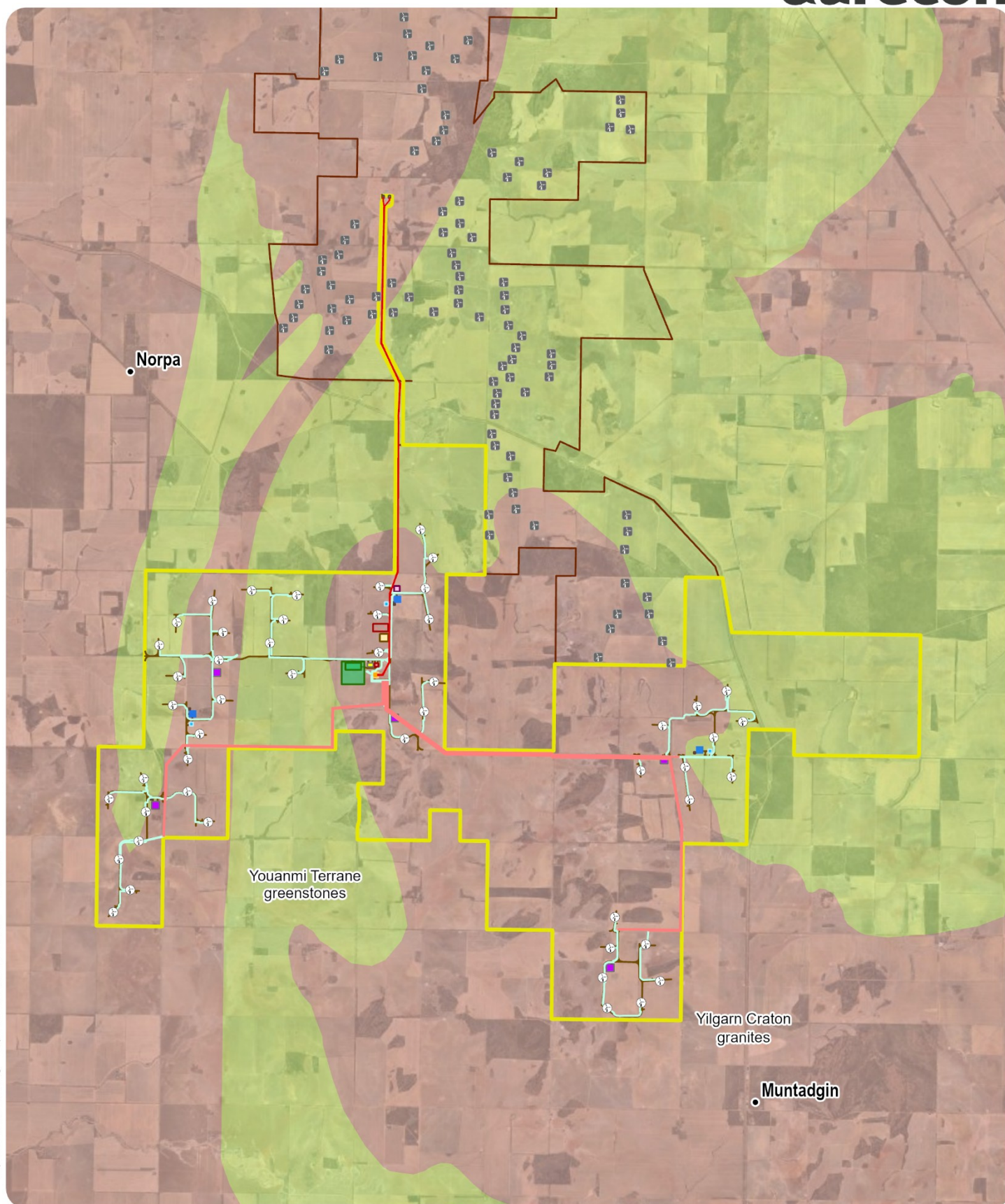
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Figure : Surface geology



