Mount Piper to Wallerawang Transmission Line Upgrade

Technical Report 1 – Water Impact Assessment

Transgrid

August 2025

→ **The Power of Commitment**

Project name	Mount Piper to Wallerawang Transmission Line Upgrade
Document title	Mount Piper to Wallerawang Transmission Line Upgrade | Technical Report 1 – Water Impact Assessment
Project number	12612502
File name	MP2W_Water Impact Assessment.docx

Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
			Name	**Signature**	**Name**	**Signature**	**Date**
S4	0	A Harvey I Gilmore T Darley	T Darley B James		G Marshall		31/07/25
S4	1	A Harvey I Gilmore T Darley	T Darley B James		G Marshall		19/08/25

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Acknowledgement of Country

Transgrid and GHD acknowledge Aboriginal and Torres Strait Islander peoples as the Traditional Custodians of the land, water and sky throughout Australia on which we do business. We recognise their strength, diversity, resilience and deep connections to Country. We pay our respects to Elders of the past, present and future, as they hold the memories, knowledges and spirit of Australia. Transgrid and GHD are committed to learning from Aboriginal and Torres Strait Islander peoples in the work we do.

Executive summary

The project

Transgrid proposes to deliver approximately eight kilometres (km) of new 330 kilovolt (kV) transmission line and double circuit transmission structures located between the Mount Piper and Wallerawang 330 kV substations (the project). The project would incorporate sections of an existing, single-circuit 132 kV transmission line, where the two transmission lines would share a widened easement and transmission structures. The project is located within the Central West region of NSW within the Lithgow Local Government Area (Lithgow LGA).

The project is identified in the NSW Network Infrastructure Strategy (EnergyCo, 2023) and also supports the key tenets of the NSW Electricity Infrastructure Roadmap (DPIE, 2020). The Roadmap identifies that the expansion of renewable generation must be accompanied by increased transmission capacity to transfer power from Renewable Energy Zones (REZ) in inland NSW to key demand centres. The Mount Piper to Wallerawang Transmission Line Upgrade Project would provide the additional capacity required to reliably transmit power from the Central West Orana REZ to the Greater Sydney region.

Purpose of this report

This water impact assessment has been prepared as part of the Environmental Impact Statement (EIS) to assess potential surface water and groundwater (including water quality) impacts from the construction and operation of the project. The assessment has been undertaken in accordance with the Secretary's Environmental Assessment Requirements (SEARs).

Existing environment

The project footprint is located within the upper reaches of the Coxs River catchment within the Sydney Drinking Water Catchment, upstream of Lake Wallace and crosses varying terrain, topography and waterways. Key existing environmental features include the Gardens of Stone State Conservation Area, as well as tributaries of Wangcol Creek, the Coxs River and tributaries of the Coxs River. The project footprint traverses land which has been subject to varying development, including for existing transmission infrastructure. The project footprint aligns primarily with an existing Transgrid transmission line easements and is also located within disturbed riparian zones.

Assessment methodology

A desktop-based study was undertaken to consider potential risks to waters associated with the project, including those related to riparian land, hydrology, flooding, water quality, groundwater, water licensing/security of supply, wastewater management and with regard to cumulative impacts from other developments. This included consideration of whether the project achieves a neutral or beneficial effect on waterways, given the project is located within Sydney's Drinking Water Catchment.

Impacts from the project

The impact assessment identified key risks associated with water, including:

– disturbance leading to potential erosion and sedimentation associated with construction activities and the potential risks to water quality, including direct impacts associated with upgrading or construction of new waterway access crossings
– interactions of construction compounds and activities with waterways and drainage during the construction phase and for permanent access tracks during operational phases
– interactions with groundwater during construction, including potential dewatering.

Recommended mitigation measures

To manage these key risks, standard mitigation and management measures are proposed including:

– Preparation of a Soil and Water Management Plan as part of the CEMP, including staged Erosion and Sediment Control Plans, prepared in accordance with WaterNSW Current Recommended Practices (CRPs), *Managing Urban Stormwater: Soils and Construction (Volume 1)* (*Landcom*, 2004) and *Volume 2C* (DECC, 2008) to manage construction phase risks associated with water quality and groundwater.
– Reviewing groundwater levels during detailed design and incorporating outcomes into the Soil and Water Management Plan, including developing a trigger action response plan for the construction phase, in the event that groundwater inflows are greater than predicted.

In addition, Transgrid's existing operational and maintenance procedures would continue to be applied to manage potential risks associated with the maintenance and operation of the project, including flood emergency response procedures.

Cumulative impacts

Nearby major projects were reviewed with reference to potential cumulative impacts that may arise from the proposed project interacting with other projects listed on the NSW Major Projects portal. Cumulative impacts are not anticipated from any of the reviewed projects.

Conclusion

On the basis of the impacts expected and with the implementation of the proposed mitigation measures, the project is not anticipated to result in a significant impact in relation to soils and water, including flooding during construction or operation. A neutral effect on the Sydney Drinking Water Catchment and associated water quality objectives is anticipated.

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Key terms, acronyms and abbreviations

Term	Description
AEP	Annual exceedance probability
AHD	Australian Height Datum. A common national surface level datum approximately corresponding to mean sea level.
AIP	Aquifer Interference Policy
Alkalinity	A measure of the ability of an aqueous solution to neutralise acids. Alkalinity of natural waters is due primarily to the presence of hydroxides, bicarbonates and carbonates. It is expressed in units of calcium carbonate (CaCO3).
Alluvial	Deposition from running waters.
Ambient	Pertaining to the surrounding environment or prevailing conditions.
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines 2018
Aquifer	A groundwater bearing formation sufficiently permeable to transmit and yield groundwater.
ARI	Average Recurrence Interval
ARMCANZ	Agriculture and Resources Management Council of Australia and New Zealand
ARR	Australian Rainfall and Runoff
ASC	Australian Soil Classification
B&C SEPP	*State Environmental Planning Policy (Biodiversity and Conservation) 2021*
bgl	Below ground level
BoM	Bureau of Meteorology
Bore	Constructed connection between the surface and a groundwater source that enables groundwater to be transferred to the surface either naturally or through artificial means.
Catchment	The land area draining through the mainstream, as well as tributary streams, to a particular site.
Clean Water	Water that has not come into physical contact with ore material and does not have an elevated sediment load.
CRP	Current Recommended Practice
CSSI	Critical State Significant Infrastructure
CWO REZ	Central-West Orana Renewable Energy Zone
Dewatering	The removal or pumping of water from an above or below ground storage.
DGV	Default guideline value
Discharge	The quantity of water per unit of time flowing in a stream, for example cubic metres per second or megalitres per day.
Drawdown	A reduction in piezometric head within an aquifer.
Easement	A legal property right attached to a parcel of land that enables the use of an identified part of the land by a third party other than the owner. For transmission lines, an easement defines the corridor area where the lines are located and that allows access, construction and maintenance work to take place. The easements for the 330 kV transmission lines would typically be 60 metres wide. The easement grants a right of access and for construction, maintenance and operation of the transmission line and other operational assets. For the project, some easements may overlap with existing easements such that the final easement width for the new easement would be narrower than 60 m (e.g. where paralleling the existing transmission line north of the Wallerawang 330 kV substation) and in other areas it may be wider to accommodate diverging transmission lines (eg in the area south of the Mount Piper 330 kV substation).
EC	Electrical conductivity

Term	Description
EIS	Environmental impact statement
Electrical Conductivity	A measure of the concentration of dissolved salts in water.
EnergyCo	Energy Corporation of NSW
Ephemeral	Stream that is usually dry, but may contain water for rare and irregular periods, usually after rainfall.
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	Environment Protection Authority
EPL	Environment Protection Licence
ESCP	Erosion and Sediment Control Plan
Fracture	Cracks within the strata that develop naturally or as a result of underground works.
GDE	Groundwater dependent ecosystem
GHD	GHD Pty Ltd
Groundwater	Subsurface water that occurs in soils and geological formations.
Guideline Value	The concentration or load of physicochemical characteristics of an aquatic ecosystem, below which there exists a low risk that adverse ecological effects will occur. They indicate a potential risk of impact if exceeded and should 'trigger' action to conduct further investigations or to implement management or remedial processes.
Hydrogeology	The study area of geology that deals with the distribution and movement of groundwater in soils and rocks.
Hydrology	The study of rainfall and surface water runoff processes.
Infiltration	The downward movement of water into soil and rock. It is largely governed by the structural condition of the soil, the nature of the soil surface (including presence of vegetation) and the antecedent moisture content of the soil.
kL	Kilolitre
kL/day	Kilolitre per day
km	Kilometre
kV	Kilovolt
LCC	Lithgow City Council
LDP	Licensed discharge point
Licensed Discharge Point	A location where a licensed operation discharges water to the environment in accordance with conditions stipulated within the site Environment Protection Licence.
L/s	Litres per second
m	Metres
Median	The middle value, such that there is an equal number of higher and lower values. Also referred to as the 50th percentile.
MVA	megavolt ampere
mg/L	Milligram per litre
ML	Megalitre
ML/day	Megalitre per day
mm	Millimetre
MW	Megawatt
NEM	National Energy Market
NorBE	Neutral or Beneficial Effect
NT Act	Native Title Act 1993
NTU	Nephelometric turbidity unit

Term	Description
NWQMS	National Water Quality Management Strategy
OEMP	Operational Environmental Management Plan
OEH	Office and Environment and Heritage
Percentile	The value of a variable below which a certain per cent of observations falls. For example, the 80th percentile is the value below which 80% of values are found.
pH	The value taken to represent the acidity or alkalinity of an aqueous solution. It is defined as the negative logarithm of the hydrogen ion concentration of the solution.
POEO Act	*Protection of the Environment Operations Act 1997*
Potable Water	Water of a quality suitable for drinking.
Project	The CSSI project "Mount Piper to Wallerawang Transmission Line Upgrade Project", which is the subject of this Environmental Impact Statement. The project involves the construction and operation of high voltage transmission lines between the 330 kV Mount Piper and Wallerawang substations.
Project footprint	Area that is to be directly affected by the construction and operation of the project.
REZ	Renewable Energy Zones
RL	Reduced level
Riparian	Pertaining to, or situated on, the bank of a waterway or other water body.
Runoff	The amount of rainfall which actually ends up as streamflow, also known as rainfall excess.
SEARs	Secretary's environmental assessment requirements
Sediment	Soil or other particles that settle to the bottom of lakes, rivers, oceans and other waters.
SILO	Scientific Information for Landowners
SCSS	The Springvale Coal Services Site operated by Centennial Coal
SCA	State Conservation Area
SSI	State Significant Infrastructure
Strata	Geological layers below the ground surface.
Strahler Stream Order	Stream classification system where order one is for headwater (new) streams at the top of a catchment. Order number increases downstream using a defined methodology related to the branching of streams.
Structure	The combination or spatial arrangement of primary soil particles (clay, silt, sand, gravel) into aggregates such as peds or clods, and their stability to deformation.
Subsidence	Vertical lowering, sinking or collapse of the ground surface.
Surface Water	Water that is derived from precipitation or pumped from underground and may be stored in dams, rivers, creeks and drainage lines.
SWIA	Surface Water Impact Assessment
SWMP	Soil and Water Management Plan
Topography	The arrangement of the natural and artificial physical features of an area.
TRH	Total recoverable hydrocarbons
Total Suspended Solids (TSS)	A measure of the filterable matter suspended in water.
Tributary	A stream or river that flows into a main river or lake.
Turbidity	A measure of clarity (turbidity) of water. Turbidity in excess of 5 NTU is just noticeable to the average person.
VRZ	Vegetated riparian zone
WAL	Water access licence
Waterway	A natural or artificial channel through which water flows.
WM Act	*Water Management Act 2000*

Term	Description
WSP	Water sharing plan
µg/L	Micrograms per litre
µS/cm	Microsiemens per centimetre

1. Introduction

1.1 Background

The Commonwealth and NSW governments have both established targets to achieve net-zero emissions by 2050. Achieving these targets requires low emissions technologies to be deployed at scale across all sectors of the economy, including the electricity generation sector, currently Australia's largest source of greenhouse gas emissions.

The NSW Transmission Infrastructure Strategy (DPE, 2018) aims to engage the private sector to invest in priority energy infrastructure projects, which can deliver low-cost, clean and reliable energy to consumers

As part of the Transmission Infrastructure Strategy, the NSW Government has developed a plan to establish five Renewable Energy Zones (REZs) to increase renewable energy generation, reduce carbon emissions, and help deliver lower wholesale electricity costs to consumers. The Central-West Orana REZ (CWO REZ), being the first REZ established, is planned to generate at least 4.5 gigawatt by the late-2020s.

The NSW Government's Electricity Infrastructure Roadmap (DPIE, 2020) identifies that the expansion of renewable generation must be accompanied by increased transmission capacity to transfer power from REZs in inland NSW to key demand centres. Interest in new energy generation projects in the CWO REZ is forecasted to exceed the existing transmission network capacity in several locations. The existing infrastructure located between the Mount Piper 550/330 kilovolt (kV) substation (Mount Piper 330 kV substation) and the Wallerawang 330/132 kV substation (Wallerawang 330 kV substation) has been identified in the NSW Network Infrastructure Strategy (EnergyCo, 2023) as requiring upgrades. The Mount Piper to Wallerawang Transmission Line Upgrade Project (the project) would provide the additional capacity required to reliably transmit power from the CWO REZ to the Greater Sydney region.

1.2 Location

The project is located within the Central West region of NSW within the Lithgow City Local Government Area (LGA). It is located approximately 14 kilometres (km) north-west of Lithgow situated on the western fringes of the Blue Mountains (Figure 1.1).

The area that is to be directly affected by the construction and operation of the project, is referred to as the project footprint and is shown in Figure 1.1. The project footprint is approximately 86.5 hectares in size and is generally bounded by the following:

– Castlereagh Highway to the north
– Former Wallerawang Power Station site to the east
– Gardens of Stone State Conservation Area (SCA) to the south
– Mount Piper Power Station to the north-west.

Land uses within and adjacent to the project footprint include:

– electricity generation at Mount Piper Power Station
– electricity transmission, including the Mount Piper and Wallerawang 330 kV substations, and associated transmission lines
– mining activities, with several Centennial Coal operations including the former Ivanhoe Coal Mine and Springvale Coal Services overlapping the project footprint
– agriculture, primarily livestock grazing
– conservation, notably the Gardens of Stone SCA
– state and local road reserves including the Castlereagh Highway, Boulder Road and Brays Lane
– rail corridors including the Main Western Rail Line and a disused railway line near Brays Lane.

A mixture land uses are proposed at the former Wallerawang Power Station site including predominately commercial land uses in the vicinity of the project. This may include redevelopment of the land for commercial and industrial land use and also the development of a Battery Energy Storage System (BESS).

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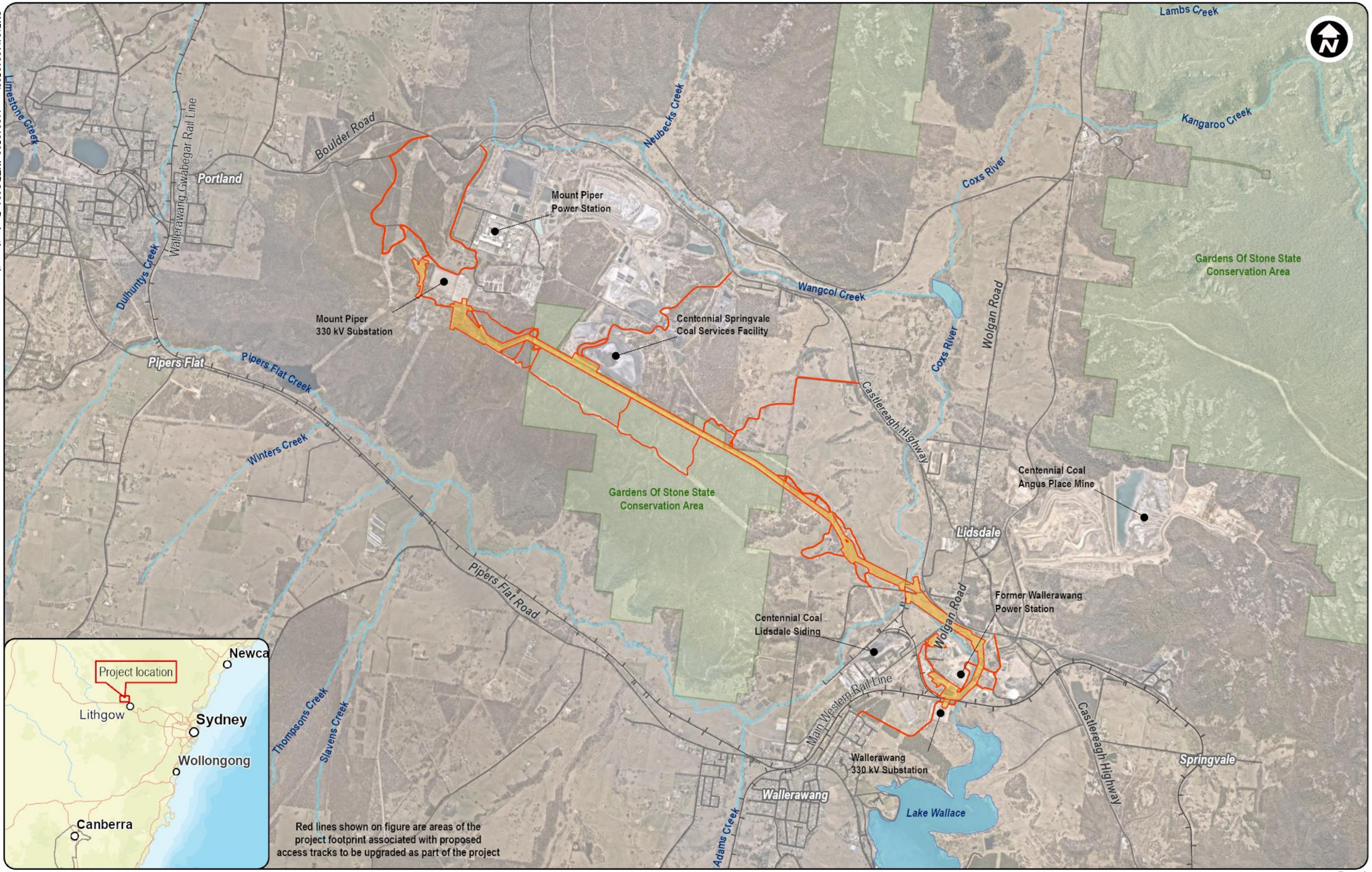


Project components
Project footprint

Existing environment
Gardens of Stone SCA
Roads

Railway
Watercourse

Rev: A
Date: 12/06/2025
1:50,000 @ A4

0 500 1,000
Metres
Grid: GDA2020 MGA Zone 56

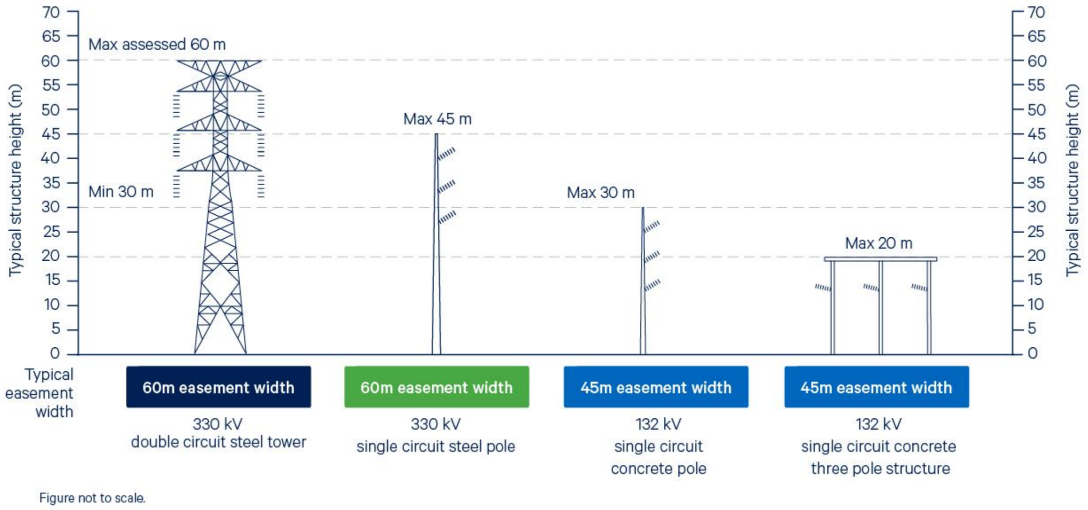
Figure 1.1 Project location and regional context

1.3 The project

The project would involve construction and operation of approximately 8 km of new 330 kV transmission line between the Mount Piper and Wallerawang 330 kV substations as shown in Figure 1.1. The project would also include the replacement of transmission structures, partial adjustment of existing transmission lines, permanent and temporary access tracks, construction compounds and laydown areas.

Table 1.1 outlines the key features of the project. The description of the project in Table 1.1 is based on the current concept design. Further detail is provided in Chapter 3 of the Environmental Impact Statement (EIS). The project will continue to be refined as part of detailed design.

Table 1.1 The project

<table>
<tr><th>Feature</th><th>Description</th></tr>
<tr><td colspan="2">Design</td></tr>
<tr><td>Transmission line and easement</td><td>Approximately 8 km of new 330 kV transmission line between the existing Mount Piper 330 kV and Wallerawang 330 kV substations that would include (from north-west to south-east):
– widening of approximately 0.5 km of existing easements in the vicinity of the Mount Piper 330 kV substation by up to 40 metres (m) to accommodate the new 330 kV transmission line and adjustments to existing 132 kV and 330 kV transmission lines
– widening of the existing 132 kV easement from 45 m to 60 m for 4.8 km to accommodate double circuit transmission structures for the existing 132 kV transmission line and the new 330 kV transmission line
– installation of two 132 kV pole structures where the existing 132 kV transmission line is restrung onto the new double circuit transmission structures
– construction of 1.2 km of new 330 kV transmission line from the existing 132 kV transmission line south-east to the intersection of Main Street and the Castlereagh Highway on a 60 m easement
– construction of 1.5 km of new 330 kV transmission line on a 40 m easement running parallel to existing 330 kV transmission lines for approximately 1.1 km and then diverging and widening to 60 m for the remaining 0.4 km to the Wallerawang 330 kV substation.
The standard easement widths for 132 kV and 330 kV transmission lines are 45 m and 60 m respectively. However, easements may vary in width where multiple transmission lines converge/ diverge or where they overlap with an existing easement.</td></tr>
<tr><td>Transmission structures</td><td>Transmission structures for the project include approximately 28 new steel lattice towers and four steel and/or concrete pole structures. Transmission structures would range in height from approximately 14 to up to 60 m, however these heights would be subject to detailed design. The image below presents an indicative illustration of the types of structures proposed for the project and their maximum heights.


The steel transmission structures would generally be spaced between 100 m to 550 m apart and the pole structures about 30 m to 50 m apart.
New conductors, earth wires and optical ground wire (OPGW) would be installed on the new transmission structures for the new 330 kV and existing 132 kV lines.</td></tr>
</table>

Feature	Description
	Local adjustment of existing transmission structures would be required in the vicinity of the Mount Piper 330 kV substation to minimise crossover of transmission lines. Redundant transmission structures, including the gantry immediately north of the Main Western Rail Line, would be removed and recycled, where possible.
Construction	
Program	Construction of the project would commence once all necessary approvals are obtained. It is anticipated that construction would commence in late 2026. Construction would be undertaken in stages over a period of approximately 20 months. The key activities and their indicative durations shown in the below table.

Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Site establishment	■	■	■	■																
Civil works			■	■	■	■	■	■												
Assembly of structures				■	■	■	■	■	■	■										
Testing and commissioning								■	■	■	■	■	■	■	■	■	■			
De-mobilisation																		■	■	■

Feature	Description
Construction methodology	Construction of the project would include: – site establishment including vegetation removal, construction compound establishment, access track construction and upgrade – removal of existing transmission structures where required – civil works involving earthworks and establishment of construction benches for each transmission structure, and establishment of brake and winch sites – construction of footings and foundation work for the new transmission structures – assembly and erection of new transmission structures – stringing of conductors.
Construction hours	The proposed construction working hours for the project are 7am to 7pm Monday to Sunday. Out-of-hours construction work will likely be required between 7pm to 7am Monday to Sunday and public holidays, to align with scheduled outages. Justification for the out-of-hours works includes: – proximity to live transmission lines requiring the work to be completed under a scheduled outage for network and personnel and contractor safety – the need to complete works within a limited time window to meet a timeframe to re-energise the transmission line to avoid disruption to customers – minimising disruptions to the use of the Main Western Rail Line during stringing.
Construction workforce	Expected to peak at about 150 personnel and contractor, with an average workforce of about 60 personnel and contractor.
Construction compounds and laydown areas	A total of three construction compounds would support the construction of the project. One would be located at the western end of the project near the Mount Piper 330 kV substation and two located at the eastern end of the project within the former Wallerawang Power Station site. The locations of these compounds are shown in Figure 1.2. Laydown of materials (e.g. poles, cable drums, other large equipment, etc.) would also occur at specified locations along the easement within the project footprint, particularly at transmission structure locations.
Access	To facilitate efficient construction access, the following is required: – upgrading and widening of approximately 25 km of existing access tracks to at least 6 m, with some sections widened up to 10 m due to local topography – construction of approximately 2 km of new 6 m wide access tracks. In addition to those tracks, approximately 4 km of existing track would be used only by light vehicles. The light vehicle tracks may require minor repairs (for example, filling potholes), but would not be graded or widened. The project footprint would be accessed from public roads at 13 access points, with the majority of these being existing property access points.

Feature	Description
	Existing access tracks would be used in preference to new tracks wherever possible. Access track upgrades and widening would include required drainage. Access points and access tracks established for the construction of the project that are not required for future operation and maintenance activities would be returned to pre-project conditions, subject to agreement with landowners.
Utility adjustments and infrastructure crossings	The new transmission line would need to cross the following utilities and infrastructure: – water pipeline operated by WaterNSW – distribution lines operated by Endeavour Energy – rail signal power supply – council drainage and other assets – public roads at Brays Lane and Main Street – rail lines at the Main Western Rail Line and the disused rail line travelling north of Brays Lane. It is not currently anticipated that the project would require the adjustment of any nearby utilities. Further investigations and consultation with asset owners would be undertaken during detailed design.
Vegetation clearing	The project would require the clearance of vegetation for a number of activities including but not limited to building new access tracks and widening existing ones, establishment of construction compounds, laydown areas, and brake and winch sites, construction of the transmission structures, and establishing and maintaining the vegetation clearance requirement for the transmission lines. Vegetation clearing would be undertaken either with the use of machinery or manually, where it is unsafe to operate machinery, or when access is limited. Root balls would be retained where possible. Clearing methods would be determined with consideration to vegetation type or structure, slope and terrain, and environmental and ecological constraints. Removed vegetation, which is weed free, would be mulched for beneficial reuse, where appropriate. Areas cleared for construction, that are not needed for operation of the project, would be rehabilitated to a stable and weed free condition.
Testing and commissioning	Testing and structure checks would form part of the final construction and installation work. These activities would ensure the project has been installed in accordance with the design and statutory standards and is safe to proceed to commissioning which would include, but not be limited to: – transmission line cut-in and connection to the electrical network – protection, control and metering checks – high voltage equipment operation and energisation – post commissioning testing and verification.
Demobilisation and rehabilitation	Upon completion of the construction works, all construction equipment, temporary fencing and waste would be removed. All disturbed areas would be rehabilitated to a stable, weed-free condition, unless designated as a permanent access track. This would include spreading topsoil, cleared and stockpiled at the beginning of construction, across the disturbed area to stabilise it to a state where natural regrowth can occur.
Operation	
Design life	About 50 years.
Maintenance	All project infrastructure would require regular maintenance to maintain serviceability and maximise its operational life. Maintenance activities would include: – transmission structure monitoring – annual aerial inspection – routine vegetation management on the easement and in the hazard tree zone – access tracks would be maintained in a trafficable condition. Should any irregularities be identified following routine inspections, a work crew would be dispatched from existing Transgrid maintenance depots to rectify any defects found. Periodic inspection and maintenance work would be managed by Transgrid as part of existing operations, with no additional personnel and contractor requirements.

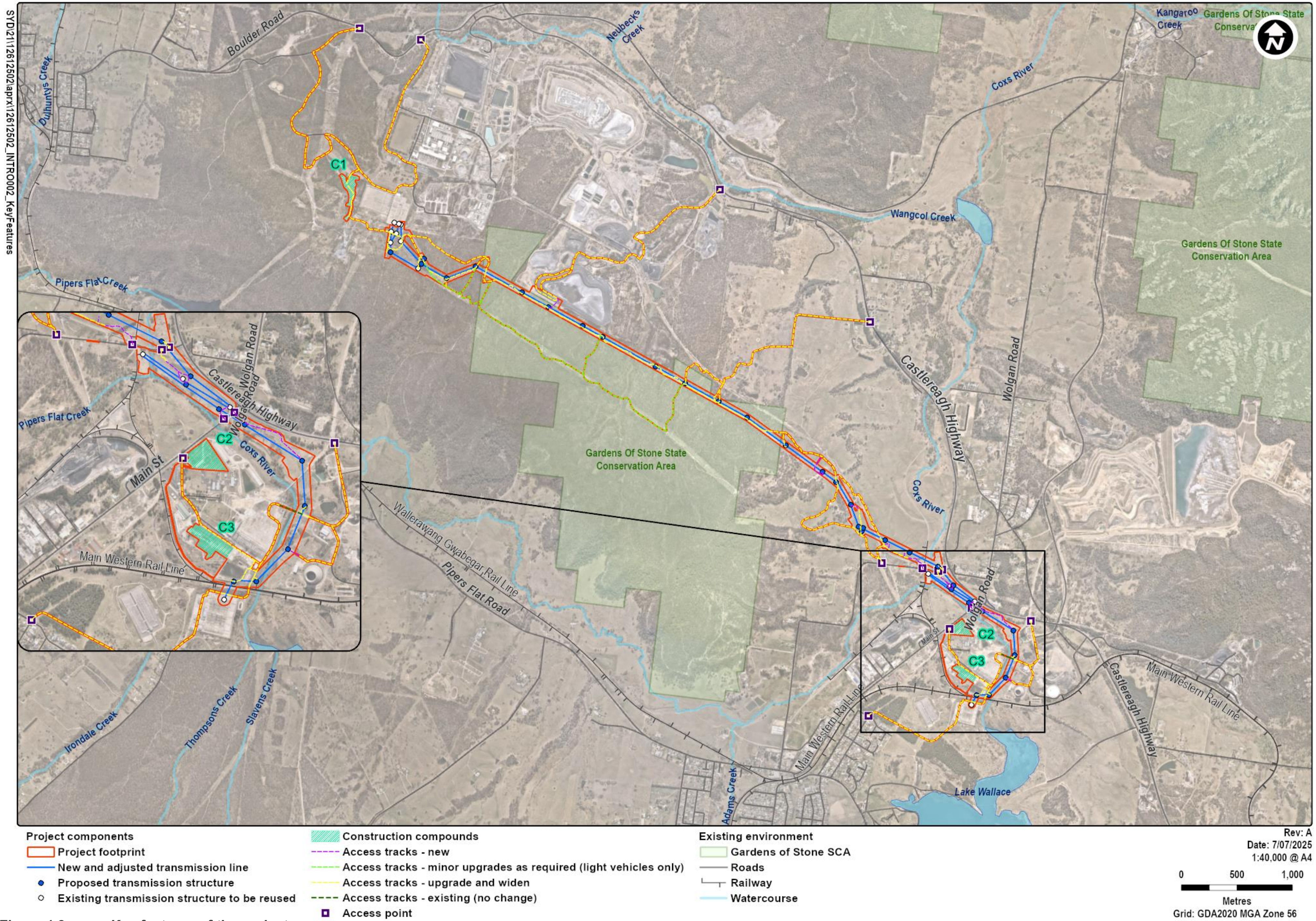


Figure 1.2 Key features of the project

1.4 Secretary's environmental assessment requirements

This water assessment has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) which were issued on 22 May 2025. Table 1.2 outlines the requirements relevant to this assessment.

Table 1.2 Relevant Secretary's Environmental Assessment Requirements

Requirements	Where addressed in this report
Water and soils	
An assessment of the impacts of the project on the quantity and quality of the region's surface water resources, including the Coxs River, Pipers Flat Creek and Lake Wallace, having regard to NSW Water Quality Objectives and the Neutral or Beneficial Effect (NorBE) Guideline. This should also include any potential groundwater dewatering required during construction and how this may impact on surface water resources	Surface water and quality assessment – sections 5.2 and 5.4 Water Quality Objectives – section 3.2.1 NorBE assessment – section 5.4.3. Groundwater assessment – section 5.4.3
Details of water requirements, supply arrangements and wastewater disposal arrangements for construction and operation (including consultation with suppliers)	Water requirements, sourcing and supply – section 5.6 Wastewater disposal – section 5.7
An assessment of the impacts of the project on groundwater aquifers and groundwater dependent ecosystems having regard to the NSW Aquifer Interference Policy and relevant Water Sharing Plans	Groundwater assessment – section 5.4.3
An assessment of the potential flooding impacts and risks of the project	Flooding assessment – section 5.3
Where the project involves works within 40 metres of the high bank of any river, lake or wetlands (collectively waterfront land), identify likely impacts to the waterfront land, and how the activities are to be designed and implemented in accordance with the DPI Guidelines for Controlled Activities on Waterfront Land (2018) and (if necessary) Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (DPI 2003); and Policy & Guidelines for Fish Habitat Conservation & Management (DPI, 2013)	Riparian and waterfront land assessment – section 5.1
A description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with Managing Urban Stormwater: Soils & Construction (*Landcom* 2004)	Erosion and sediment control measures – sections 6.1 and 6.2

1.5 Purpose and structure of this report

This report has been prepared by GHD Pty Ltd (GHD) as part of the Environmental Impact Statement (EIS) for the project.

The purpose of this report is to assess potential surface water and groundwater issues from the construction and operation of the project, and where required, identify feasible and reasonable mitigation and management measures.

The report is structured as follows:

– Section 1 – provides an introduction to the project and the assessment
– Section 2 – describes the methodology for the assessment
– Section 3 – described the legislative context of the project with regards to water resources
– Section 4 – describes the existing conditions
– Section 5 – assesses the impacts of the construction and operation of the project on water resources
– Section 6 – provides mitigation measures for the impacts identified
– Section 7 – concludes and summarises the report.

2. Methodology

2.1 Study area

For the purposes of the assessment, the study area has been defined as the project footprint and surrounding area with the potential to be directly or indirectly affected by the project. Two study areas apply to this assessment as follows:

– Surface water study area is the Sydney Drinking Water Catchment of which the project footprint is located in the upper reaches of the catchment and includes the catchments of Wangcol Creek, Pipers Flat Creek, and the upper Coxs River, from the confluence of the Coxs River with Wangcol Creek to the inlet of Lake Wallace.
– Groundwater study area consists of groundwater resources within 5 km of the project footprint.

These study areas are shown on Figure 2.1.

2.2 Assessment methodology

A desktop assessment was undertaken and covers both the construction phase and the operational phase of the project. The construction phase includes site establishment works, main construction work, testing and commissioning and demobilisation. The assessment methodology comprises the following:

– Review of the relevant legislative context to identify the governing legislation, policy and guidelines and how these documents are applicable to the project.
– Desktop review of the surrounding environment with respect to climate, water resources, soils and geology to identify the existing conditions and potential receptors of the project within the study area.
– Impact assessment for the effects of the project (during both construction and operations) on the following:
  - riparian zones
  - surface water quality
  - flooding
  - groundwater
  - water sourcing and security
  - cumulative impacts.
– Where construction elements are predicted to intercept groundwater, the rate of groundwater inflow has been estimated using the analytical equations and approach outlined in *Marinelli and Niccoli* (2000). The methodology for these analytical equations is presented in Appendix A.
– Based on the outcomes of the impact assessment, relevant mitigation and management measures during both construction and operations have been recommended to manage or mitigate potential impacts.

Given the proposed upgrade would replace existing transmission structures in a similar location along the Coxs River, and that transmission structure foundations would be buried which would only result in minor, localised changes to flows, a qualitative assessment of flooding risks was deemed appropriate for the project, with no flooding modelling undertaken as part of the project.

2.3 Impact assessment criteria

2.3.1 Surface water

In accordance with the requirements of the SEARs, the potential impacts of the project have been assessed with regard to the quality and quantity of the regions surface water resources. *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (B&C SEPP) sets out the relevant Water Quality Objectives for the drinking water catchment, which are published and maintained by WaterNSW and include broad reference to *ANZECC* 2018 and benchmarks in metropolitan catchment streams. The impact assessment criteria require that projects within the Sydney drinking water catchment have a neutral or beneficial effect on water quality, which forms the basis of the criteria for the assessment. Refer to section 3.2.1 for additional information.

2.3.2 Groundwater

The potential impacts on groundwater have been assessed in accordance with the NSW Aquifer Interference Policy (AIP). The AIP requires that potential impacts on groundwater sources, including their users and GDEs, be assessed against Minimal Impact Considerations, outlined in Table 1 of the AIP. If the predicted impacts meet the Level 1 Minimal Impact Considerations, then these impacts will be considered as acceptable.

The NSW AIP divides groundwater into "highly productive" and "less productive" groundwater sources. Highly productive groundwater is defined in this policy as having:

– total dissolved solids of less than 1,500 milligram per litre (mg/L), and
– contains water supply works that can yield water at a rate greater than 5 L/s.

Based on the low reliance of groundwater in the vicinity of the project footprint for stock and domestic purposes, and existing water quality, the Level 1 Minimal Impact Considerations for Less Productive Fractured Rock and Alluvial Groundwater Sources have been adopted for this assessment. The criteria are presented in Table 2.1.

Table 2.1 Level 1 minimal impact considerations for less productive groundwater sources

Aquifer Interference	Minimal Impact Consideration
Water table	1. Less than or equal to 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40 m from any: a. high priority groundwater dependent ecosystem. b. high priority culturally significant site; listed in the schedule of the relevant water sharing plan a maximum of a 2 m decline cumulatively at any water supply work. 2. If more than 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40 m from any: a. high priority groundwater dependent ecosystem b. high priority culturally significant site listed in the schedule of the relevant water sharing plan then appropriate studies will need to demonstrate to the Minister's satisfaction that the variation will not prevent the long-term viability of the dependent ecosystem or significant site. If more than 2 m decline cumulatively at any water supply work, then make good provisions should apply
Water pressure	1. A cumulative pressure head decline of not more than a 2 m decline, at any water supply work. 2. If the predicted pressure head decline is greater than requirement 1. (a) above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply.
Water quality	1. Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity. 2. If condition 1 is not met then appropriate studies will need to demonstrate to the Minister's satisfaction that the change in groundwater quality will not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works. 3. For alluvial water sources, no increase of more than 1% per activity in long-term average salinity in a highly connected surface water source at the nearest point to the activity. 4. If condition 3 is not met, then hen appropriate studies are required to demonstrate to the Minister's satisfaction that the River Condition Index category of the highly connected surface water source will not be reduced at the nearest point to the activity.

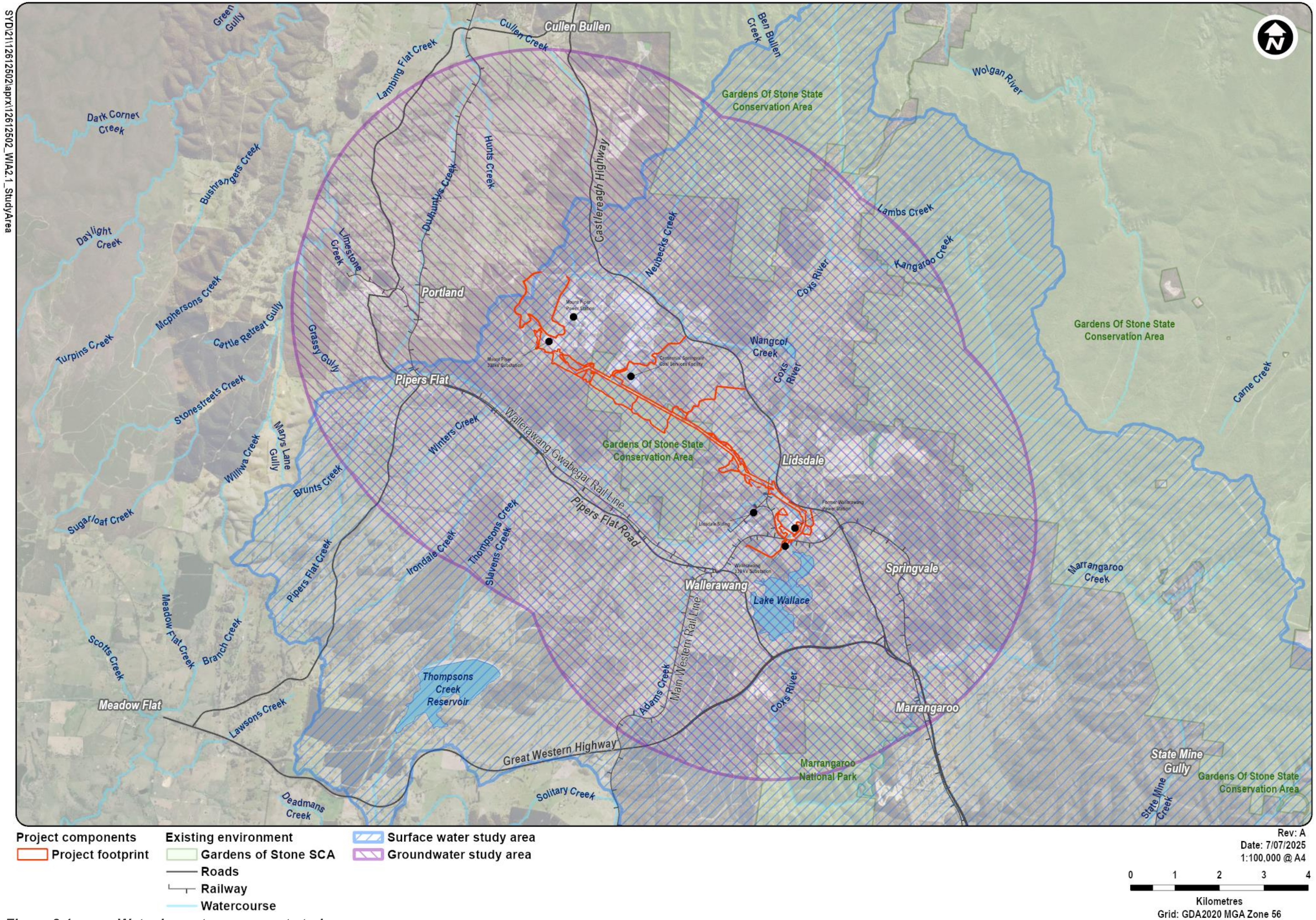


Figure 2.1 ***Water impact assessment study area***

3. Legislative and policy context

3.1 Legislative requirements

3.1.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) is the core legislation relating to planning and development activities in NSW and provides the statutory framework under which development projects are assessed. The EP&A Act aims to encourage the proper management, development and conservation of resources, environmental protection and ecologically sustainable development.

The NSW Minister for Planning and Public Spaces declared the project to be Critical State Significant Infrastructure (CSSI) on 3 July 2024, in accordance with section 5.12(4) and section 5.13 of the EP&A Act. The Minister for Planning and Public Spaces is the approval authority, and the project is to be assessed in accordance with section 5.16 of the EP&A Act.

3.1.2 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is administered by the NSW Environment Protection Authority (EPA), which is an independent statutory authority and the primary environmental regulator for NSW. The objectives of the POEO Act are to protect, restore and enhance the quality of the environment. Some of the mechanisms that can be applied under the POEO Act to achieve these objectives include programs to reduce pollution at the source and monitoring and reporting on environmental quality. The POEO Act regulates and requires licensing for environmental protection, including for waste generation and disposal and for water, air, land and noise pollution.

Under the POEO Act, an Environment Protection Licence (EPL) is required for premises at which a ‘scheduled activity’ is conducted. Schedule 1 of the POEO Act lists activities that are scheduled activities for the purpose of the Act. Licence conditions relate to pollution prevention and monitoring and can control the air, noise, water and waste impacts of an activity. No EPL will be sought for the project as the development of a transmission line is not listed as a scheduled activity in Schedule 1 of the POEO Act.

3.1.3 Water Management Act 2000

The *Water Act 1912* (Water Act) was historically the main legislation for managing water resources in NSW, however, was progressively phased out and replaced by water sharing plans (WSPs) made under the *Water Management Act 2000* (WM Act). Once a WSP commences, existing licences under the Water Act were converted to water access licences (WALs), water supply works and use approvals under the WM Act. The aim of the WM Act is to ensure that water resources are conserved and properly managed for sustainable use benefiting both present and future generations. It is also intended to provide formal means for the protection and enhancement of the environmental qualities of waterways and in-stream uses as well as to provide for protection of catchment conditions.

WALs entitle licence holders to specified share components in the available water that may be sustainably extracted from a particular water source or within a specified water management area. WALs entitle licence holders to take water at specified times, at specified rates or in specified circumstances, or in any combination of these, and in a specified area or from specified locations. The actual volume of water available to be extracted may vary, dependent on available water determinations made under the WM Act. Available water determinations are made for each WAL category in each water source and are generally made at the start of a water year, although may be altered at any time.

Water Sharing Plans

Water sources in NSW are managed via WSPs under the WM Act. Provisions within WSPs provide water to support the ecological processes and environmental needs of Groundwater Dependent Ecosystems (GDEs) and waterways. WSPs also regulate how the water available for extraction is shared between the environment, basic landholder rights, town water supplies and commercial uses. Key rules within the WSPs specify when licence holders can access water and how water can be traded.

WALs entitle licence holders to specify share components in the available water that may be sustainably extracted from a particular water source. The actual volume of water available to be extracted may vary, dependent on available water determinations made under the WM Act. Available water determinations are made for each WAL category in each water source and are generally made at the start of a water year, although may be altered at any time.

Table 3.1 outlines the water sharing plans which are relevant to the project.

Table 3.1 Relevant water sharing plans

Relevant Water Sharing Plan	Source	Relevance to the project
Groundwater		
Greater Metropolitan Region Groundwater Sources 2023	Sydney Basin West Groundwater Source	Underlies the project footprint
Greater Metropolitan Region Groundwater Sources 2023	Lachlan Fold Belt Greater Metropolitan Groundwater Source	Underlies the project footprint
Surface Water		
Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2023	Wywandy Water Source	Surface water sharing plan governing the project footprint

Water licences may be required for the project, depending on the construction methodology and site conditions encountered. These are discussed in sections 5.2, 5.4.3 and 5.6.

3.2 Policy and guidelines

3.2.1 State Environmental Planning Policy (Biodiversity and Conservation) 2021

The *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (B&C SEPP) regulates a number of environmental considerations for the planning rules and controls including those relating to:

– clearing of native vegetation in NSW
– protection and preservation of bushland within public open space and reservations
– provisions to support the water quality objectives for the Sydney Drinking water catchment by maintaining a neutral or beneficial effect on water quality for all developments.

The project is located within the Sydney Drinking Water Catchment boundary, shown on the *Sydney Drinking Water Catchment Map* (NSW Government 2023) as defined in the B&C SEPP. The Sydney drinking water catchment is listed in Part 6.5 of the B&C SEPP, which nominates development control requirements for water quantity and quality.

There are no Water Quality Objectives or River Flow Objectives listed by the then Department of Environment, Climate Change and Water (2006) for Sydney's Drinking Water Catchment. The B&C SEPP instead documents general objectives for the catchment being:

– To provide for healthy water catchments that will deliver high quality water to the Sydney area while also permitting compatible development, and
– To provide for development in the Sydney Drinking Water Catchment to have a neutral or beneficial effect on water quality.