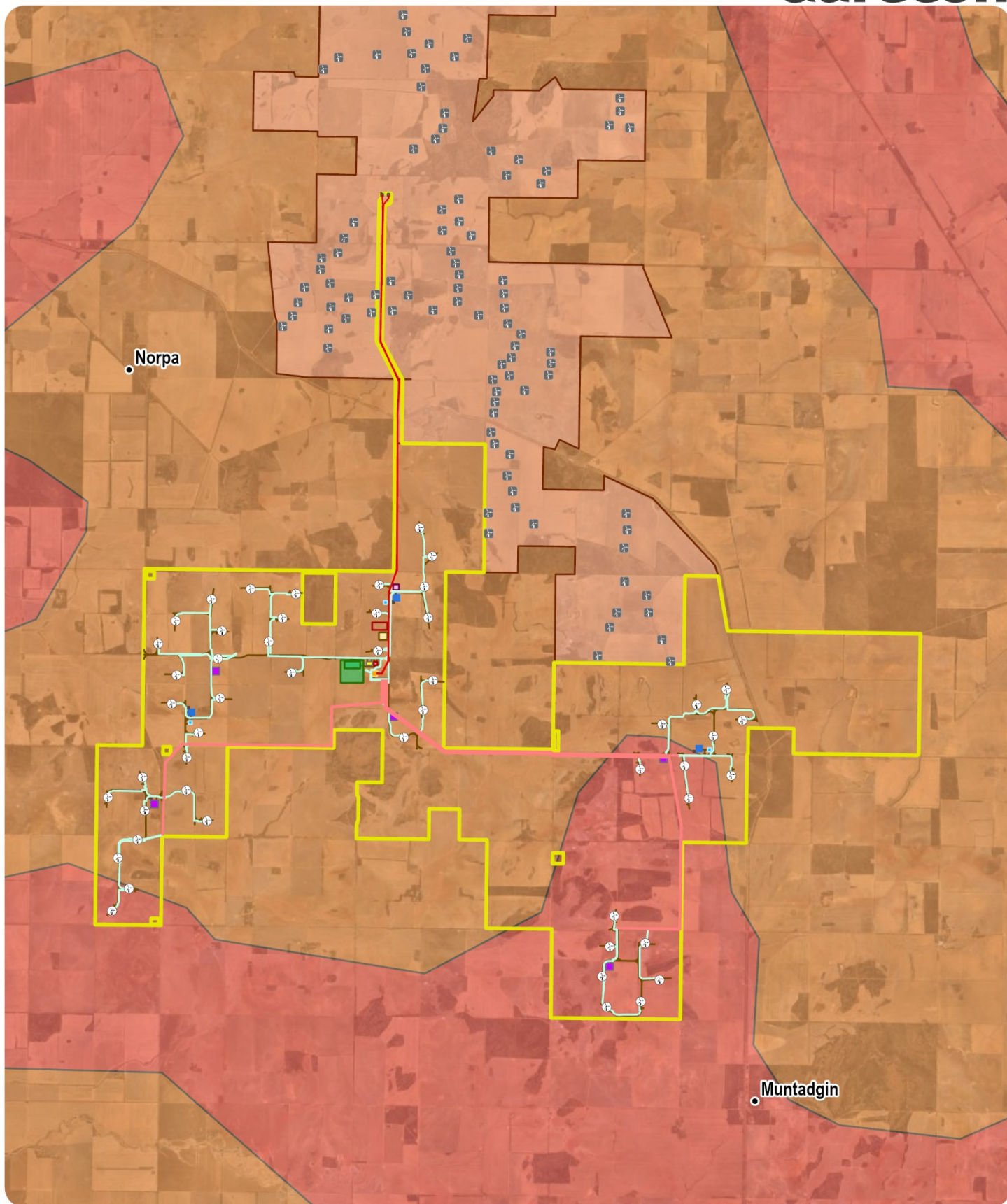
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Figure : Bedrock geology