In addition, the B&C SEPP outlines a list of controls for developments to be met within Sydney's Drinking Water Catchment which are included in Table 3.2. As part of the B&C SEPP, WaterNSW is required to provide a regulatory function; establishing a guideline to test the water quality objective in Sydney's Drinking Water Catchment (the Neutral or Beneficial Effect on Water Quality Assessment Guideline, refer below).

Table 3.2 General controls on development

Condition to be assessed	Where addressed
Whether the development will have a neutral or beneficial effect on water quality,	Section 5.4.3
Whether the development will have an adverse impact on water flow in a natural waterbody,	Section 5.2
Whether the development will increase the amount of stormwater run-off from a site,	Section 5.2
Whether the development will incorporate on-site stormwater retention, infiltration or reuse,	The project does not include any on-site stormwater retention, infiltration or reuse or impact on any existing infrastructure for other development.
The impact of the development on the level and quality of the water table,	Section 5.4.3
The cumulative environmental impact of the development on the regulated catchment,	Section 5.6
Whether the development makes adequate provision to protect the quality and quantity of ground water.	Section 5.4.3

Neutral or Beneficial Effect on Water Quality Assessment Guideline

The *Neutral or Beneficial Effect* (NorBE) *on Water Quality Assessment Guideline* ('the NorBE Guideline'; WaterNSW 2022) provides guidance on the requirement under the B&C SEPP for all development in the Sydney drinking water catchment to have a neutral or beneficial effect on water quality. Achieving NorBE is a regulatory tool of WaterNSW to achieve the water quality objectives of the drinking water catchment set out by the B&C SEPP. As As the development application is for a State Significant Infrastructure (SSI) under part 5 of the *EP&A Act*, the project would be assessed by regulators under Appendix 2 - Part 5 NorBE Assessment of the NorBE Guideline. A NorBE water quality impact assessment for the project is therefore required and is included in section 5.4.3.

3.2.2 Water Quality and River Flow Objectives

There are no Water Quality Objectives or River Flow Objectives listed by the then Department of Environment, Climate Change and Water (2006) for Sydney's Drinking Water Catchment. This is discussed in section 3.2.1.

3.2.3 Australian and New Zealand water quality guidelines

The *National Water Quality Management Strategy* (NWQMS) provides a national framework for improving water quality in Australia's waterways. The main policy objective of the NWQMS is to achieve sustainable use of the nation's water resources, protecting and enhancing their quality, while maintaining economic and social development. The NWQMS is a joint strategy developed by two Ministerial Councils — the Agriculture and Resources Management Council of Australia and New Zealand (ARMCANZ) and the Australian and New Zealand Environment and Conservation Council (ANZECC).

Guidelines for Fresh and Marine Water Quality (ANZECC 2000 and ANZG 2018)

The *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000 and ANZG 2018), are the benchmark documents of the NWQMS which provide a guide for assessing and managing ambient water quality in a wide range of water resource types and according to specified environmental values, such as aquatic ecosystems, primary industries, recreation and drinking water. The ANZECC (2000) guidelines provide a framework for determining appropriate guideline values or performance criteria to evaluate the results of water quality monitoring programs. The ANZECC (2000) guidelines also present numerical guidelines which can be used as a basis to assess the impact of the project against defined objectives or values for the receiving waters.

The *Australian and New Zealand Guidelines for Fresh and Marine Water Quality – Primary Industries* also provide water quality guidelines that are recommended for agricultural use (irrigation, livestock drinking water and general on-farm use).

The *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG 2018) provide guidance for assessing and managing ambient water quality in a wide range of water resource types and according to specified environmental values, such as aquatic ecosystems, primary industries, recreation and drinking water. The revised *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG 2018) were published in 2018 following scientific review of the ANZECC (2000) guidelines. The Water Quality Management Framework (ANZG 2018) provides the key requirements for determining appropriate guideline values or performance criteria to evaluate the results of water quality monitoring programs.

The ANZG (2018) guidelines adopt a risk-based approach to assessing ambient water quality by providing the framework to tailor water quality guidelines to local environmental conditions. Guideline values provided by ANZG (2018) can be modified into regional, local or site-specific guideline values by considering factors such as the level of modification of the ecosystem, natural variability in water quality at reference sites, and water hardness. Guideline values are applied to the receiving environment at the edge of the mixing zone and do not apply to mine water at the point of discharge. For the purposes of this assessment, the median (for physicochemical parameters and nutrients) and 95th percentile (for toxicants) results for the downstream sites were compared to the applicable default guideline values (DGV), as recommended by ANZG (2018).

3.2.4 Guidelines for controlled activity approvals

Section 91 of the WM Act details the requirements for controlled activity approval to carry out work on waterfront land, which includes the bed of any river, lake or estuary and any land within 40 m of its highest bank. However, in accordance with Section 4.41 of the EP&A Act, SSIs do not require controlled activity approvals. It remains an offence to harm waterfront land by not adhering to the terms and conditions of a development consent, including works outside the project footprint as stated in Section 345 of the WM Act. Potential impacts associated with waterfront land and corresponding mitigation measures are assessed within this report.

NSW DPHI has published a number of guidelines on types of controlled activities and the protection of waterfront land. The guidelines provide recommendations for the design and construction of instream works and an indication of the width of riparian zones to be considered.

In accordance with the guidelines, an assessment of impacts to riparian zones and waterfront land are included in section 5.1, with recommendations for waterway crossings made in section 6.16.

3.2.5 Policy and Guidelines for Fish Habitat Conservation and Management (DPI 2013)

The *Policy and Guidelines for Fish Habitat Conservation and Management: 2013 update* (DPI 2013) provides guidance of the management of waterways, development and assessment methods to fulfil the objectives of the FM Act, particularly the objective of conserving key fish habitats.

DPI (2013) outlines the policy and guidelines for waterway crossings that should be followed when implementing a waterway crossing to minimise the potential impacts on aquatic biota, including impediments to fish passage. This includes consideration of the following in the design and construction of waterway crossings:

- *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (DPI 2003) Some of the key guidelines for implementing the *Policy and Guidelines for Fish Habitat Conservation and Management: 2013 update* (summarised from the DPI 2003) are:
  - For waterway crossings incorporating culverts (including low flow culvert cell(s)), a minimum of 300 mm of water should pool through the structure, with a centrally placed low-flow cell being preferable.
  - Waterway crossings should be constructed perpendicular to the flow of the water and should be positioned away from channel bends.
- Waterway crossing projects should be consistent with the policy and guidelines for riparian and aquatic vegetation, snag management, general environmental assessment requirements for developments, fish passage, sediment extraction, minimising water pollution and use of explosives, electrical devices and other dangerous substances in waterways of DPI (2013).

3.2.6 Managing Urban Stormwater – Soils and Construction, *Landcom* (2004)

Managing Urban Stormwater, Soils and Construction, Volume 1 (Landcom 2004) more commonly referred to as 'The Blue Book' provides guidance and performance standards with relation to the control of erosion and sediment. Throughout NSW the performance standards of Landcom (2004) are commonly used to assess the suitability of proposed controls and residual risk and are commonly included by the EPA in relevant regulatory requirements. The guidelines are supported by the NSW EPA, as well as throughout other NSW government agencies, local government and industry.

The mitigation and management measures recommended in section 6, are made in accordance with Landcom (2004).

3.2.7 NSW Aquifer Interference Policy 2012

The *NSW Aquifer Interference Policy* (NSW AIP) (DPI 2012) outlines the water licensing requirements under the *Water Act 1912* and WM Act. A water licence is required whether water is taken for consumptive use or whether it is taken incidentally by the aquifer interference activity (such as dewatering) even where that water is not being used consumptively as part of the activity's operation.

Under the WM Act, a WAL gives its holder a share of the total entitlement available for extraction from the groundwater source. The WAL(s) held by the person undertaking the extraction must cover a sufficient share component and water allocation to account for the take of water from the relevant water source at all times. Sufficient access licences must be held to account for all water taken from a groundwater or surface water source as a result of an aquifer interference activity, both for the life of the activity and after the activity has ceased.

The NSW AIP requires that potential impacts on groundwater sources, including users and GDEs, be assessed against Minimal Impact Considerations, outlined in Table 1 of the policy. If the predicted impacts meet the Level 1 Minimal Impact Considerations, then these impacts will be considered as acceptable. The adopted Level 1 Minimal Impact Considerations for the project are discussed in section 5.4.3.

4. Existing environment

4.1 Catchment overview

The project traverses the upper Coxs River catchment. The Coxs River is a perennial river that drains a catchment area of approximately 1,700 km^2 and is part of the greater Hawkesbury/Nepean catchment. The river rises within the former Ben Bullen State Forest east of Cullen Bullen and flows generally in a south-east direction into Lake Burragorang (impounded by Warragamba Dam), which is the primary reservoir for drinking water supply to Sydney. The flow in Coxs River is regulated by three reservoirs: Lake Wallace, Thompsons Reservoir and Lake Lyell, which are used to supply power generation activities at Mount Piper Power Station.

The upper Coxs River and its tributaries receive various rainfall derived runoff and licenced discharges from various mining and energy operations located within the catchment. The location of the Coxs River and its tributaries relative to the project footprint are shown in Figure 4.3. Key tributaries of the Coxs River and relevant operations located upstream of the project footprint include:

– Kangaroo Creek, a third order waterway located adjacent Angus Place Colliery
– Pipers Flat Creek, a fifth order waterway located adjacent Lidsdale Siding
– Wangcol Creek, a fourth order waterway located adjacent Mount Piper 330 kV substation and Centennial's Springvale Coal Services Site (SCSS)
– Neubecks Creek, a fourth order waterway which rises in the Gardens of Stone SCA.

4.2 Climate

Patched point climate data were obtained from the *Scientific Information for Landowners* (SILO) database operated by Queensland Government's Department of Environment and Science (DES 2024*).* SILO point data consists of interpolated estimates based on historically observed data from the Bureau of Meteorology (BoM) climate stations. For this assessment, SILO data was obtained for a location to the north of the project, north of Centennial Coal's Springvale Coal Services Facility. Climate statistics for the project footprint between 1970 and 2023 are presented in Figure 4.1.

Review of BoM climate Köppen classification mapping indicates the project footprint is located in a temperate climate zone and is characterised by warm summers with no dry season. Strong seasonality is observed in temperature fluctuations, with temperature maximums typically reaching 24-25 degrees Celsius (ºC) in the summer months (January, February and December) and 10-11 ºC in the winter months (June, July and August). Temperature minimums showed temperatures reaching 11-13 ºC in the summer months (January, February and December) and 1-3 ºC in the winter months (June, July and August).

Monthly rainfall is relatively uniform throughout the year, with slightly increased median rainfall occurring in January, February and December compared with other months. The annual average rainfall is 771.8 mm, with a maximum of 1268.2 millimetre (mm) recorded in 1973 and minimum of 346.2 mm recorded in 1982.

Strong seasonality in evapotranspiration is observed throughout the year, with the highest monthly totals observed in January and December with 180.8 mm and 179.0 mm respectively. The annual average evapotranspiration is approximately 1206 mm.

A moisture deficit (monthly evapotranspiration less monthly rainfall) is observed in all months except for June. An average annual moisture deficit of 434.1 mm is observed, indicating the presence of moisture in environmental conditions are more strongly dominated by evapotranspiration throughout the year.

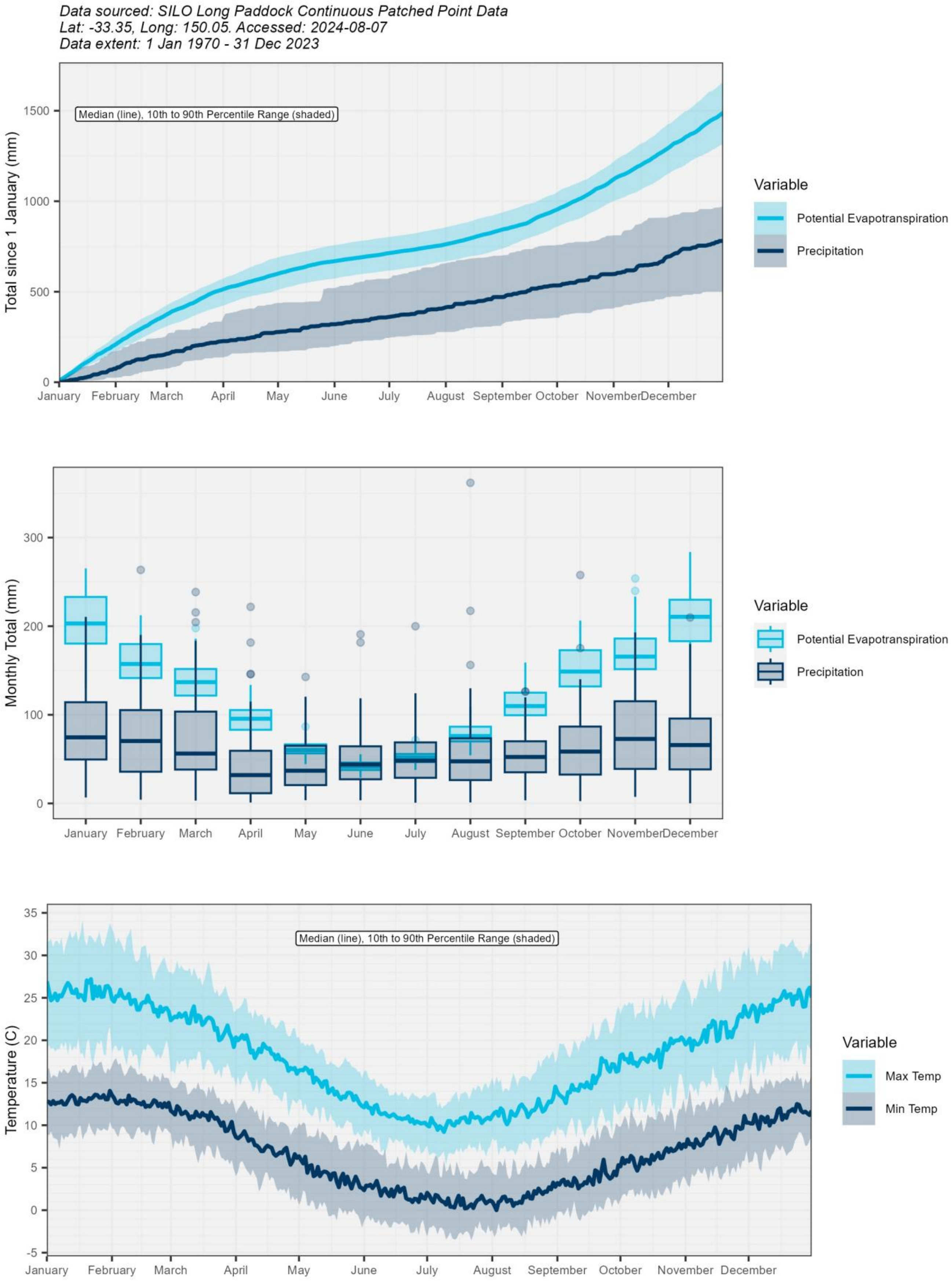


Figure 4.1 Climate data summary for the project

4.3 Topography and hydrology

Topographic data were obtained based on review *of NSW digital elevation model* (NSW SS 2011), while information regarding the location of waterways were obtained through review of the *NSW hydro line spatial dataset*. These spatial datasets were reviewed with respect to the locations of the proposed project elements. The topography, hydrology and project features described in this section are shown on Figure 4.3.

Mount Piper 330 kV substation

In the vicinity of the project footprint, the eastern portion of the Mount Piper 330 kV substation site slopes to the north from approximately 960 m Australian Height Datum (AHD) to 950 m AHD, while the western portion slopes to the west from an elevation of 960 m AHD to 950 m AHD. Several modified drainage lines (disconnected from Wangcol Creek) flow to the north, west of the Mount Piper 330 kV substation. A first order drainage line flows to a small dam, located on the southern side of the substation. The downstream extents of this drainage line were decommissioned through filling and construction of the Mount Piper Power Station; however, overland flows are diverted around the power station site to Wangcol Creek. Wangcol Creek has been subject to diversions and instream impacts (such as mining) with its condition varying from partly vegetated to cleared and degraded lands.

Transmission lines and access tracks

Along the proposed transmission line, the site topography is characterised by broken ridgelines, gulleys and spurs, with transmission structures typically being located along the highpoints of ridgelines and spurs. The area generally falls to the north towards Wangcol Creek and Coxs River with the topography of the transmission line alignment undulating around 950 m AHD.

Between proposed transmission structures 21D and 17D, several unmodified tributaries of Wangcol Creek flow to the north. The upper portion of one tributary, referred to as Huon Gully is diverted through the SCSS site to Lamberts Gully, which discharges to Wangcol Creek.

To the south-east of proposed transmission structure (TS) 13D, the project footprint transitions to the flats of Pipers Flat Creek. The topography in this area falls to approximately 876 m AHD at proposed TS11D. A waterway crossing is proposed on a first order stream of the Coxs River, near TS11D. Based on a site visit undertaken in December 2024, the waterway has limited hydraulic connectivity to the Coxs River, with a railway embankment resulting in rainfall and runoff accumulating at the topographic low point. Some seepage of water through the railway embankment may be occurring. The proposed transmission line would also cross a third order tributary of Pipers Flat Creek, which flows to the south-east, to meet the main (sixth order) channel of Pipers Flat Creek.

Between proposed transmission structures 10D and 2C, the project footprint follows the Coxs River downstream, falling from 880 m AHD to 875 m AHD over approximately 1.6 km. The Coxs River transitions to a sixth order stream at the confluence of Pipers Flat Creek, approximately 170 m south of proposed TS11D.

Wallerawang 330 kV substation

The topography at the final proposed transmission structure footing at the Wallerawang 330 kV substation is approximately 875 m AHD. The site topography at the Wallerawang 330 kV substation slopes downhill to the north from 880 m AHD to 875 m AHD. The western boundary of this substation is located approximately 50 m from the banks of the 6^{th} order Coxs River. Immediately downstream of the substation, Lake Wallace regulates downstream flows in the Coxs River.

The WaterNSW flow gauge Coxs River at Wallerawang Power Station - (212054) is located within the study area. The daily flow exceedance curve is shown in Figure 4.2. As shown in Figure 4.2, the flow recorded at this gauge is typically (50^{th} percentile) less than 25 megalitres per day (ML/day) and generally less than 65 ML/day (10^{th} percentile). Lake Wallace (Wallerawang Dam) is located downstream of the substation on the Coxs River.

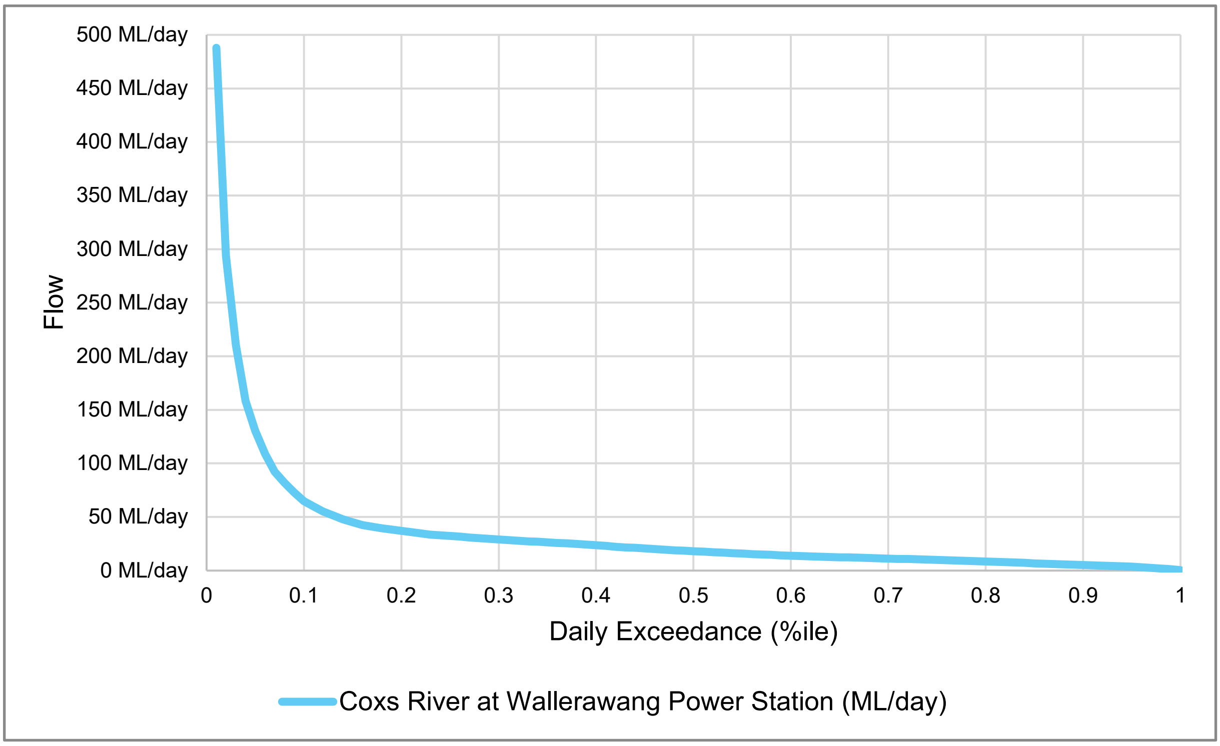


Figure 4.2 Daily flow exceedance probability curve for Coxs River at Wallerawang Power Station

4.4 Flooding

Available historical data was reviewed to characterise the existing flood condition of the Coxs River and tributaries in the vicinity of the Project.

There are no publicly available regional flood studies for the Coxs River or tributaries in the vicinity of the project. Review of the Lithgow City Council Local Environment Plan Flood Prone Land mapping indicates the project footprint is located outside of the flood planning area.

It is noted that water levels within Pipers Flat Creek and the Coxs River are periodically influenced by environmental releases from Thompsons Creek Reservoir, which is operated by EnergyAustralia under a WAL, and licenced discharges from various mining operations.

A review of the maximum water levels at WaterNSW flow gauge (Coxs River at Wallerawang Power Station – 212054) was undertaken from 1992 to 2025. The review indicated that water levels are 1 to 2 m above the top of bank at the gauge location during large flood events. There are no other flow gauges available in the vicinity of the project. Based on review of Bureau of Meteorology (BOM) flood frequency analysis information, significant storm flow rates in the area are anticipated to be in the order of 200-300 m^3/s, for storms between the 1 in 50 to 1 in 100 AEP event.

While these flow rates have not been observed at the gauge between 17 January 1992 to 4 May 2025, the maximum recorded flood levels appear to generally be within the confines of the bank at the gauging stations, which may suggest that there is limited lateral connectivity to the floodplain, given the apparent high channel capacity. As a result, inundation of the floodplain is anticipated to be limited to locations where channel constraints or changes in channel geometry reduce channel capacity, resulting in overbank flows. Inundation depths on the Coxs River floodplain could be in the order of 1 to 2 m during rare events (e.g. the 1 in 100 AEP event) but would be highly varied and subject to location.

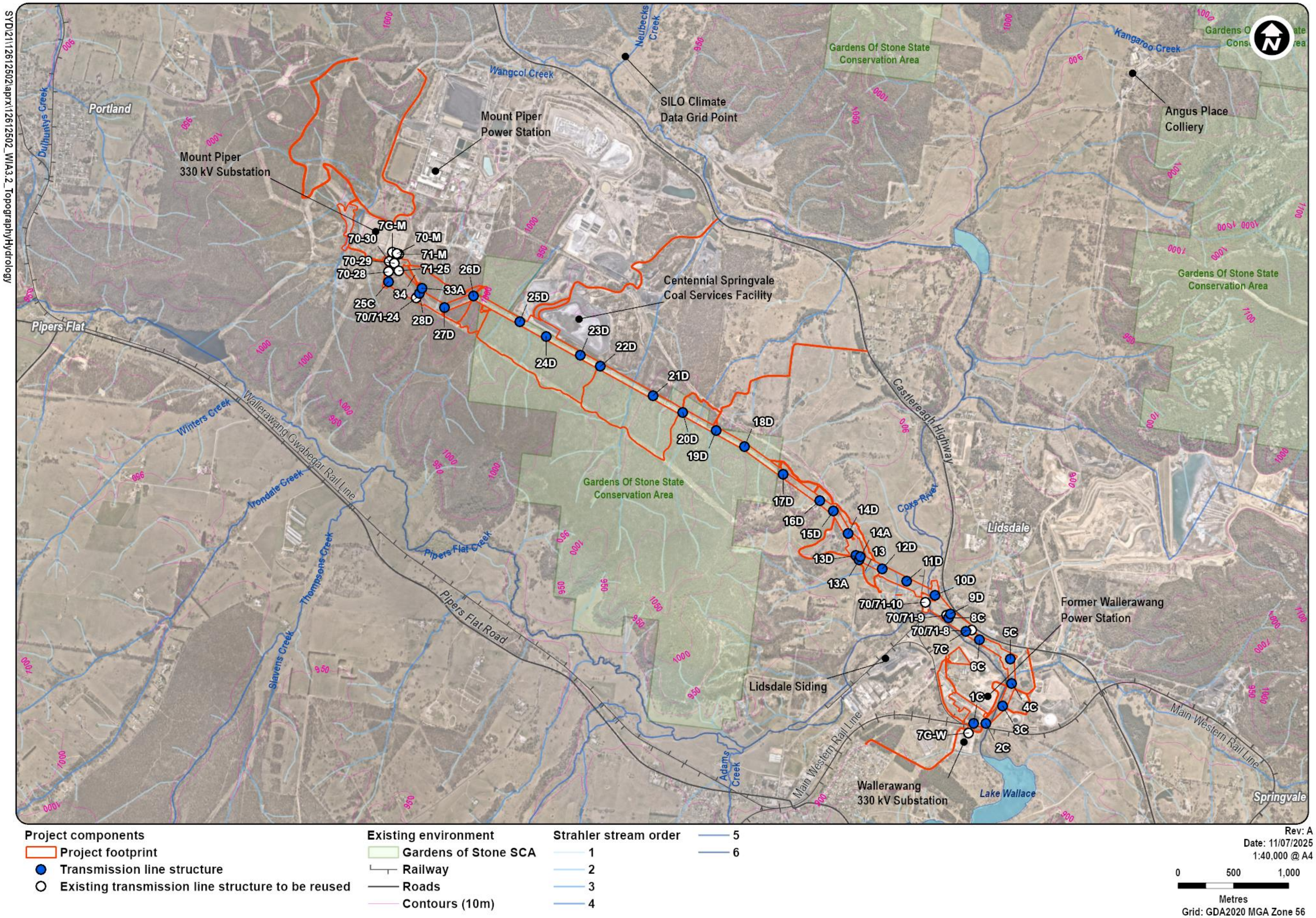


Figure 4.3 Topography and hydrology

4.5 Surface water quality

4.5.1 Upper Coxs River

Upstream of Lake Wallace, the upper Coxs River catchment is influenced by a number of factors which have the potential to alter the surface water quality of the Coxs River and associated tributaries. This includes a number of licensed discharges (under EPL) from mining operations, energy generation sites and water/wastewater treatment plants as well as urbanisation and general development in the catchment.

Review of publicly available water quality monitoring data on Coxs River has been undertaken based on water quality data obtained from the *Springvale Mine Upper Coxs River Action and Monitoring Plan* (Springvale Coal Pty Limited 2023). Monitoring locations are shown on Figure 4.5. Data at monitoring locations along the Coxs River were collected between 2015 and 2016. The median results from this period at monitoring locations on the Coxs River are presented in Table 4.1.

Table 4.1 Water quality summary Coxs River 2015 and 2016

Analyte	Unit	ANZECC (2000) guideline values	Coxs River median result (Springvale Coal Pty Limited 2023)				
			Coxs River Far U/S	Coxs River U/S	Coxs River D/S	Coxs River (Wang bridge)	Coxs River (Delta Site)
pH	pH units	6.5 – 8.0	6.7	6.9	8.1	8.6	8.5
TSS	mg/L	-	7	5	5	5	5
EC	µS/cm	350	117	99	438	1,082	1,114
Oil and grease	mg/L	-	5	5	5	5	5
Turbidity	NTU	25	14	8	5	4	5

Note: results highlighted in grey indicate the average result exceeded the ANZECC (2000) guideline value for upland rivers.

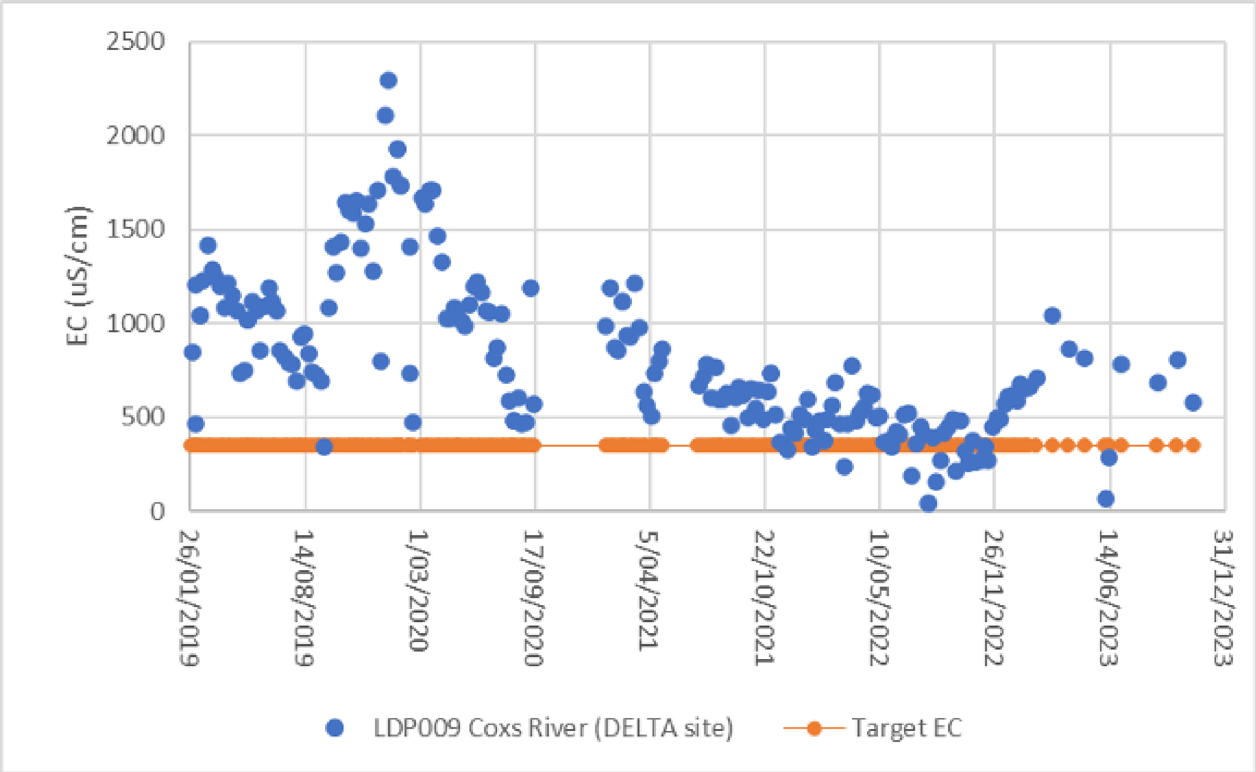
As shown in Table 4.1, water quality monitoring results show pH results generally increased from slightly acidic in the catchment headwaters at Coxs River Far U/S, to circumneutral upstream of the confluence with Pipers Flat Creek at Coxs River D/S. The monitoring results were more alkaline upstream of Lake Wallace at Coxs River (Wang Bridge) above the upper pH ANZECC (2000) guideline values.

Salinity (electrical conductivity - EC) is a key analyte of consideration within the upper Coxs River. Based on the monitoring results reported in 2015 and 2016, EC recorded upstream to downstream along the Coxs River was shown to increase. At the Coxs River D/S monitoring site, EC was recorded above the ANZECC (2000) guideline value. At Coxs River (Wang Bridge) monitoring location, downstream of the confluence of Pipers Flat Creek and the Coxs River, EC was shown to increase further with a median result of 1082 µS/cm. Downstream of Lake Wallace (Coxs River (Delta Site)), median EC recorded was more elevated (1,114 µS/cm).

Turbidity results recorded within the Coxs River during the monitoring period were all below the guideline value.

It is noted however that the licensed discharge conditions from some operations within the catchment have changed since this publicly available data was published. For example, up until June 2019, Springvale Mine discharged up to 30 ML/day of mine water (at up to 1200 µS/cm) to the Coxs River via Sawyers Swamp Creek on EPL 3607 and Angus Place up to 10 ML/day of treated water (350 µS/cm) via Kangaroo Creek. Since the approval of the Springvale Water Treatment Project (SSD-7592) and the commissioning of the reverse osmosis (RO) water treatment plant at the Mount Piper Power Station, no discharges have been occurring to Coxs River.

Mine water from Angus Place and Springvale is treated in the RO water treatment plant and transferred to Mount Piper Power Station for beneficial reuse. Licensed discharges from Western Coal Services remain an influencing factor on catchment EC during times of low streamflow within Coxs River (Springvale Coal Pty Limited 2023). The EC trends at monitoring location Coxs River (Delta Site) downstream of Lake Wallace between January 2019 and December 2023 is presented in Figure 4.4. As shown in Figure 4.4, EC concentrations remain above the ANZG (2018) DGV of 350 µS/cm, however fluctuations are present, reportedly associated with streamflow conditions. This is evidenced by the decrease in EC recorded during the wet periods of 2021 and 2022.



Source: Springvale Coal Pty Limited 2023

Figure 4.4 ***LDP009 Coxs River (Delta site) EC monitoring***

4.5.2 Wangcol Creek and Pipers Flat Creek

Water quality monitoring data for Wangcol Creek and Pipers Flat Creek collected during 2023 were obtained from the 2023 Annual Review for Western Coal Services and Lidsdale Siding (Springvale Coal Pty Ltd 2024a and Ivanhoe Coal Pty Ltd 2024 respectively). Average results reported during 2023 at key locations on Wangcol Creek and Pipers Flat Creek and are presented in Table 4.2. The monitoring locations are presented in Figure 4.6 and Figure 4.7 respectively.

Table 4.2 ***Water quality summary Wangcol Creek and Pipers Flat Creek 2023***

Analyte	Unit	ANZECC (2000) guideline values	Wangcol Creek average result (Springvale Coal Pty Ltd 2024a)		Pipers Flat Creek average result (Ivanhoe Coal Pty Ltd 2024)	
			Wangcol Creek gauge	Wangcol Creek Far DS	Wallerawang Sewage Treatment Plant MP1	Pipers Flat Creek D/S
pH	pH units	6.5 – 8.0	7.1	7.1	7.6	7.9
Total Suspended Solids (TSS)	mg/L	-	7	6	23	8
Electrical conductivity (EC)	µS/cm	350	1837	1851	639	619
Oil and grease	mg/L	-	<5	<5	<5	<5
Turbidity	NTU	25	6.8	4.4	79.5	9.6

Note: results highlighted in grey indicate the average result exceeded the ANZECC (2000) guideline value for upland rivers.

As shown in Table 4.2, pH results reported during 2023 along the Wangcol Creek tributary of Coxs River were circumneutral, while electrical conductivity (EC) results were slightly brackish. TSS and turbidity results were recorded below the ANZECC (2000) guideline value of 25 Nephelometric turbidity unit (NTU). While no guideline value exists for oil and grease, the analysed sample of oil and grease constituents were less than the limit of reporting assessable by the laboratory.

Water quality sampling results obtained for Pipers Flat Creek show similar circumneutral to slightly alkaline pH, and within the ANZECC (2000) guideline value range. EC was fresher than recorded in Wangcol Creek, however above the ANZECC (2000) guideline value. Turbidity results recorded downstream of the Wallerawang Sewage Treatment Plant (MP1) showed on average more elevated results than those recorded at the Pipers Flat Creek D/S site and the Wangcol Creek sites, recorded above the ANZECC (2000) guideline value.

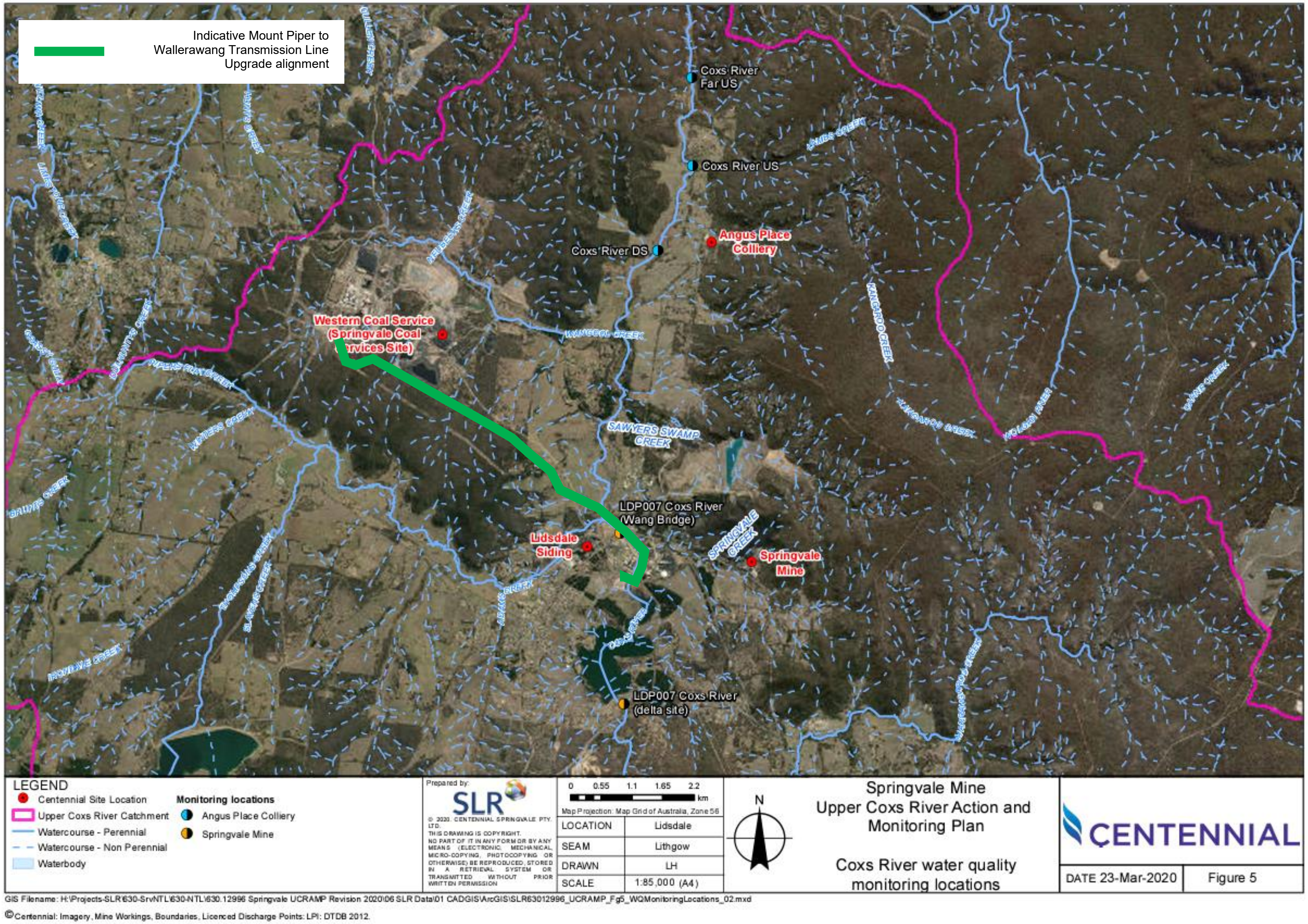


Figure 4.5 Coxs River water quality monitoring locations (Springvale Coal Pty Ltd 2023, GHD mark-up)

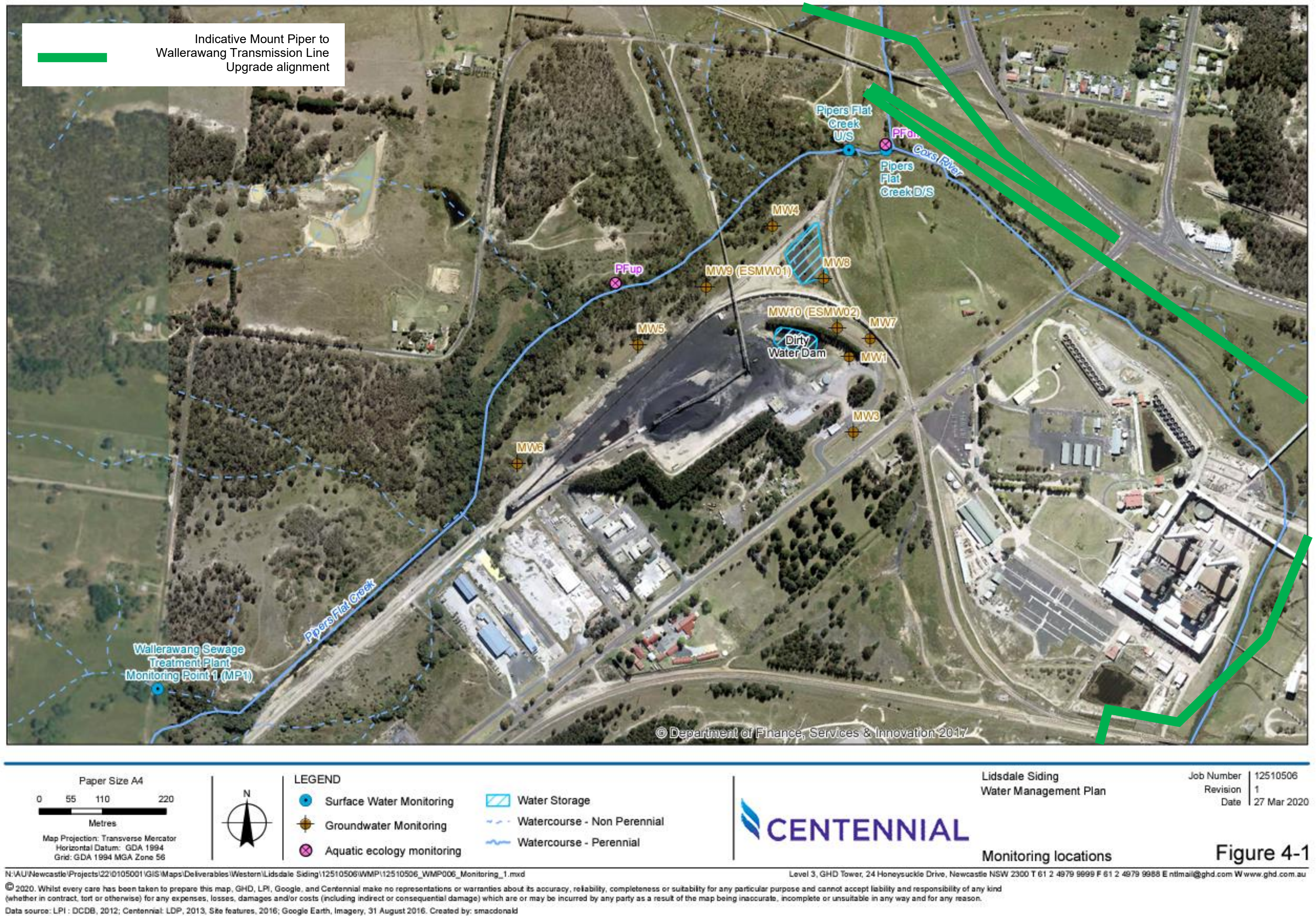


Figure 4.6 Lidsdale Siding and Pipers Flat Creek water quality monitoring locations (Ivanhoe Coal Pty Ltd 2022, GHD mark-up)

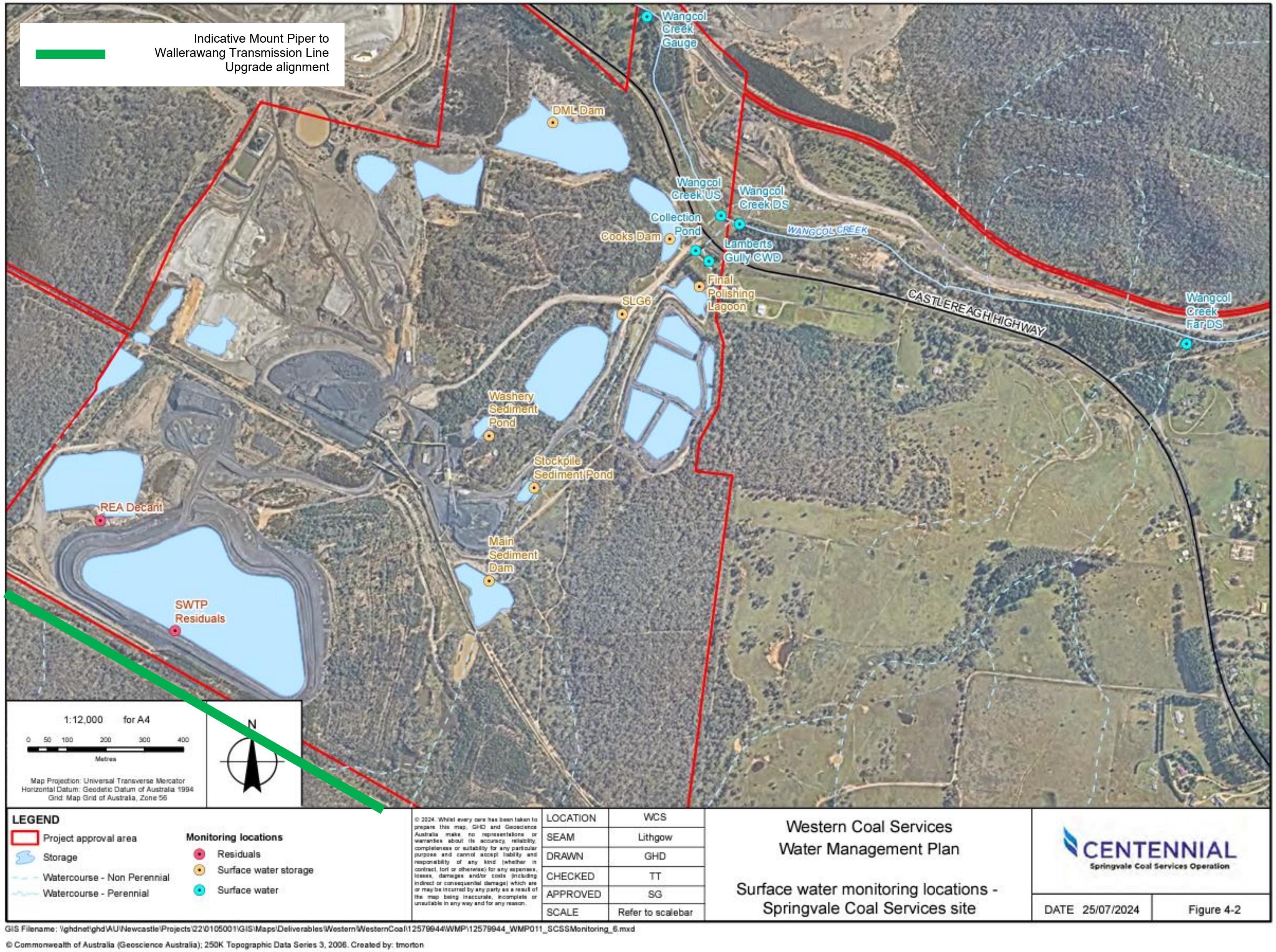


Figure 4.7 Western Coal Services and Wangcol Creek water quality monitoring locations (Springvale Coal Pty Ltd 2024b. GHD mark-up)

4.6 Soils and geology

4.6.1 Soils

A review of published soil mapping within the vicinity of the project footprint has been undertaken based on soil landscape mapping (NSW DCCEEW, 2024) and Australian Soil Classification (ASC) mapping (eSpade v2.2, NSW Environment and Heritage (2023), eSpade v2.2 (nsw.gov.au) accessed November 2023) is provided in Table 4.3 and Figure 4.8.