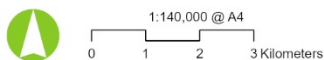


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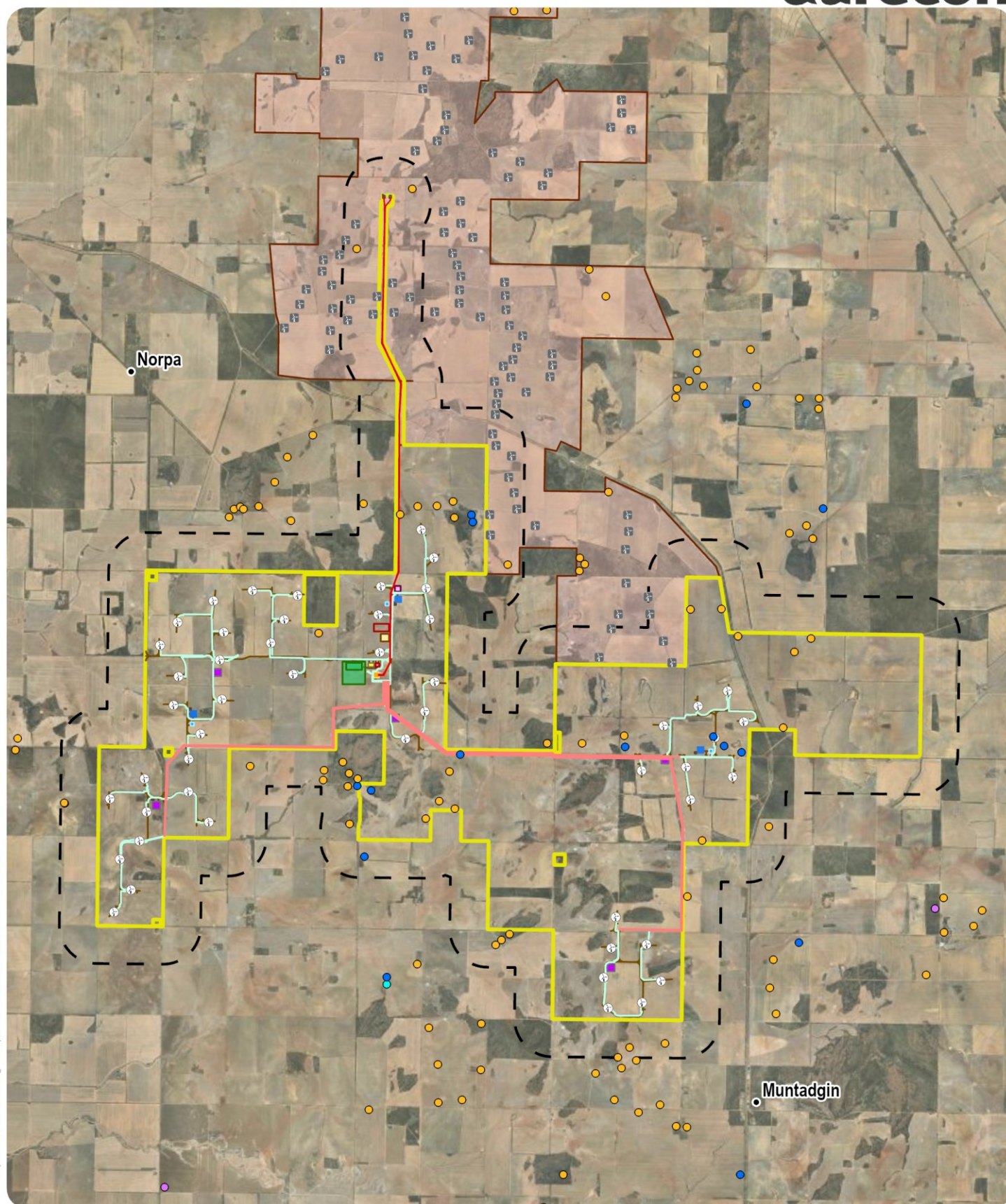
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Projection: GDA2020 MGA Zone 50

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Figure : Groundwater salinity



Sources: Aurecon, Esri Basemap, Landgate

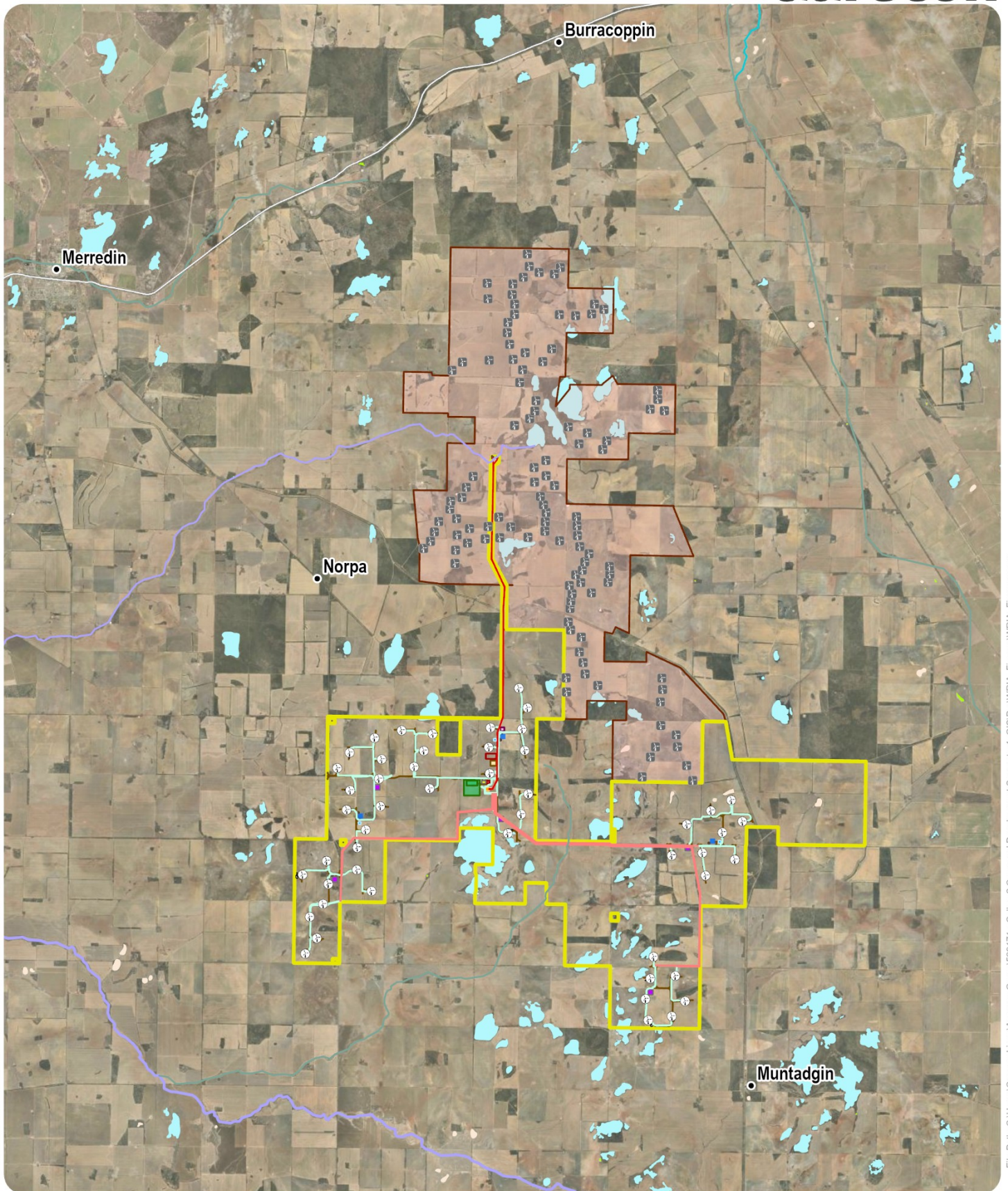


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Figure : Registered groundwater bores