The project footprint traverses the soil landscapes of Lithgow, Cullen Bullen, Pipers Flat, Wollangambe, Hassans Walls and areas of disturbed terrain. In the vicinity of the Mount Piper substation and the ridgeline of the Gardens of Stone SCA, Cullen Bullen and Wollangambe soils may be present, dominated by kurosols and rudosols.

To the south-east along the flats of Pipers Flat Creek and the Coxs River, the project footprint traverses the soil landscapes of Pipers Flat Creek, Cullen Bullen, Lithgow and areas of disturbed terrain. Pipers Flat soil landscape is comprised of erodible alluvial soils including, leached loams, soloths, and gleyed podzolic soils, which may be high in nutrient content.

In the vicinity of the Coxs River and the Wallerawang 330 kV substation, in areas mapped as the Lithgow and Cullen Bullen soil landscapes, moderately deep to deep, solods or yellow solodic/podzolic soils high in organic matter may be present. These soils are hard setting with high run off potential. The potential for high aluminium toxicity is also noted.

Table 4.3 Relevant soil landscapes within the project footprint

Soil Landscape	Soil attributes
Lithgow (8931 li)	Landscape: flat to undulating rises and broad valley floors on Illawarra Coal Measures and the Berry Formation. Local relief to 20 m. Slopes <10%. Elevation approximately 800 – 1 000 m. Localised rock outcrop. Extensively cleared open-forest and open-woodland Soils: moderately deep (<120 cm) Red Podzolic Soils (Dr3.41) and Yellow Podzolic Soils (Dy2.11, Dy3.11) and Yellow Leached Earths (Gn2.34) on upper slopes and well-drained areas. Moderately deep to deep (>170 cm), Solods/yellow Solodic Soils (Dy2.41, Dy3.41) on lower slopes and in areas of poor drainage. Limitations: hard setting topsoils, high run-on, localised Mine Subsidence District, localised rock fall hazard, localised high potential aluminium toxicity. Erosion: Moderate gully erosion is evident along some drainage lines. Sheet erosion is occasionally present and, where severe, topsoil materials may be completely eroded.
Hassans Walls (8931hw)	Landscape: cliffs derived from Narrabeen Group sandstones and steep colluvial talus sideslopes developed over the Illawarra Coal Measures and the Shoalhaven Group. Local relief >100 m, slopes mostly >40%, elevation 280 ‐ 1 000 m. Open-forest and open-woodland. Soils: shallow (<30 cm) discontinuous Lithosols/ Siliceous Sands (Uc1.21, Uc1.24) on small rocky ledges on cliffs; moderately deep stony Lithosols/Siliceous Sands (Uc1.2, Uc5.11) on upper slopes and recently deposited talus; moderately deep (>80 cm) Yellow Podzolic Soils (Dy4.11, Dy5.11) and Brown Podzolic Soils (Db4.11) on lower slopes; shallow (<70 cm) Sands/Lithosols (Uc1.2) along narrow steep deeply incised drainage lines and moderately deep (70 ‐ 150 cm) Sands/Lithosols (Uc1.2, Uc5.11) along narrow drainage flats. Limitations: severe rock fall hazard, steep slopes, extreme water erosion hazard, mass movement hazard, severe foundation hazard, rock outcrop and localised shallow soils, high run-on, localised noncohesive soils, mine subsidence district. Erosion: Severe sheet erosion and rock fall occur throughout the landscape. Rock fall may continue into adjacent landscapes.

Soil Landscape	Soil attributes
Cullen Bullen (8931 cb)	Landscape: rolling low hills and rises on Illawarra Coal Measures and the Berry Formation. Slopes 10 – 25%, local relief <50 m, elevation 550 – 1050 m. Localised rock outcrop occurs as small isolated low scarps (<5 m). Extensively cleared open-woodland and open-forest. Soils: shallow to moderately deep (<100 cm) Yellow Podzolic Soils (Dy2.41, Dy2.51) and Yellow Earths (Gn2.21, Gn3.71, Gn3.84) on crests; moderately deep (<100 cm) Yellow Podzolic Soils (Dy5.21), Soloths (Dy3.31, Dy3.41) and Yellow Leached Earths (Gn2.34, Gn3.84) on upper and mid slopes. Moderately deep to deep (50 – 150 cm) yellow Solodic Soils (Dy2.32, Dy2.42, Dy4.42, Dy5.42) and Yellow Podzolic Soils (Dy5.21) on lower slopes near and along narrow (<20 m) drainage lines. Shallow (<80 cm) Yellow Earths (Gn2.21, Gn3.71) and Lithosols (Uc1.24) associated with low scarps. Limitations: hardsetting topsoils, high water erosion hazard, localised mine subsidence district, high run-on, rock outcrop, localised rock fall hazard and localised high foundation hazard Erosion: Moderate gully erosion is evident along some drainage depressions. Minor sheet erosion is common where ground cover has been disturbed by clearing. Extensive severe sheet and rill erosion have occurred on isolated steeper slopes—e.g., west of Wallerawang sewage works.
Wollangambe (8931 wo)	Landscape: rounded convex crests and moderately to steeply inclined side slopes on Narrabeen Group sandstones. Local relief to 100 m. Slopes usually 600 m. Localised rock outcrop is common including broken scarps and small rock edges and cliffs (<25m). Largely uncleared open-woodland and open-forest. Soils: shallow (<30 cm) Siliceous Sands/Lithosols (Uc1.21, Uc1.24), Earthy Sands (Uc5.21, Uc5.22) and Yellow Earths (Gn2.21) on crests; moderately deep (<100 cm) Earthy Sands (Uc5.21, Uc5.22), Yellow Earths (Gn2.21) and Red Earths (Gn2.11) on side slopes; moderately deep (<120 cm) Yellow Podzolic Soils (Dy5.11) and Gleyed Podzolic Soils (Dg3.1, Dg4.11) developed over shale lenses; shallow (<50 cm) Siliceous Sands/Lithosols (Uc1.21, Uc1.24) on small rock ledges and low broken scarps. Limitations: high to severe water erosion hazard, steep slopes, shallow soils, localised rock fall hazard, localised rock outcrop, low soil fertility Erosion: Moderate sheet erosion is evident over most of this landscape. The landscape is particularly susceptible to sheet erosion following bushfire or clearing. Severe rill erosion and sheet erosion are commonplace along poorly designed access tracks.
Pipers Flat (8931 pf)	Landscape: level to very gently undulating drainage depressions and floodplains on recent alluvium overlying the Berry Formation and Illawarra Coal Measures. Local relief <20 m, slopes <5%, elevation about 800 - 1 000 m. Extensively cleared open woodland. Soils: moderately deep to deep (>100 cm) Grey brown Alluvial Soils, Leached Loams (Um2.22), Soloths (Dy3.11, Dy3.41), and Gleyed Podzolic Soils (Dg4.11). Limitations: high water tables and seasonal waterlogging, high run-on, high foundation hazard. Erosion: Gully erosion <1.5 m deep is evident throughout the landscape particularly along most drainage lines. Severe stream bank erosion common on drainage lines.
Disturbed Terrain (8931 xx)	Landscape: occurs within other landscapes and is mapped as xx. Varies from level plains to undulating terrain and has been disturbed by human activity to a depth of at least 100 cm. The original soil has been removed, greatly disturbed or buried. Most of these areas have been levelled to slopes of <5%. Landfill includes a wide variety of soil, rock, building and waste material. The original vegetation has been completely cleared. Limitations: are dependent on nature of fill material and may include mass movement hazard (subsidence), soil impermeability leading to poor drainage, low fertility and toxic material. Care must be taken when these sites are developed. A survey at a suitable scale as well as geotechnical analysis should be undertaken. Advice from local councils should be sought concerning individual areas of disturbed terrain. Erosion: Erosion varies greatly according to site characteristics. Usually sheet and rill erosion occur on exposed soil batters in quarries. Landfill areas are usually flat, topsoiled and stabilised by ground cover and consequently have few erosion problems.

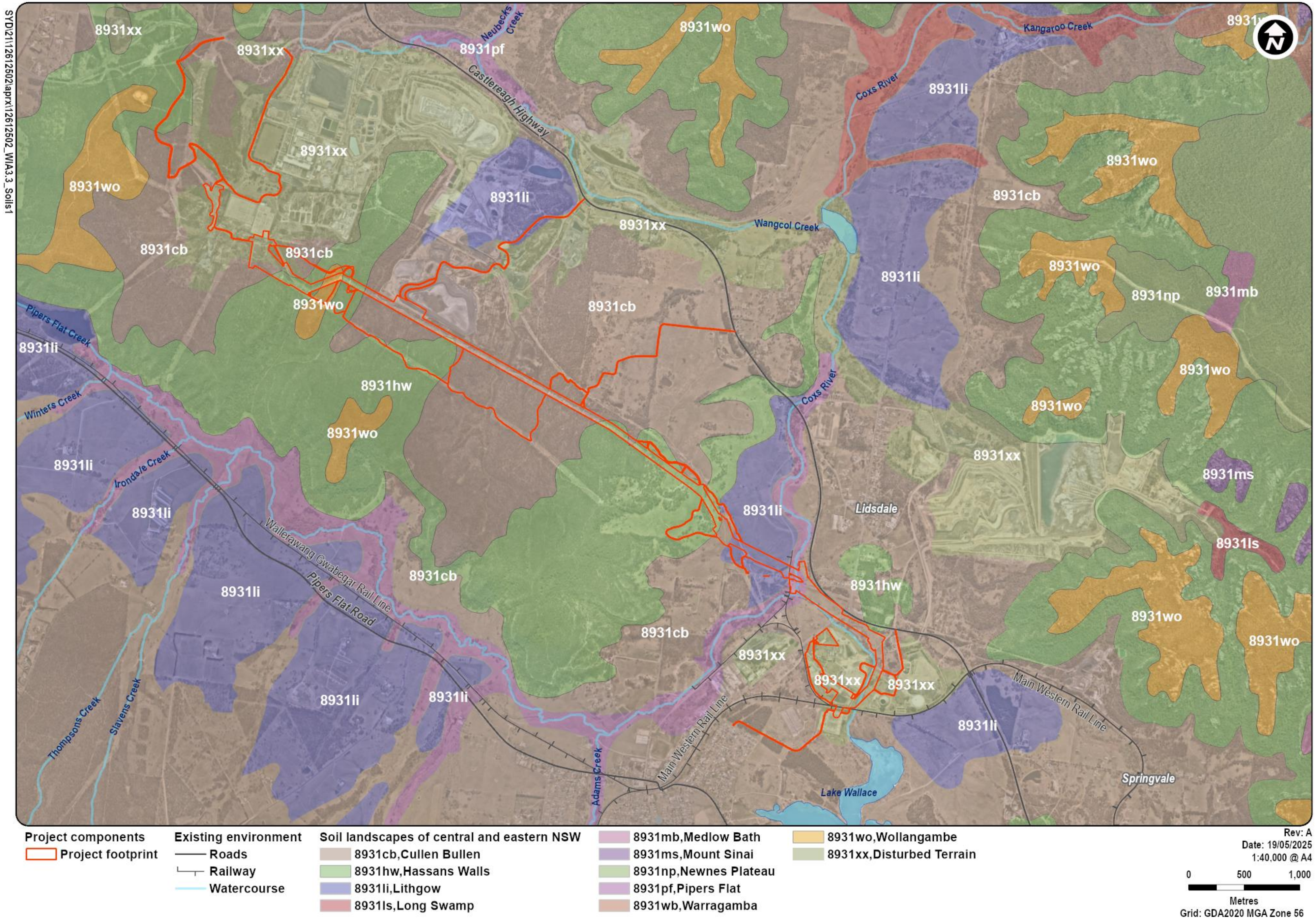


Figure 4.8 *Soil landscapes in the study area*

4.6.2 Geology

The project footprint is located on the western edge of the Sydney basin. The Sydney Basin contains rocks of Permian and Triassic age. The surface geology at the project footprint has been obtained from *Western Coalfield Regional Geology (southern part) 1:100,000 map* (Yoo, 1992) and the *NSW Seamless Geology Version 2.3 dataset* (NSW Government 2024) and is shown in Figure 4.9.

The majority of the site is underlain by Permian aged Illawarra Coal Measures. The Illawarra Coal Measures consists of various coal seams with layers of interburden consisting of sandstone, claystone, mudstone, siltstone and tuff. Historic mining of the Illawarra Coal Measures has occurred at Centennial Springvale Coal Services facility. The Illawarra Coal Measures are underlain by Permian aged Berry Siltstone. Permian aged Berry Siltstone outcrops within the eastern portion of the project footprint. Quaternary aged alluvium is mapped within the eastern portion of the project footprint. The alluvium is associated with Coxs River, Piper Flat Creek and Lake Wallace.

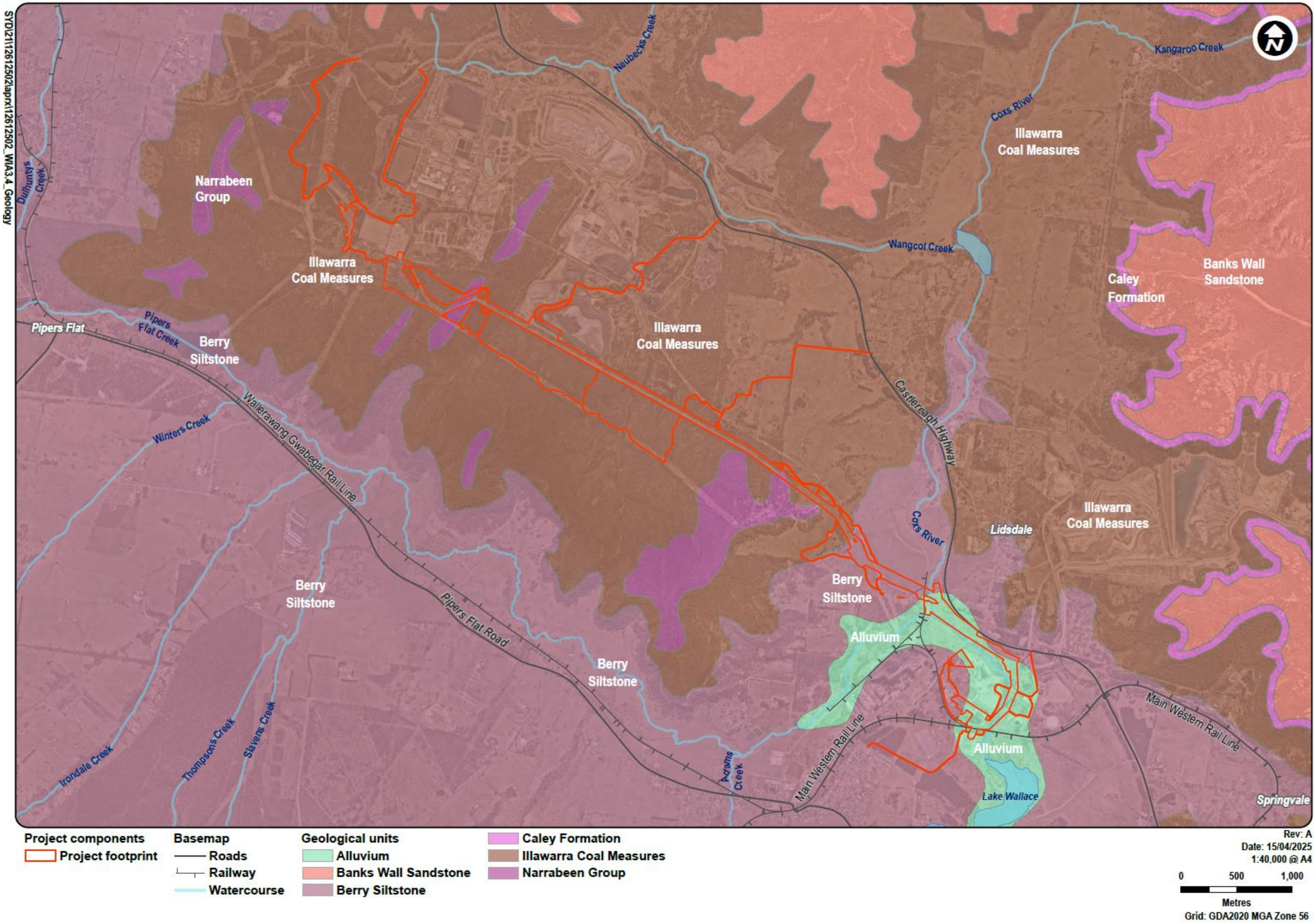


Figure 4.9 Surface geology in the study area

4.7 Hydrogeology

4.7.1 Receptors

Landholder bores

A search of the *Australian Groundwater Explorer* (BoM 2024a) and *WaterNSW Real Time Data Portal* (WaterNSW 2024c) was undertaken to identify registered bores within 1 km of the project footprint. Of the 61 bores identified, the majority (55) were classified as monitoring bores, two were classified as domestic, two classified as test bores, one classified as domestic, stock and irrigation and one bore was classified as industrial. The majority of the monitoring bores are associated with Mount Piper Power Station. The locations of these bores are shown in Figure 4.10 to Figure 4.12, while a summary of bore details is shown in Appendix B.

Reported yields varied from 18.19 L/s to 0.06 L/s. Four bores had a yield less than 1 L/s, seven bores had a yield between 1 L/s to 2 L/s, one bore having a yield greater than 5 L/s. The remaining 49 bores had no yield reported. Groundwater was typically encountered at depths greater than 3 m.

Bores GW115565, GW115566 and GW115625 are located within the project footprint. These bores are all registered as monitoring bores. Bore GW101461 is the closest registered stock and domestic bore to the project footprint and is located approximately 440 m north of the project footprint and approximately 500 m from the transmission line.

Groundwater dependent ecosystems

The potential dependence or interaction of ecosystems within the study area with groundwater was assessed by searching the Australian Bureau of Meteorology's (BoM) Groundwater Dependent Ecosystem (GDE) Atlas (BoM, 2024b). Both aquatic and terrestrial GDEs were assessed within 5 km of the project footprint. Potential GDEs are shown in Figure 4.13.

The GDE atlas indicates there are areas of low, medium and high potential terrestrial GDEs from regional studies within 5 km of the project. The closest high potential terrestrial GDE is mapped within the project footprint. The GDE atlas indicated there are waterways that are mapped as moderate and high potential aquatic GDEs within 5 km of the site, including the Coxs River, located within the project footprint and a number of waterways located south and south-west of the project footprint. Table 4.4 below outlines the mapped potential aquatic GDEs. There is low potential of GDEs being present within existing cleared easements.

Table 4.4 Potential aquatic GDEs (BoM, 2024)

Waterway	Potential GDE (low, moderate, or high)	Location relative to site
Coxs River	High, moderate	Within the project footprint
Adams Creek	Moderate	Approximately 1.5 km south of project footprint
Slavens Creek	Moderate	Approximately 4 km south-west of project footprint
Thompsons Creek	High	Approximately 4 km south-west of project footprint
Irondale Creek	High	Approximately 3 km south-west of project footprint
Winters Creek	Moderate	Approximately 2.5 km south-west of project footprint
Pipers Flat Creek	High, moderate	Approximately 2.5 km south-west of project footprint

The WSP for the Greater Metropolitan Region Groundwater Sources 2023 was also reviewed to identify high priority GDEs within 5 km of the project footprint. The review identified a high priority karst environment GDE at Portland, located approximately 3.5 km west of the project footprint.