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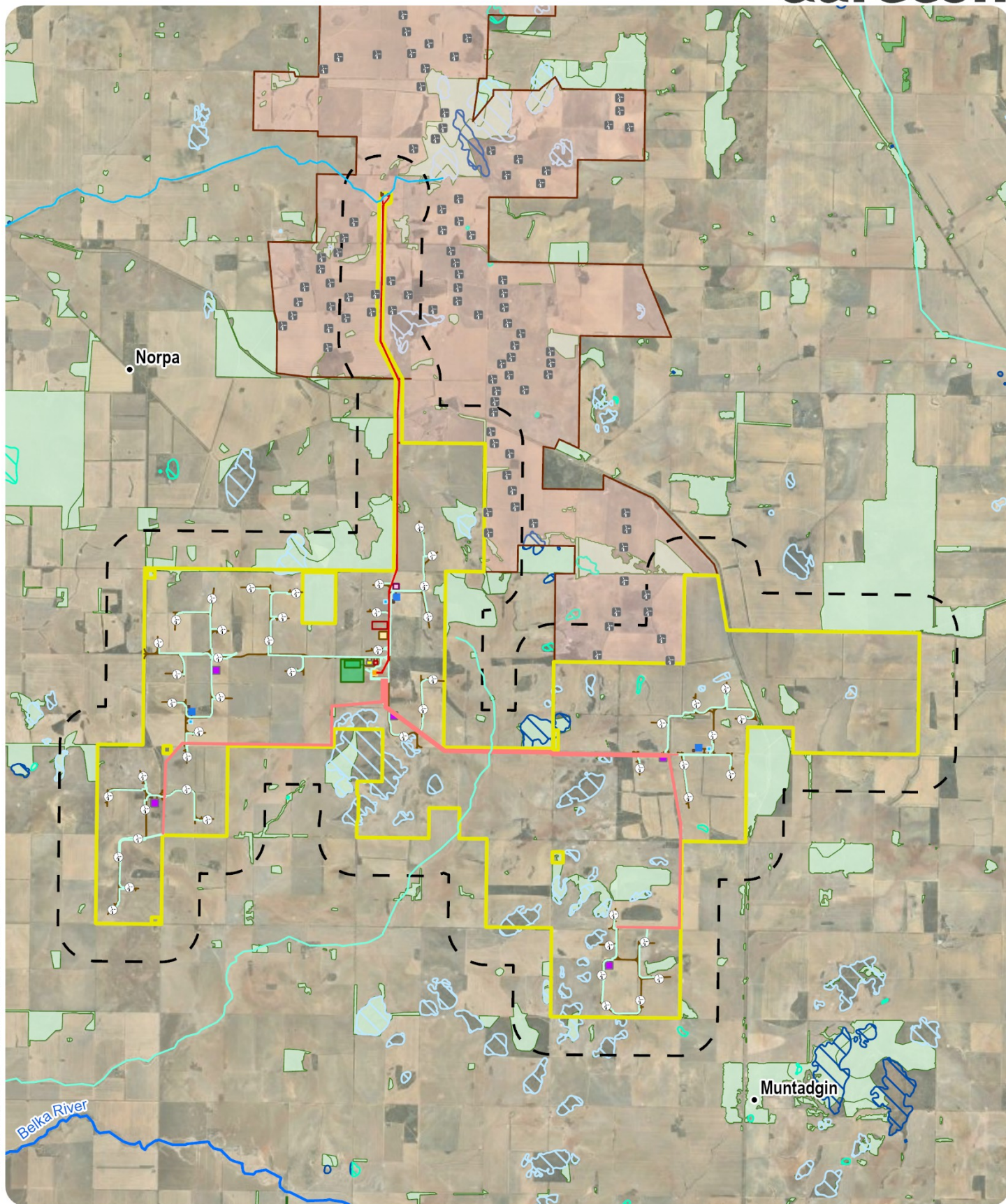


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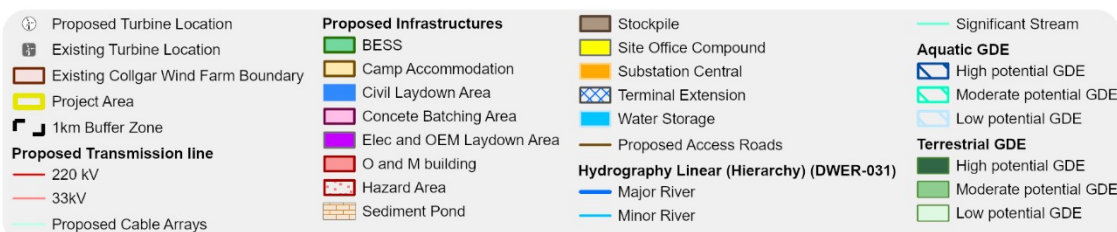
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Figure : Wheatbelt wetlands



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Figure : Groundwater Dependent Ecosystems

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