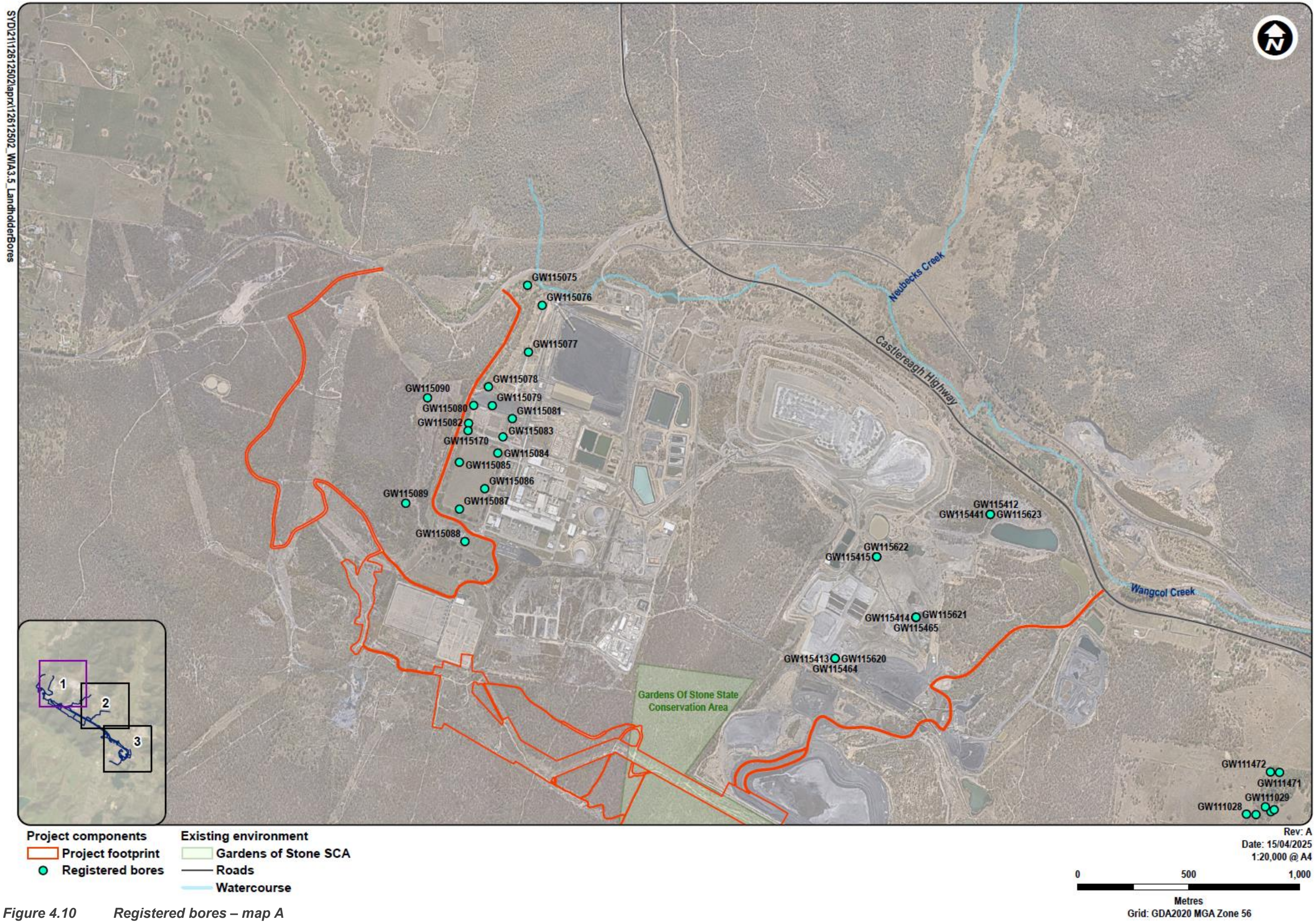


Figure 4.10 Registered bores – map A

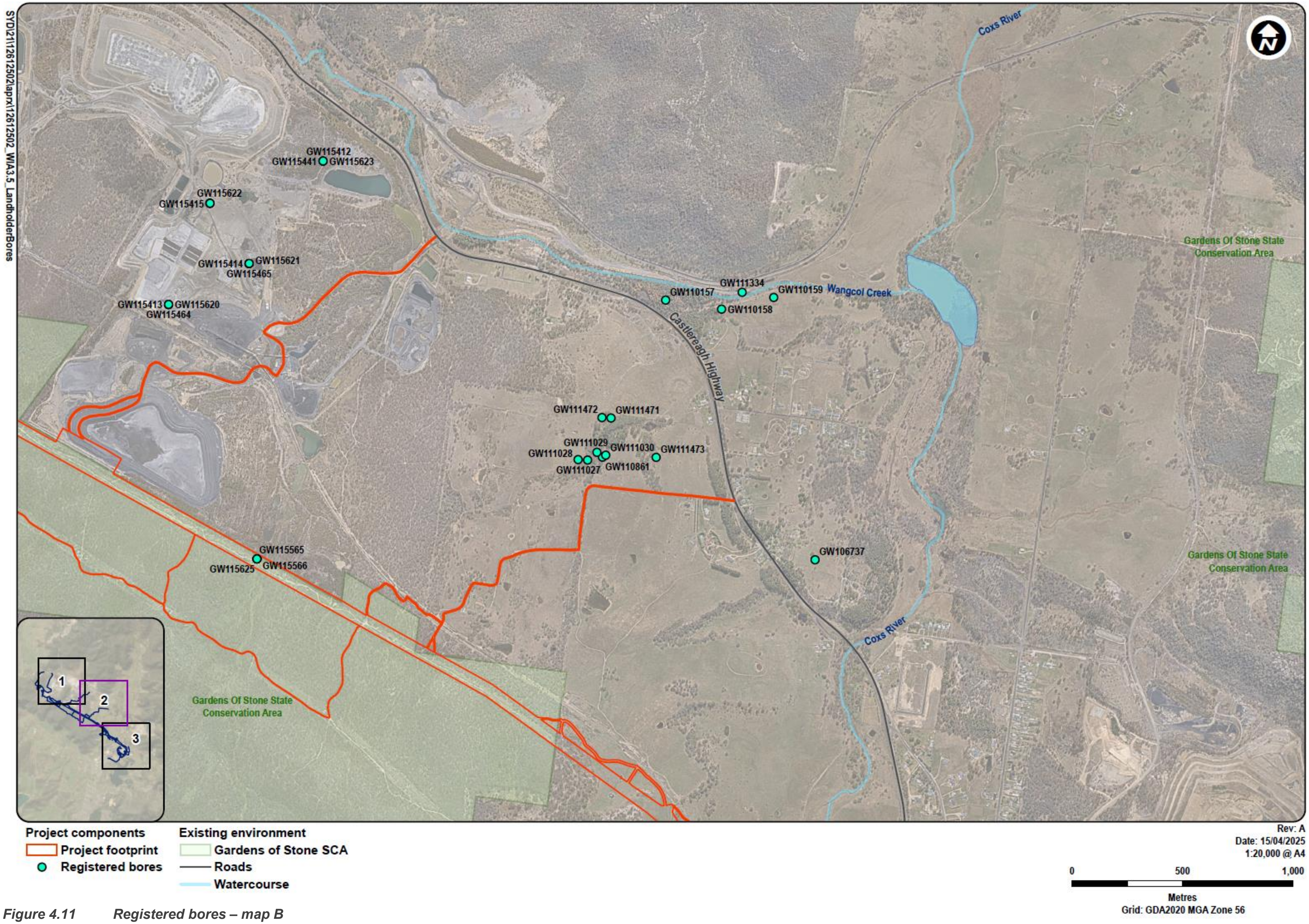


Figure 4.11 Registered bores – map B

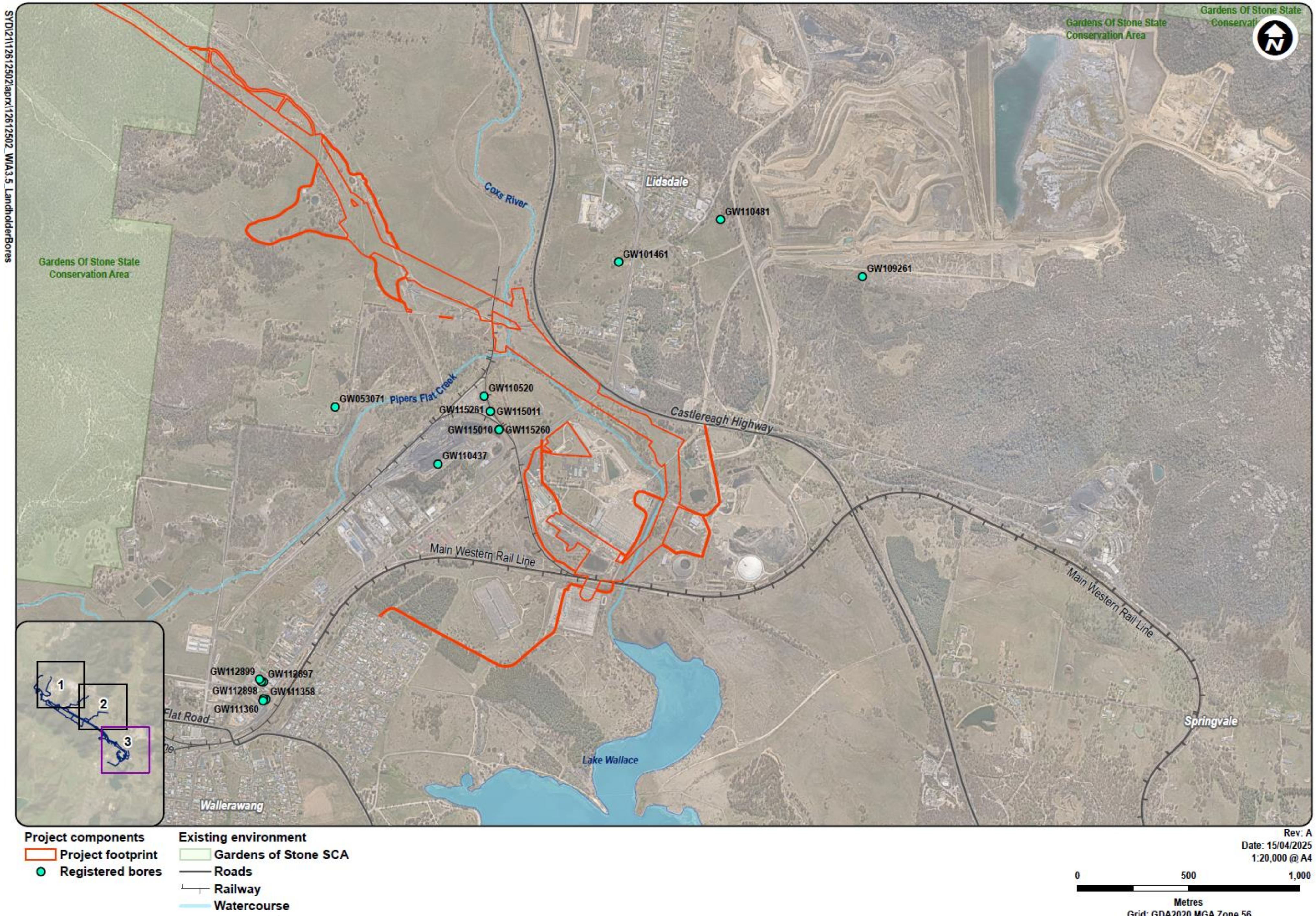


Figure 4.12 Registered bores – map C

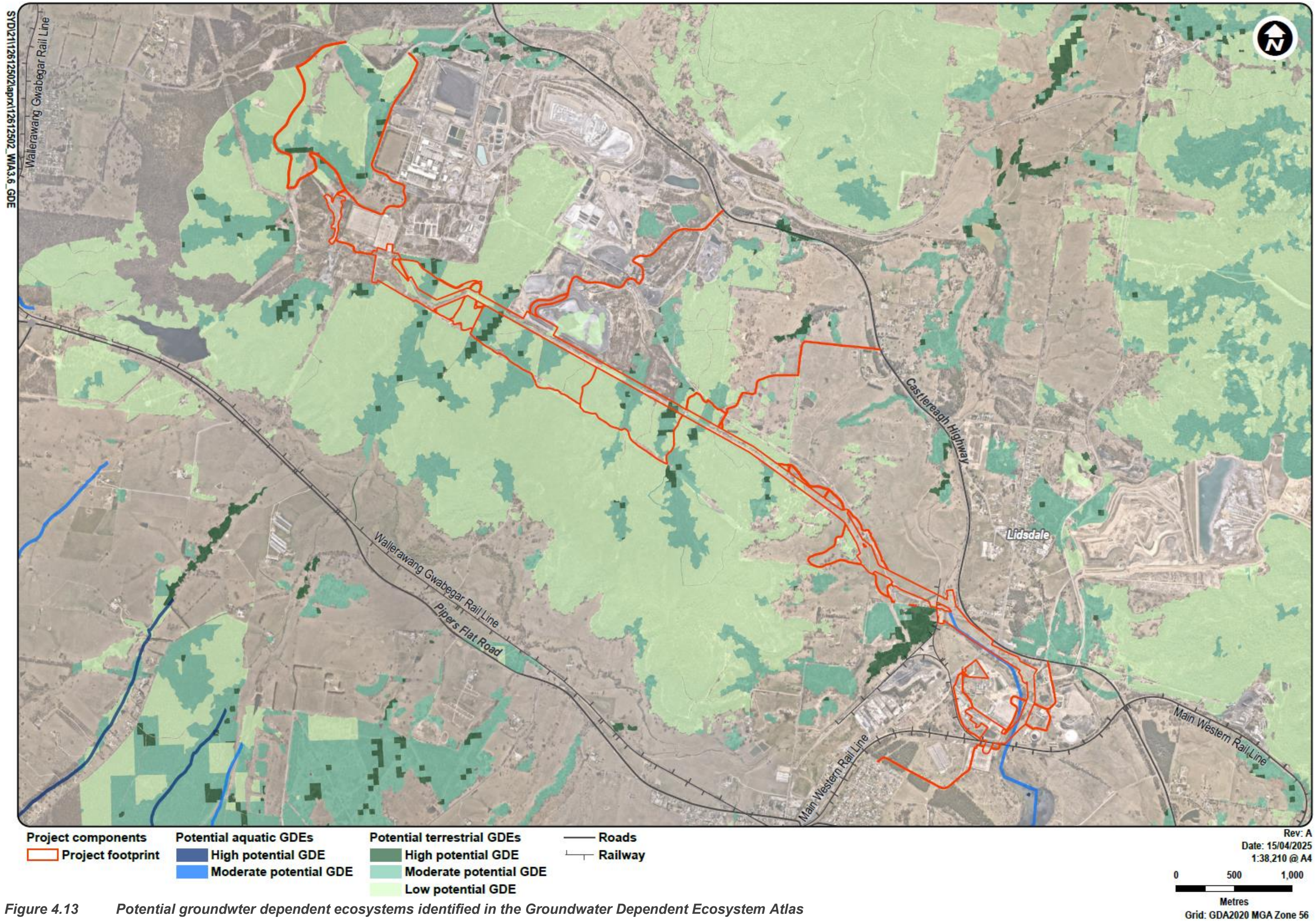


Figure 4.13 Potential groundwter dependent ecosystems identified in the Groundwater Dependent Ecosystem Atlas

4.7.2 Groundwater monitoring data

Publicly available groundwater monitoring data in the vicinity of the site was reviewed and indicates that groundwater quality is variable across the study area, likely due to the variability in geology including fill, alluvium and fractured rock of mudstone, sandstone and coal.

Mount Piper Power Station

Groundwater monitoring data at Mount Piper Power Station has been obtained from *Environmental Monitoring Report - Water Management and Monitoring 2023/24* (ERM, 2024). ERM identified that monitoring bores MPGM4/D4 and MPGM5/D5 are located upgradient of ash emplacement activities at Mount Piper power station. As these bores are unlikely to be impacted by ash emplacement activities, they have been reviewed as part of this assessment as they are reflective of existing conditions at the power station site.

Monitoring data at MPGM4/D4 and MPGM5/D5 has been assessed by ERM (2024). Groundwater levels were recorded between July 2022 and April 2024, noting a gap in reported data between October 2021 and October 2022. The recorded groundwater levels at MPGM/D4 were generally stable, ranging between 918 – 919 m AHD. Groundwater levels at MPGM4/D5 ranged between 916 – 919 m AHD and observed a spike in elevation (from 916.5 to 919 m AHD) due to suspected high rainfall events early in 2024. The exact depths to groundwater in these locations are unable to be confirmed based on available information.

ERM (2024) reported groundwater quality between 12/07/2023 and 17/04/2024. A summary of the recorded data is as follows:

– At MPGM4/D4, pH ranged from 3.42 to 3.48 pH units and EC ranged from 640 to 720 µS/cm. This indicates that groundwater within the fill at Mount Piper Power Station is acidic and fresh.
– At MPGM5/D5, pH ranged from 5.87 to 5.9 pH units and EC ranged from 1160 to 1260 µS/cm. This indicates that groundwater within the mudstone, sandstone and coal at Mount Piper Power Station is slightly acidic and fresh.

Groundwater at the Mount Piper Power Station is more acidic than surface water within Upper Coxs River, Wangcol Creek and Pipers Flat Creek presented in section 4.5. Groundwater EC at Mount Piper Power Station is within the observed range of surface water EC presented in section 4.5.

Figure 4.14 shows the location of monitoring bores MPGM4/D4 and MPGM4/D5, circled in yellow, within the Mount Piper Power Station site (ERM 2024).

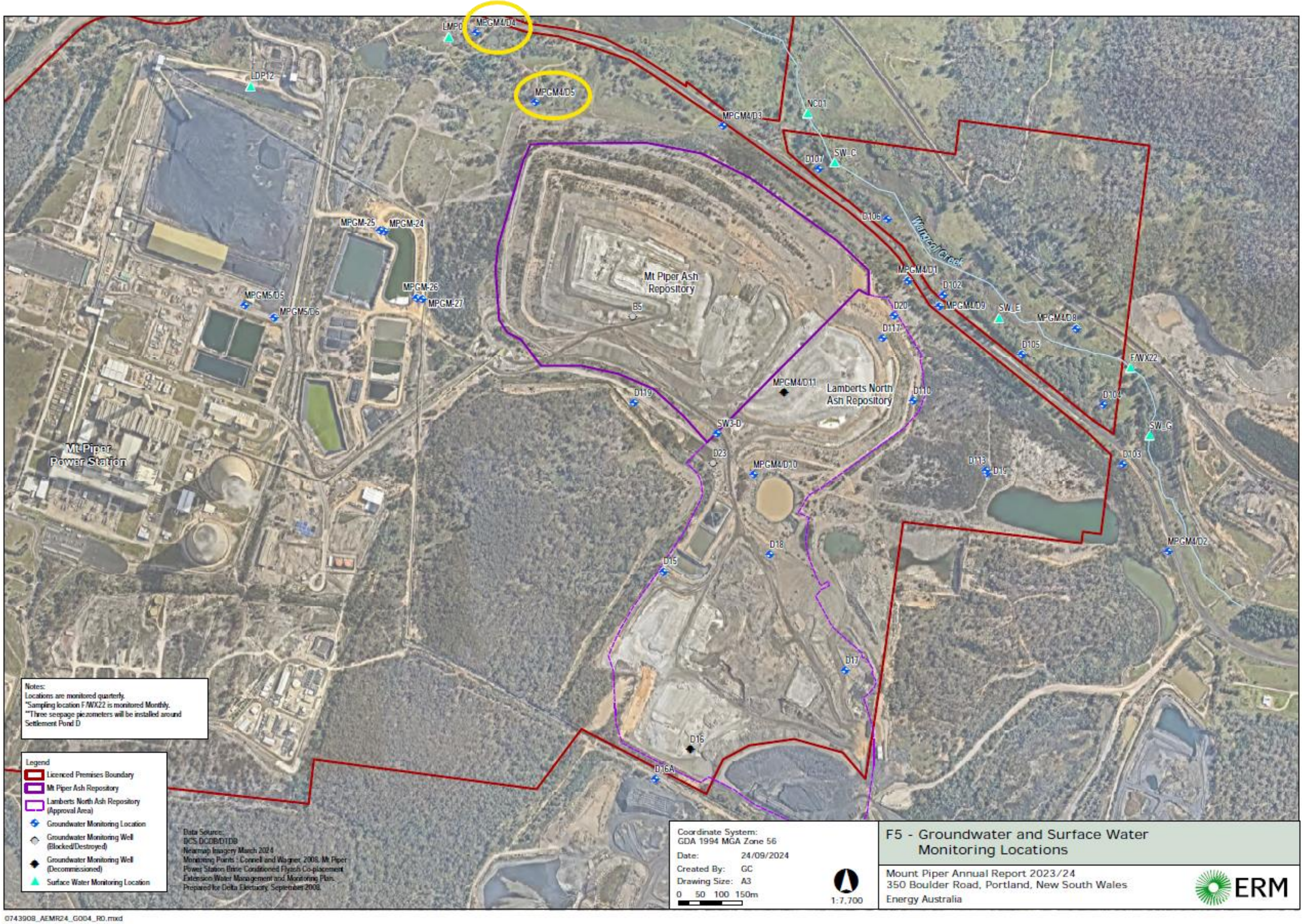


Figure 4.14 Mount Piper power station monitoring bore locations (ERM 2024, GHD markup)

Springvale Coal Services Facility

Groundwater monitoring data was obtained from Western Coal Services 2023 Annual Review (Springvale Coal, 2024a). Review of the groundwater monitoring network (Springvale Coal, 2024b) indicated that monitoring bore BH07 is located adjacent to the project footprint. The location of BH07 is shown in Figure 4.15.

Monitoring bore BH07 is located upgradient of the SCSS (Springvale Coal, 2024b). Therefore, groundwater monitoring data at BH07 provides an indication of groundwater levels and groundwater quality at the project footprint.

Groundwater levels and quality at BH07 were recorded each quarter in 2023. Recorded groundwater levels in metres below ground level from Q1 to Q4 are recorded to be 14.28, 12.46, 14.02 and 12.46 respectively.

At BH07, observed pH varied from 5.6 to 7.0 pH units and EC varied from 1430 to 2441 µS/cm indicating slightly acidic to neutral and fresh to slightly brackish groundwater.

Groundwater at BH07 varies from more acidic to within the observed range of pH of surface water within Upper Coxs River, Wangcol Creek and Pipers Flat Creek presented in section 4.5. The maximum EC observed at BH07 exceeds the maximum observed EC within Upper Coxs River, Wangcol Creek and Pipers Flat Creek presented in section 4.5.

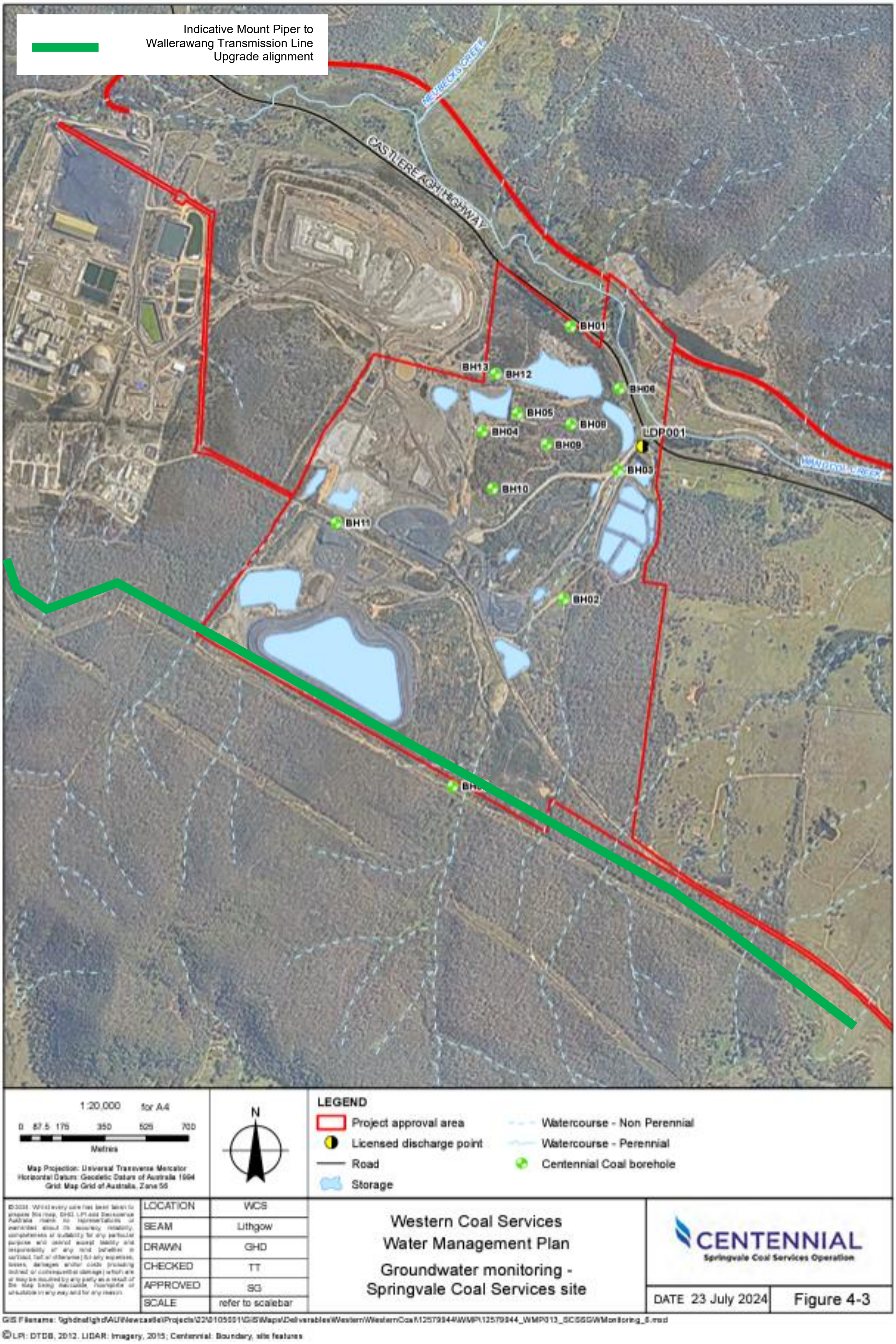


Figure 4.15 Western Coal Services groundwater monitoring bore network (Springvale Coal, 2024b, GHD mark-up)

Lidsdale Siding

Lidsdale Siding, operated by Ivanhoe Coal Pty Ltd a subsidiary of Centennial Coal, is an operational coal storage and rail loading facility in Wallerawang. Lidsdale Siding is located west of the former (now decommissioned) Wallerawang Power Station and approximately 300 m south of the proposed transmission line. Centennial Coal maintains a groundwater monitoring network at Lidsdale Siding (GHD, 2022). The monitoring network is presented in Figure 4.6.

Lidsdale Siding monitoring bores MW4, MW7 and MW8 are closest to the project transmission line. Of these bores, MW4 is located outside the operations area of Lidsdale Siding and therefore groundwater monitoring data at MW4 has been reviewed to characterise groundwater levels in the vicinity of Coxs River.

Groundwater monitoring data for MW4 has been obtained from the *Lidsdale Siding 2023 Annual Review* (Ivanhoe Coal, 2024). Monitoring data at MW4 indicates a groundwater level of 873.5 m AHD (i.e. 2.9 m below ground level).

At MW4, pH varies from 4 to 4.4 pH units and EC varies from 510 to 594 µS/cm. This indicates that alluvial groundwater quality at Lidsdale Siding is fresh and slightly acidic. Groundwater at MW4 is more acidic than surface water within Upper Coxs River, Wangcol Creek and Pipers Flat Creek presented in section 4.5. Groundwater EC at MW4 is within the observed range of surface water EC within Upper Coxs River, Wangcol Creek and Pipers Flat Creek presented in section 4.5.

Wallerawang 330 kV substation

Douglas Partners (2009) undertook a geotechnical investigation at the Wallerawang 330 kV substation site. The geotechnical investigations included the installation of four groundwater monitoring bores. The geotechnical investigation (Douglas Partners, 2009) identified that the substation is underlain by fill to a depth of 0.05 m to 0.15 m. The fill is underlain by natural soils that are highly variable in composition ranging from clays to silty sands to clayey gravels extending to a depth of 0.4 m to 6 m across the site. Bedrock underlies the natural soils. The weathered bedrock consists of conglomeratic sandstone.

Monitoring of groundwater levels was undertaken by Douglas Partners on 16 October 2009. Groundwater level monitoring data indicates that groundwater levels at the substation vary from 0.5 m below ground level (bgl) to 4.8 m bgl.

Table 4.5 Wallerawang 330 kV substation – monitoring bore details and groundwater levels

Bore	Bore depth (m)	Easting	Northing	Strata	Groundwater level – 16 October 2009 (m bgl)	Groundwater level – 16 October 2009 (m AHD)
BH1	6.6	228610	6299802	Clayey sandy silt, weathered siltstone and sandstone	4.8	874.7
BH7	5.8	228558	6299939	Sandstone, conglomeratic sandstone	0.5	874.2
BH22	5.5	228424	6299756	Conglomeratic sandstone	3.8	876.6
BH28	7.8	228604	6299882	Conglomeratic sandstone	3.5	873.0

5. Impact assessment

5.1 Riparian and waterfront land

A review of the potential impacts of construction and operation of the project with respect to riparian zones and waterfront land has been undertaken as depicted in Figure 5.1. Waterfront land is defined as all land within 40 m of the highest bank of the river, lake or estuary and includes the bed and bank of any river lake or estuary. Typical impacts to riparian zones were reviewed and include:

– Direct impacts, associated with works in riparian zones, including removal of riparian vegetation, channel bank disturbance or instream disturbance.
– Indirect impacts, associated with changes to soil, water quality or hydrologic regime which may impact the conditions required for riparian vegetation survival.

The potential impacts are discussed below.

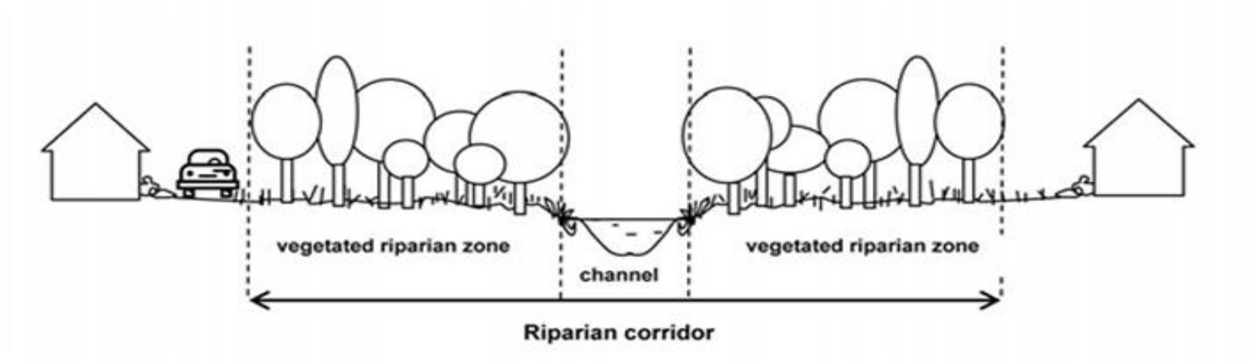


Figure 5.1 Riparian corridor and vegetated riparian zones (DPE 2022)

5.1.1 Construction

Construction activities have the potential to impact the riparian zones of the Coxs River, Wangcol Creek and Pipers Flat Creek, as identified on the *NSW Hydrography hydroline spatial dataset* (Spatial Services (DCS) 2025). The potential impacts to riparian zones associated with construction include:

– increased turbidity or suspended solids within the creeks through disturbance of the riparian zone vegetation and bed material
– the potential for leaks and spills from machinery and equipment damaging riparian zone vegetation
– interruption of the hydrologic regime through instream works.

Transmission structures and compounds

Where works on waterfront land are proposed, DPE (2022) recommends vegetated riparian zone (VRZ) distances from the top bank of the waterway, which vary depending on the Strahler stream order defined for the waterway (up to a maximum of 40 m from the top of bank or high-water line). To identify potential areas where impact to riparian zones and waterfront land may occur, a review of the proposed distances of the transmission structures and other infrastructure from the Coxs River, Wangcol Creek and Pipers Flat Creek has been undertaken. Based on Nearmap (2024) aerial imagery and the *LiDAR digital elevation model* (NSW SS 2011), the top banks of these waterways were delineated and are shown in Figure 5.2.

Proposed transmission structures

A review of the proposed transmission structure locations (including construction benches, brake and winch sites, and construction compounds) in proximity to the nearest riparian zone is documented in Table 5.1, with transmission structure locations identified within VRZ's highlighted in orange.

Table 5.1 Transmission structure locations and proximity to nearest riparian zones

Structure ID	Waterway	Stream order	Bank visible	Required offset distance	Vegetation present in VRZ	Approx. distance of transmission structure from top bank	Transmission structure located in VRZ?	Approx. distance of construction bench from top bank	Construction bench/ construction compound located in VRZ?
1C	Coxs River	6th	Yes	40m	Pasture/Grass	120m	No	95m	No
13A	Pipers Flat	3rd	No	30m	Pasture/Small shrubs	120m	No	85m	No
14A	Pipers Flat	3rd	No	30m	Grassland/Pasture	135m	No	90m	No
33A	Wangcol Creek	1st	No	10m	Thick Trees/Forest	180m	No	145m	No
2C	Coxs River	6th	Yes	40m	Pasture/Grass	20m	Yes	0m /up to top of bank	Yes
3C	Coxs River	6th	Yes	40m	Large Trees/ Shrubs	40m	No	10m	Yes
4C	Coxs River	6th	Yes	40m	Large Trees/ Shrubs	35m	Yes	0m /up to top of bank	Yes
5C	Coxs River	1st	No	40m	Sparse Large Trees/ Grassland	65m	No	20m	Yes
6C	Coxs River	6th	Yes	40m	Large Trees/Shrubs	55m	No	30m	Yes
7C	Coxs River	6th	Yes	40m	Large Trees/Shrubs	40m	No	10m	Yes
8C	Coxs River	6th	Yes	40m	Large Trees/Shrubs	20m	Yes	0m/up to top of bank	Yes
25C	Wangcol Creek	1st	Yes	10m	Large Trees/Shrubs	155m	No	115m	No
9D	Coxs River	6th	Yes	40m	Sparse Large Trees/ Grassland	65m	No	0m /up to top of bank	Yes
10D	Coxs River	5th	Yes	40m	Grassland/Pasture	40m	No	0m /up to top of bank	Yes
	Coxs River	2nd	Yes	20m	Grassland/Pasture	25m	No	0m /up to top of bank	Yes
11D	Piper's Flat	3rd	No	30m	Grassland/Pasture	80m	No	40m	No
12D	Pipers Flat	3rd	No	30m	Grassland/Pasture	5m	Yes	0m /up to top of bank	Yes
13D	Pipers Flat	3rd	Partial	30m	Grassland	165m	No	120m	No

Structure ID	Waterway	Stream order	Bank visible	Required offset distance	Vegetation present in VRZ	Approx. distance of transmission structure from top bank	Transmission structure located in VRZ?	Approx. distance of construction bench from top bank	Construction bench/ construction compound located in VRZ?
14D	Pipers Flat	1st	Yes	10m	Sparse Small trees/Pasture	30m	No	0m /up to top of bank	Yes
15D	Pipers Flat	1st	Yes	10m	Sparse Small trees/Pasture	190m	No	170m	No
16D	Pipers Flat	1st	Yes	10m	Sparse Small trees/Pasture	145m	No	70m	No
17D	Wangcol Creek	1st	Yes	10m	Bush	230m	No	180m	No
18D	Wangcol Creek	1st	Yes	10m	Thick Trees/Forest	165m	No	130m	No
19D	Wangcol Creek	2nd	Yes	20m	Thick Trees/Forest	70m	No	30m	No
20D	Wangcol Creek	1st	Yes	10m	Thick Trees/Forest	135m	No	100m	No
21D	Wangcol Creek	1st	Yes	10m	Thick Trees/Forest	150m	No	120m	No
22D	Wangcol Creek	1st	No	10m	Thick Trees/Forest	40m	No	5m	Yes
23D	Wangcol Creek	1st	No	10m	Thick Trees/Forest	235m	No	200m	No
24D	Wangcol Creek	2nd	Yes	20m	Thick Trees/Forest	155m	No	110m	No
25D	Wangcol Creek	2nd	No	20m	Thick Trees/Forest	75m	No	40m	No
26D	Wangcol Creek	1st	No	10m	Thick Trees/Forest	230m	No	200m	No
27D	Wangcol Creek	1st	No	10m	Thick Trees/Forest	65m	No	20m	No
28D	Wangcol Creek	1st	No	10m	Thick Trees/Forest	185m	No	145m	No
33A	Wangcol Creek	1st	No	10m	Thick Trees/Forest	180m	No	145m	No
30	Wangcol Creek	1st	Yes	10m	Thick Trees/Forest	205m	No	175m	No
Construction compound 1	Wangcol Creek	3rd	No	30m	Trees/scrub	N/A	NA	10m	Yes
Construction compound 2	Coxs River	6th	Yes	40m	Pasture/grass	NA	NA	70m	No
Construction compound 3	Coxs River	6th	Yes	40m	Pasture/grass	N/A	No	180m	No

For the majority of transmission structure locations, construction activities would be located outside of the riparian zones. As indicated in Table 5.1, TS2C, TS4C, TS8C and TS12D would be within the riparian zone.

Transmission structures (2C, 4C and 8C) are mapped within 40 m of the Coxs River, where the main channel is a 6th order stream. In these locations, there is limited existing riparian vegetation, with pasture and grass dominant and some remnant woody large trees and shrubs observable from the aerial. As these areas of the Coxs River are already disturbed (including clearing previously undertaken for the existing powerlines), no significant impacts to the riparian zone are anticipated.

Transmission structure 12D is within the riparian zone of a third order tributary of Pipers Flat Creek. As noted in Table 5.1, there is no visible bed or bank features within the vicinity of the hydro line with flows in the area anticipated to be categorised by overland flow. Accordingly, impacts to the riparian zone or waterway are considered unlikely.

As indicated in Table 5.1, works will be required up to the top of bank of waterways, particularly where existing infrastructure constrains available area (e.g. TS2C in the vicinity of the Coxs River). It is noted that the Mount Piper Power Station construction compound will be located within 10 m of a third order, unnamed tributary of Wangcol Creek. This tributary has been diverted to a concrete lined channel around the Mount Piper Power Station site and the Mount Piper 330 kV substation. Therefore, while works would be undertaken within the riparian zone, it is unlikely that riparian vegetation is supported by the channel. No filling of waterways or stream banks would be undertaken.

Areas where construction activities disturb the riparian zone would be rehabilitated following construction in accordance with the Rehabilitation Management Plan to ensure bank stability and minimise ecological impacts.

Erosion and sediment control measures for all transmission structure locations are recommended as mitigation measures, in accordance with *Landcom* (2004) and with consideration to *Controlled activities - Guidelines for instream works on waterfront land* (DPE 2022b) (refer to Section 6.1). The final size and position of construction benches and brake and winch sites would be refined during detailed design and construction planning, with consideration of waterways and riparian zones.

Decommissioning existing infrastructure

Minor excavation is required to remove redundant wooden pole transmission structures. The removal of redundant steel transmission structures would require demolition and excavation of concrete footings. Structures being removed are shown in yellow on Figure 5.2. The following steel transmission structures are being removed:

– TS27 is located approximately 200 m from 1st order tributary of Wangcol Creek. This structure is not located within the riparian zone.
– TS24 is located approximately 34 m from a 1st order stream of Wangcol Creek. This structure is not located within the riparian zone.
– TS21 is located approximately 30 m from a 2nd order unnamed tributary of Coxs River. This structure is not located within the riparian zone.
– TS9D is located approximately 35 m from 6th order Coxs River. This structure is located within the riparian zone (within 40 m of a waterway or waterway). Minor impacts to the riparian zone would occur during the removal of this structure.

Works in the riparian zone are required for the removal of TS9D. Review of aerial imagery indicates the vegetation surrounding the tower is pasture. Therefore, direct impacts to riparian vegetation would be negligible. All other transmission structures that are proposed to be removed are located outside of the riparian zone.

Erosion and sediment control measures for structures to be decommissioned would be in accordance with *Landcom* (2004) and with consideration to *Controlled activities - Guidelines for instream works on waterfront land* (DPE 2022b) (refer to section 6.1).

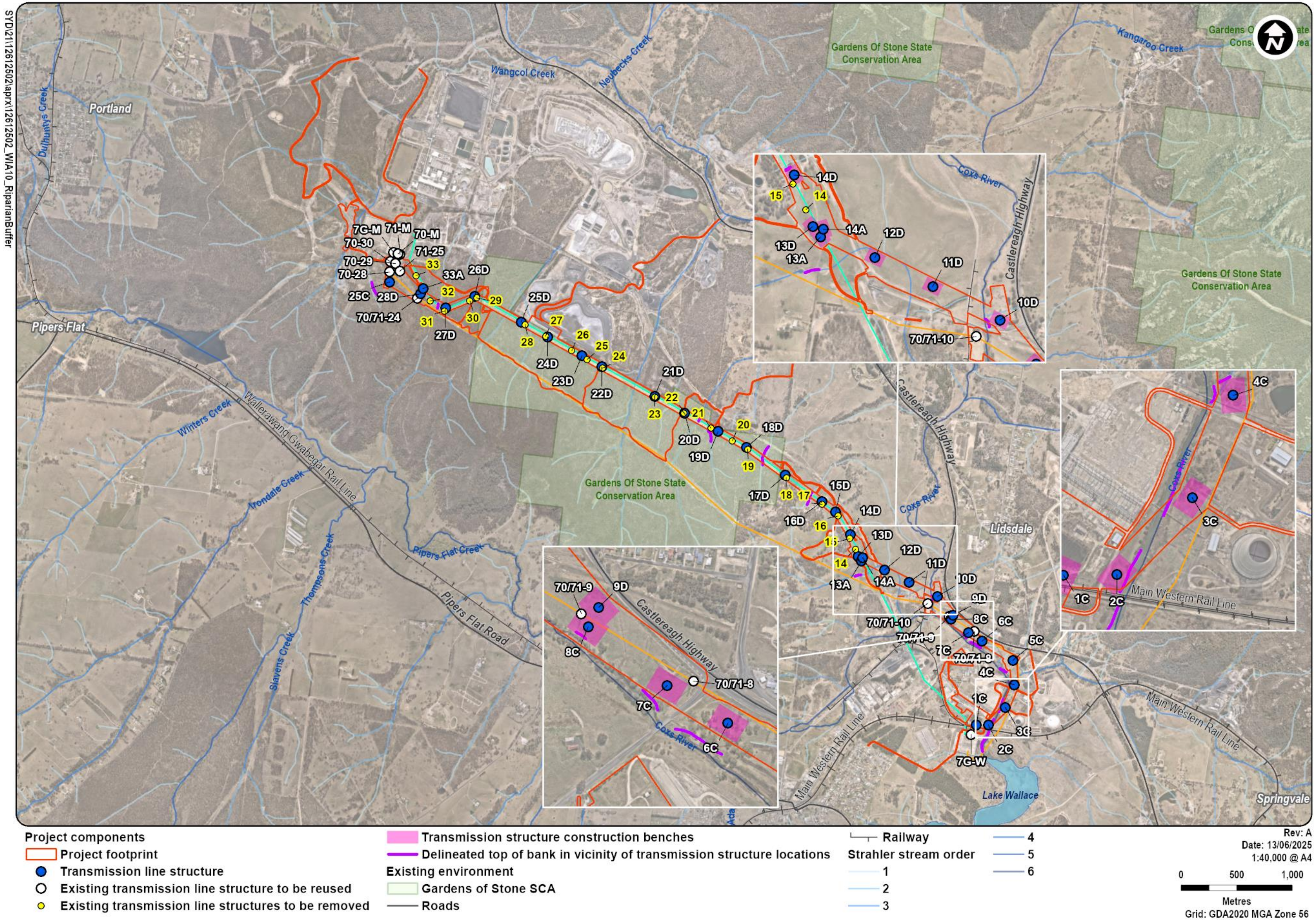


Figure 5.2 Riparian zones and waterways in proximity to the study area

Access tracks

Access track upgrades are proposed across a number of mapped waterways, ranging from first order to third order. Most of these waterway crossings of access tracks are ‘bed level’ crossings, excluding four ‘culvert’ waterway crossings (Figure 5.3). Two of these culvert waterway crossings are upgrades to existing culverts and two would be new culverts.

New waterway crossings

A new waterway crossing and access track is proposed on an unnamed, first order tributary of the Coxs River to allow access to TS10D and TS11D. Based on a site visit undertaken in December 2024, the tributary appears to have limited hydraulic connectivity to the Coxs River, with a railway embankment causing substantial ponding at a low topographic point. The waterway is a first order stream and is not considered Key Fish Habitat (refer to Technical Report 3 (Aquatic Ecology Impact Assessment). Design of the culvert crossing would be prepared during detailed design including consideration of inundation and ponding which was previously observed at this location. Dewatering from the terminating waterway and temporary instream works may be required to facilitate construction which is further discussed in section 5.6.1. Minor impacts to riparian vegetation would occur, however would be limited to the works area associated with the crossing itself, and would not impact the riparian vegetation of the Coxs River in this area, given the limited connectivity.

Another new crossing is proposed to facilitate access to transmission structures 5C and 6C. This crossing would intercept a saturated low-lying area located between the Coxs River and the Castlereagh Highway, however this area is not mapped as a waterway on the NSW Hydrography hydroline spatial dataset (Spatial Services (DCS) 2025). The proposed crossing is located near the riparian zone of an adjacent first order waterway of the Coxs River, with some potential riparian vegetation present based on a visual review of aerial imagery only with access to this property not available at the time of the assessment of this crossing. While there appears to be some low-lying riparian vegetation near the proposed culvert, vegetation appears to have been cleared for an existing informal access track.

At the proposed crossing locations, all disturbed areas would be revegetated to facilitate the stabilisation of the works area following construction in accordance with *Landcom* (2004) and consideration to the *Controlled activities - Guidelines for instream works on waterfront land* (DPE 2022b). This would not include any tall growing species that could encroach on the Vegetation Clearance Requirements of the transmission line.

On the above basis, no impacts to riparian and waterfront land associated with the construction of the new waterway crossings are anticipated.

Existing waterway crossings

A large portion of existing access tracks within the project footprint would be reused and upgraded for construction. Where these tracks include existing waterway crossings, these ‘bed level’ crossings generally do not exhibit classical waterway features (i.e. no identifiable bed and banks) and have limited to no riparian vegetation present. The riparian zones for these waterways were not identified as supporting key fish habitat and impacts were assessed to be minor and are described in Technical Report 3 - Aquatic Ecology Impact Assessment.

There are two waterway crossings consisting of existing culverts which are proposed to be replaced along an unsealed private access track extending from Karawatha Drive are required to allow vehicle access to transmission structures 18D and 19D. These proposed culvert upgrades would involve the replacement of the existing steel galvanised culverts with concrete culverts of similar dimensions. The proposed culvert replacement would occur within first and second order tributaries of Wangcol Creek. Limited to no riparian vegetation was observed for these tributaries at the two waterway crossings along the private access track off Karawatha Drive. Impacts associated with the replacement of the waterway crossings are not anticipated due to:

– replacement of the existing culverts with those of similar dimensions
– a lack of existing riparian vegetation in the immediate vicinity of the culverts, current disturbance and minor nature of waterways
– the nature of the existing disturbance (i.e. likely to be limited riparian vegetation associated with the agricultural land, the presence of the existing culvert)
– the relatively short construction period, allowing for construction staging outside of periods of forecast rainfall, and therefore streamflow
– low disturbance activities proposed as the culverts would be removed, the area desilted and new culvert placed to design levels.

All disturbance activities would be managed with consideration to the *Controlled Activities - Guidelines for Instream works* on waterfront land (DPE 2022b). Impacts associated with the use of existing waterway crossings or upgraded waterway crossings are not anticipated.

5.1.2 Operation

During operation, existing waterway crossings and those developed during the construction phase will be retained and used for maintenance of the transmission structures. The track crossings will likely only be used a few times a year and therefore would only be accessed infrequently by vehicles. Maintenance of access tracks and waterway crossings would occur in accordance with Transgrid's existing operational procedures to prevent rutting and erosion of road materials into the adjacent creeks. Operational impacts associated with the four towers located within waterfront land is not anticipated to be significant, as areas disturbed during construction would be rehabilitated, and the transmission structures would have a small footprint.

Given implementation of Transgrid's existing operational procedures, no impacts to riparian or waterfront land are anticipated.

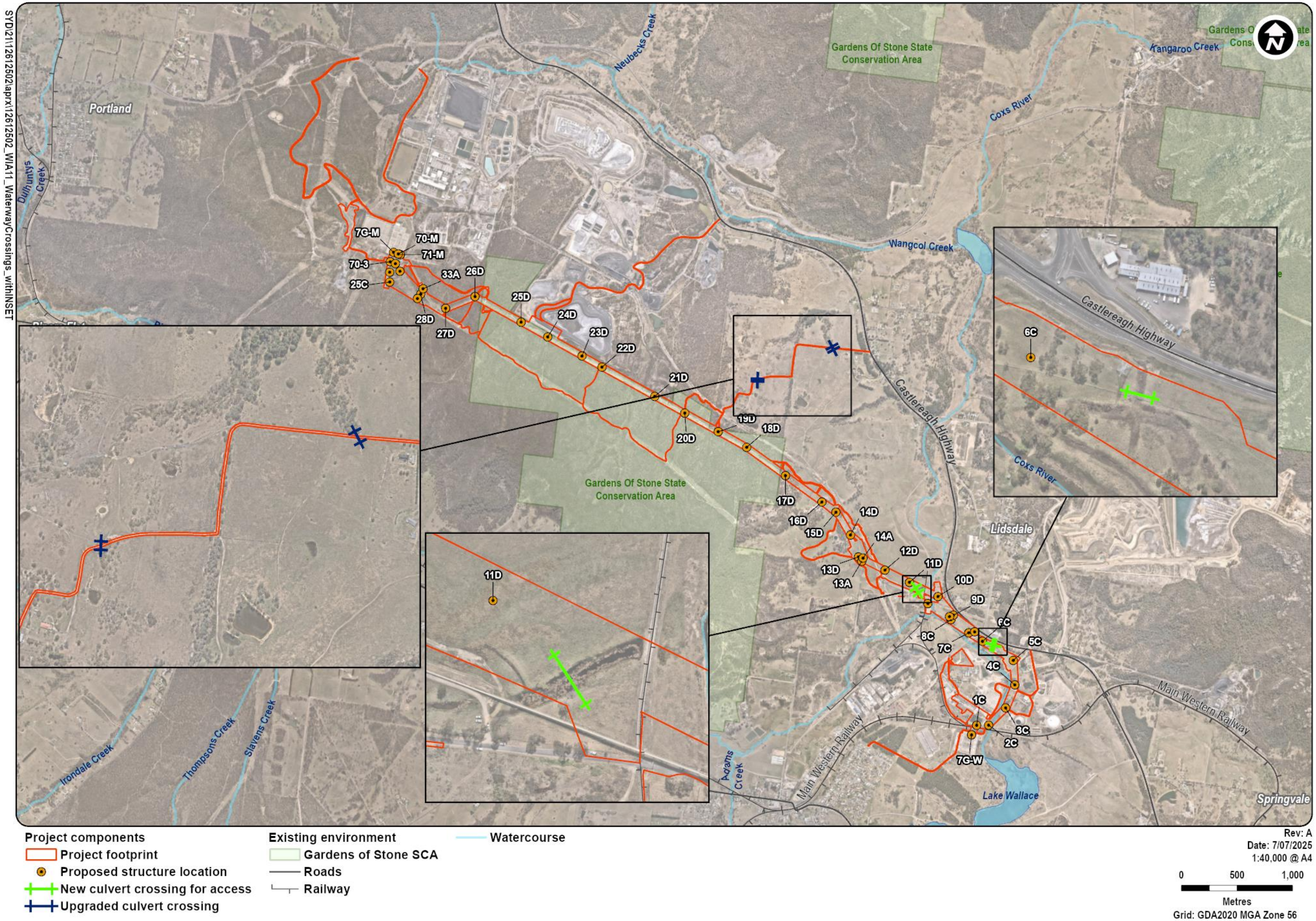


Figure 5.3 *Proposed new and upgraded waterway crossings*

5.2 Hydrology and streamflow

5.2.1 Construction

The proposed construction activities have minimal potential to alter the hydrology or hydrological regime within the Coxs River or Pipers Flat Creek. With the exception of the proposed new waterway crossing of the ponded water near structures 10D and 11D (1st order disconnected stream from the Coxs River) and the culvert replacements along the private unsealed access track extending off Karawatha Drive, no construction activities would take place in waterways.

Transmission structures

The construction of transmission structures would not require any diversion of waterways or direct instream works within the Coxs River, Pipers Flat Creek and various disconnected tributaries of Wangcol Creek. Stringing of conductors would occur across these waterways, with no physical works proposed in the waterways.

The construction compounds and construction benches would only intercept small amounts of surface water. Any temporary clean water diversions around construction areas would return overland flows to the same catchment, downstream of the construction area. No direct impacts to the hydrological regime of waterways are therefore anticipated to occur.

Access tracks

Access track drainage for new and upgraded access tracks will be developed in accordance with Transgrid design and environmental management standards such that overland flow would be directed to the edges of access tracks and conveyed to waterways. It is not anticipated that any changes to streamflow within waterways or creeks would occur as a result of the construction or upgrade of access tracks. Access track drainage would be developed, installed and maintained in accordance with managing *Urban Stormwater: Soils and Construction – Volume 2C, Unsealed Roads (*DECC 2008) and the Erosion and Sediment Control Plan (ESCP).

Waterway crossings

The proposed culvert replacement along the private unsealed access track extending from Karawatha Drive would intercept two unnamed tributaries of Wangcol Creek. These unnamed waterways are mapped as ephemeral on the NSW Hydrography hydroline spatial dataset (Spatial Services (DCS) 2025).

As discussed in section 5.1.1, extraction of any accumulated water in the low point near transmission structures 10D and 11D may be required to allow installation of a new waterway crossing. If dewatering is required to permit construction, this water would be beneficially reused on site for dust suppression or similar (if the water quality is suitable) subject to consultation with the landholder. Impacts to streamflow are not anticipated as the standing water at this location is not directly connected to the Coxs River.

The proposed culvert near transmission structures 5C and 6C would be required to facilitate access through a low-lying location on sodden ground. This location is not mapped as a waterway (Spatial Services (DCS) 2025) and appears to be a localised low point in topography. Dewatering is not expected to be necessary at this location, and no impacts to streamflow within the Coxs River or tributaries would occur, as the proposed culvert would likely alleviate ponding and potential erosion, improving outcomes for nearby potential riparian vegetation.

If dewatering is required for the construction of waterway crossings, relevant works approvals and licences would be obtained if required (refer section 5.6). Given the relative size of the ponded areas and the contributing Coxs River catchment, if dewatering is required, noticeable changes to hydrology are not anticipated. No impacts to water availability are anticipated as a result of the project.

Nevertheless, mitigation measures for the construction of waterway crossings are recommended in section 6.2 and any instream works would be undertaken in accordance with *Landcom* (2004), *DECC* (2008) and *Controlled activities - Guidelines for instream works on waterfront land* (DPE 2022b). With the implementation of these mitigation measures, the project is not anticipated to impact hydrology during the construction phase to the waterway crossings of Wangcol Creek.

5.2.2 Operation

Operation of the project will not involve any works that would extract, divert, intercept or impact flows directly or indirectly.

The proposed waterway crossing near transmission structures 10D and 11D is at the termination of a small catchment. As there is limited to no connectivity with the Coxs River in these locations, there would be no ongoing impacts to the hydrological flow regime, and no impacts to other water users in terms of water availability, including licenced water users and landowners exercising harvestable rights.

The waterway crossing upgrades along the private unsealed access track extending off Karawatha Drive are not expected to have any ongoing impacts to streamflow or hydrology compared to existing conditions, as these culverts are expected to be a like for like replacement.

The proposed waterway crossing to facilitate access to transmission structures 5C and 6C would help to reduce erosion from vehicular access along the existing informal access track. This culvert would also assist with conveyance of standing water to the adjacent riparian vegetation.

Maintenance of these waterway crossings is recommended to mitigate any degradation of waterways (see section 6.1.2).

5.3 Flooding

5.3.1 Construction

The elevated nature of the project footprint means that the majority of the proposed construction compounds, is unlikely to be affected by flooding. The potential for flooding impacts would be confined to topographic low points around waterway crossings and in proximity to major waterways (i.e. the Coxs River, Pipers Flat Creek, Wangcol Creek).

Potential impacts to flooding behaviour of Coxs River could result if construction activities intercept or change overland flow pathways. The magnitude of these impacts is anticipated to be relatively minor given activities being of short duration at any one location of the proposed transmission structures, and the small number of locations potentially subject to flooding.

The potential for flooding would be taken into account during detailed design and construction planning and measures incorporated into the Flood Risk Management Plan. By implementing these measures, changes to flood patterns during construction are not anticipated to be substantial and impacts on the project and its construction activities from flooding is considered manageable.

5.3.2 Operation

The potential for flood impacts arising from the project typically result from proposed changes to the local topography, existing flow patterns and/or loss of flood storage. The project would result in additional transmission structures and access tracks that are anticipated to occur within flood liable land, particularly in proximity to the Coxs River. These are unlikely to result in noticeable changes in flood behaviour as:

- Access tracks would be constructed mostly at grade to minimise earthworks and balance cut/fill and would not change topography, flood storage or existing flow patterns.
- Project footprint would be rehabilitated in accordance with the Rehabilitation Management Plan and would include removal of any temporary construction compounds, transmission structure benches being left in a stable and weed free condition and other disturbed areas being restored to their previous condition unless otherwise agreed upon with the landowner.
- The transmission towers proposed along the Coxs River and Pipers Flat Creek would require only minor earthworks which would not result in more than localised changes in topography. Additionally, the transmission tower foundations would be mostly buried and the towers would comprise slender, bolted steel members above ground, which would result in only minor, localised changes to flood flows.

As there are unlikely to be any changes to flood behaviour during the operation phase of the project, the project would not affect any existing emergency management arrangements or result in any social or economic impacts relating to flooding.

In the event that the Coxs River floods during operation, the project is not considered to be susceptible to impacts with transmission structures unlikely to be impacted due to the depth of foundations. Impacts to proposed new transmission structures are considered to be the same as the existing infrastructure located on the Coxs River floodplain. Flooding has the potential to affect the condition of access tracks in topographic low points, depending on the flood severity and water flow rates.

Any impacts to access tracks and transmission structures would be managed in accordance with Transgrid's existing operational procedures.

5.4 Surface water quality

5.4.1 Construction

Activities that have the potential to impact surface water quality during construction include:

- Earthworks, excavation and soil disturbance. These have the potential to mobilise surface sediments resulting in downstream water quality impacts (i.e. elevated nutrients, metals or suspended solids) associated with erosion and sedimentation.
- Instream works associated with construction of new and upgraded waterway crossings.
- Handling hazardous materials such as chemicals and oils for fuels for machinery, generators and vehicles.

The potential for these activities to impact waterways is outlined in the following sections.

Earthworks, excavation and soil disturbance

Disturbance of soils has the potential to result in erosion and sedimentation of nearby waterways following rainfall events. Potential activities proposed for the project that could result in erosion and sedimentation impacts include:

- removal of vegetation for the widening of the transmission line easement
- site establishment and construction of construction compound and laydown areas, including excavation, installation of environmental controls and surface levelling/grading
- earthworks and establishment of construction benches and brake and winch benches for each transmission structure
- drilling/ excavation for transmission poles
- upgrading (including widening) of existing access tracks and establishing new access tracks (including appropriate drainage)
- demolition and removal of redundant wood pole structures from sections of the existing 132 kV transmission line
- stockpiling of topsoils for restoration and rehabilitation towards the end of construction work at each location
- demobilisation and rehabilitation of areas disturbed by construction activities.

Excess spoil would be stockpiled and beneficially reused on site where possible or appropriately disposed of within a licenced facility.

Construction works would be undertaken in accordance with an Erosion and Sediment Control Plan (ESCP) which would be prepared as part of the CEMP (refer to section 6.1.1). In order to manage potential sedimentation of waterways from the construction/upgrade of access tracks, regrading of access tracks and establishment of trackside drainage would be designed and managed in accordance Transgrid's design and environmental management standards as well as consideration of *Managing Urban Stormwater: Soils and Construction – Volume 2C, Unsealed Roads (*DECC 2008) and the ESCP.

Provided the mitigation measures described in section 6.2 are implemented, it is expected that impacts to surface water quality arising from soil disturbance would be negligible.

Instream works

Instream works are proposed to establish waterway crossings, including:

- replacement of two existing galvanised steel culverts along the private unsealed access track extending off Karawatha Drive with concrete culverts of similar size
- installation of a new waterway crossing near Brays Lane (near transmission structures 10D and 11D)
- installation of new waterway crossing south of Castlereagh Highway (between transmission structures 5C and 6C).

Given the minor nature of these works and the small quantities of earthworks needed to replace culvert structures, with the implementation of appropriate mitigation measures outlined in section 6, including design and constructing in accordance with the *Controlled activities – Guidelines for instream works on waterfront land* (DPE 2022b), impacts to waterways are expected to be minimal.

Handling of hazardous materials with water quality risks

The handling of potentially hazardous materials near waterways is an inherent risk of all construction projects. Potential activities where handling of hazardous materials could occur may include:

- the accidental spills of stored materials and leaks from equipment (e.g. hydrocarbons (diesel for generators))
- pouring of fresh concrete for transmission structure foundations e.g. displacing standing water in excavations or exposure to rainfall as runoff from fresh concrete can be highly alkaline and can influence downstream waterways until cured.

The potential impact associated with the handling of these components includes the potential mobilisation into downstream waterways via direct flow of the material itself, through rainfall derived runoff, or from applied construction water, e.g. during dust suppression.

The risk of use and storage of these materials is typical of works of this nature and well understood control measures are commonly used, such as:

- bunding and safely storing hazardous materials in accordance with relevant Australian Standards and other guidelines (including use of leakproof, labelled containers)
- visual inspection of containers, the works area and nearby waterways
- proper maintenance of vehicles transporting hazardous materials
- installation of concrete (or other alkaline materials) during periods of dry weather.

These control measures are commonly employed during construction activities and would be incorporated into the SWMP of the CEMP.

With the recommended mitigation and management plans implemented (see Section 6), the project is not anticipated to result in unacceptable water quality risks from handling of hazardous materials.

5.4.2 Operation

No water quality impacts are anticipated during the operational phase of the project. Groundcover removed during the construction phase would be allowed to re-establish as soon as works finish in any one location. Rehabilitation works would also occur where vegetation is not expected to re-establish passively (that is, grow back using seed bank in the soil) and to ensure compliance with Transgrid's *Transmission Line Design Manual (TLDM)* and *Maintenance Plan – Easement and Access Tracks Manual.*

During operation, access tracks would be used infrequently for maintenance activities.

Maintenance of access tracks and waterway crossings would be undertaken as necessary to prevent rutting and erosion of materials into adjacent waterways. The overall impact on water quality due to ongoing use of access tracks is therefore considered to be negligible.

Inspections of the transmission towers and any associated infrastructure would be undertaken in accordance with Transgrid's existing processes and procedures.

On the basis that no specific operational phase water quality impacts are likely to occur, water quality monitoring is not considered to be necessary.

5.4.3 Neutral or Beneficial Effect on Water Quality

An assessment to meet the specific requirements of Appendix 2 of the NorBE Guideline for SSI projects has been undertaken as outlined in Table 5.2. This assessment summarises the impacts assessed in previous sections of this report, including surface and groundwater quality during construction and operation and concludes that it is considered likely that a neutral or beneficial effect on water quality will occur.

Table 5.2 Neutral or beneficial effect on water quality assessment

Item	Assessment	Construction	Operation
1	Are there any identifiable potential impacts on water quality?	As identified in section 5.4.1, during **construction,** there are potential impacts to water quality identified. These include: – erosion and sedimentation arising from proposed earthworks, excavation and soil disturbance – the accidental spills of stored materials (e.g. fuels (diesel for generators) – installation of concrete (e.g. transmission structure foundations) – leaks from equipment. However, these risks are well understood for works of this nature and environmental controls/mitigation measures are proposed in section 6 to manage these risks.	During **operation**, no perceptible impact to water quality is anticipated. No notable changes to landuse are proposed and any disturbed land use associated with construction would be stabilised and re-vegetated. Due to the static nature of the project during operation, no interaction with groundwater would occur during the operations phase.
	What pollutants are likely? *Major potential pollutants are sediments (fine and coarse), nitrogen, phosphorus, pathogens and hazardous chemicals and contaminants such as oil/fuel.*	As identified in section 5.2.1, during **construction**, the following pollutants may reach waterways or groundwater: – fine and coarse sediment may be generated during earthworks and topsoil disturbance – hydrocarbons, such as fuels and oils may leak from equipment, plant, vehicles and machinery during their operation and fuelling/maintenance – alkalinity during installation of concrete slabs.	During **operation**, there is unlikely to be any change in surface water quality or groundwater quality, considering the baseline condition of the Coxs River catchment.
	At what stage do the impacts occur?	Potential to occur during the construction phase, with possibility of occurrence during each of the nominated activities above.	Potential (but unlikely) to occur during the operational phase.
2	For each pollutant, list the safeguards needed to prevent or mitigate potential impacts on water quality	During **construction**, the following safeguards are identified, which generally apply to the above pollutants: – erosion and sediment controls – bunding and safely storing hazardous materials (including use of leakproof, labelled containers) – visual inspection of containers, the works area and nearby waterways – proper maintenance and operation of all vehicles, particularly those transporting hazardous materials – installation of concrete (or other alkaline materials) during periods of dry weather. The project would also comply with the Current Recommended Practices (WaterNSW 2024b), including: – DPE (2022) *Guidelines for controlled activities* and – Landcom (2004) *Managing Urban Stormwater: Soils and Construction – Volume 1* – DECC (2008) *Managing Urban Stormwater: Soils and Construction – Volume 2C.*	During **operation**, ongoing inspection and maintenance of waterway crossing and access tracks would occur.

Item	Assessment	Construction	Operation
		The above guidelines and safeguards would be documented and managed in accordance with a project specific SWMP.	
3	Will the safeguards be adequate for the time required	Yes, these controls would be applied for the duration of the construction phase, subject to the below maintenance requirements.	Yes, inspections and maintenance of access tracks and waterway crossings would occur for the duration of the operational phase.
	How will they need to be maintained	Maintenance would be stipulated by a SWMP. The plan would stipulate: – regular inspections of controls – review of environmental control performance, including identifying where control measures could be implemented, improved and repaired – procedures to rectify these.	The safeguards are standard practice and would be implemented in accordance with Transgrid's existing operational processes and procedures.
4	Will all impacts on water quality be effectively contained on the site by the identified safeguards and not reach any waterway, waterbody or drainage depression? Or will impacts on water quality be transferred outside the site for treatment?	Localised erosion and sediment controls developed in accordance with *Landcom* (2004) would be implemented to mitigate fine and coarse grained sediments. These controls would sufficiently mitigate movement of sediment from the project footprint. Handling of hazardous chemicals such as fuels and oils would occur in bunded areas designed and constructed to Australian Standards. Regular inspections of these controls in accordance with the project-specific SWMP would also occur.	Yes, all impacts on water quality would be effectively contained on the site.
5	Is it likely that a neutral or beneficial effect on water quality will occur? Justify	Yes, on the basis that the above controls are implemented and maintained, the construction phase would be expected to have a neutral effect on water quality. Risks to water quality would be managed in accordance with the Current Recommended Practices (CRPs).	Yes, the operational phase would have a neutral effect on water quality as there is unlikely to be any change in water quality runoff or groundwater quality.

5.5 Groundwater

Potential risks to groundwater during construction and operation include:

- interception of groundwater during deeper excavation e.g. for foundations of transmission towers/poles
- impacts to groundwater quality associated with surface water contamination from hydrocarbons and chemical spills.

5.5.1 Construction

Interception of groundwater during excavation

The foundation work for the new transmission structures is proposed to include either driven and/or screwed piles and/or excavation, steel fabrication work and concrete pours. The following construction activities will require subsurface disturbance at the following indicative depths:

- For transmission structures located on steeper terrain, the need to establish a level construction bench may require up to 5 m of excavation. In relatively flat areas, bench excavation is likely to be less than 1.5 m.
- The footings for each steel lattice structure may require piles up to 18 m depth.
- Excavation and concrete placement at shallower depths (up to 14 m) would also be required for transmission structures proposed to be poles.
- Establishment of brake and winch sites would also require excavation up to 5 m depth, but would generally be located in flat areas and require less than 1.5 m excavation.
- Installation of earthing, where required, would be excavated to a depth of approximately 0.5 m.

Given the linear nature of the project and undulating topography, groundwater levels vary across the project footprint (refer section 4.7.2).

In locations where rock is present, impacts to groundwater are not anticipated as excavations in rock are either not predicted to intercept groundwater or unlikely to result in impacts as a result of the limited width of the piles (which would be confirmed during detailed design) and inert construction materials. This would apply to transmission structures 25D to 17D (refer Figure 5.2).

Groundwater levels in the vicinity of the Coxs River are approximately 0.5-4.8 m below ground level based on available data at Lidsdale Siding and Wallerawang 330 kV substation. Therefore, excavations of footings and foundations for transmission structures 10D, 9D, 8C, 7C, 6C, 5C, 4C, 3C, 2C and 1C (refer Figure 5.2) are likely to intercept groundwater.

Based on these groundwater levels, trenching for earthing materials are not predicted to intercept groundwater.

The potential rate of groundwater inflow into excavations has been conservatively estimated (refer Appendix A) to be approximately less than five cubic metres per day for each transmission structure. The actual quantity of groundwater inflow will depend on the construction methods used and the duration of construction works. Groundwater levels are likely to naturally vary over time in response to rainfall trends and may be greater than predictions. The associated radius of groundwater drawdown from an open excavation is predicted to extend approximately 76 m from the edge of the transmission structure.

Temporary dewatering and construction activities that interfere with aquifers are generally identified as aquifer interference activities (refer section 3.2.7). Based upon preliminary calculations, it is unlikely that more than 3 ML of groundwater per year would be intercepted and as such, a WAL is not anticipated to be required. The exact quantity of interception would depend on the staging of the construction works, specifically the duration that the piles and excavation are open, and groundwater inflow could occur. Subject to undertaking geotechnical investigations and detailed design, permanent liners could be used in excavation for footings to reduce groundwater inflow.

Groundwater at the project footprint is generally slightly more acidic than the surface water receiving environment. Groundwater salinity within the project footprint ranges from similar levels and higher than the observed salinity of the surface water receiving environment (refer section 4.7.2). A groundwater dewatering procedure will be implemented during construction. The procedure will be documented in the SWMP and will define measures for the appropriate management of extracted groundwater, including testing of intercepted groundwater to inform discharge requirements. With the recommended mitigation and management plans implemented (see section 6), the project is not anticipated to result in unacceptable water quality risks from discharge of dewatered groundwater.

Groundwater quality

Construction of the project has the potential to impact on groundwater quality via contamination by hydrocarbons from accidental fuel and chemical spills. Hazardous chemical handling risks (e.g. fuels) are typical of works of this nature and well understood control measures are commonly used, such as bunding, safely storing hazardous materials, and visual inspection of the works area and waterways are commonly employed during implementation of a SWMP. On this basis, with the implementation of required mitigation measures and SWMP, the project is anticipated to result in negligible groundwater quality impacts.

NSW Aquifer Interference Policy

Potential impacts on water supply works, GDEs, high priority culturally significant sites, and groundwater quality have been assessed against the Level 1 Minimal Impact Considerations of the NSW AIP in the following sections.

Water supply works

There are three stock and domestic landholder bores within 1 km of the project footprint, as discussed in section 4.7.1. The closest stock and domestic landholder bore is approximately 440 m from the project footprint. As discussed above, the radius of groundwater drawdown is conservatively estimated to extend approximately 76 m from the project footprint from an open excavation and could be reduced if permanent liners were used. Therefore, the project is not predicted to result in drawdown at any water supply work.

Groundwater dependent ecosystems

Review of the relevant WSP indicated that the closest high priority GDE is located in Portland, approximately 3.5 km west of the project footprint. As discussed above, the radius of groundwater drawdown is predicted to extend approximately 76 m from the project footprint. Therefore, the project is not predicted to result in drawdown at any high priority GDEs listed in the relevant WSP.

Potential GDEs within the project footprint include Coxs River (BoM, 2024b). Stream flow data (see section 4.3) indicates that 90 per cent of daily flows are greater than 5 ML/day. Predicted groundwater take during construction is negligible compared to the flow in Coxs River. Therefore, groundwater take is predicted to have a negligible impact on Coxs River.

Any proposed removal of vegetation has been assessed in Technical Report 2 – Biodiversity Development Assessment Report. As discussed in the BDAR, biodiversity offsets are proposed for the removal or modification of native vegetation and associated threatened species habitat, including any potential GDEs.

High priority culturally significant sites

There are no high priority culturally significant sites listed in the relevant water sharing plans. Therefore, the project would not result in any impacts on a listed culturally significant site.

Groundwater quality

Construction of the project has the potential to impact on groundwater quality via contamination by hydrocarbons from accidental fuel and chemical spills. With the implementation of mitigation measures, included in section 6.2 the project is anticipated to result in negligible groundwater quality impacts.

Summary

The potential impacts of construction of the project have been assessed against the Level 1 Minimal Impact Considerations of the NSW AIP. The construction of the project is not predicted to result in changes in groundwater levels at surrounding bores, GDEs or culturally significant sites, or changes in groundwater quality. Therefore, the construction of the project is within the Level 1 Minimal Impact Considerations in the NSW AIP.

5.5.2 Operation

Potential risks to groundwater quality during the operational phase include chemical leaks and spills during maintenance activities along the transmission line easement. The management of such events would continue to be managed in accordance with existing operation and maintenance procedures.

Operation of the project is unlikely to intercept or extract substantial quantities of groundwater (>3 ML/yr) and is unlikely to result in changes in groundwater levels at surrounding bores, GDEs or culturally significant sites, or changes in groundwater quality. Therefore, the operation of the project is compliant with the Level 1 Minimal Impact Considerations in the NSW AIP.

5.6 Water licensing, sourcing and security

5.6.1 Construction

Water supply

The project would require non-potable water for construction purposes (e.g. dust suppression, compaction of access tracks and foundation works). It is anticipated that up to 80 ML of non-potable water would be required for the purpose of dust suppression and earthworks (e.g. access tracks and benching). It is anticipated that concrete required for foundations would be transported to site, however up to 2 kilolitres (kL) of water may be required for on-site concrete batching at some transmission structure locations if concrete truck access is not possible.

Non-potable water supply would be sourced through a commercial supplier under an existing licence. Consultation would be undertaken with the commercial supplier following detailed design and construction planning. Water would be imported to site via water tanker by the commercial supplier. Non potable water demand may be offset by reuse from rainwater tanks or similar which would be located within construction compounds.

Potable water would be supplied via an external supplier. It is estimated that approximately 1.1 ML/year over the construction period would be required, based on an average water usage of 50 L per person per day, for the average workforce of 60 persons. A peak daily demand of 7.5 kL/day would be required where approximately 150 personnel and contractors are required on site.

The potable water connections at Wallerawang and Mount Piper 330 kV substations are supplied by the Fish River Water Supply Scheme, which draws from Oberon Dam and Duckmaloi River. If potable water is not sourced externally, potable water would be distributed to other work areas as required from these sources via the use of water trucks. The minimum annual quantity of bulk filtered water supplied to Lithgow City Council under the scheme was 1678 ML (approximately 4,500 kL/day) in the 2023/2024 water year (WaterNSW 2024a). Therefore, the additional potable demand on the scheme is considered to be negligible (increase of 0.07 per cent based on the 2023/2024 volumes) and would not result in changes to water security or supply.

Water extraction

Minor water extraction activities may be required to construct the waterway crossing near proposed TS11D as a result of existing accumulation of water at a low point in the area. Should any water extraction activities be required, a WAL is required under the WM Act. It is likely that a WAL would need to be obtained through application for a WAL with a zero share component under the WSP. Temporary water allocation could also be purchased from an existing licence holder.

The *WSP for the Greater Metropolitan Region Unregulated River Water Sources 2023* specifies a total share component of 211 ML for unregulated rivers within the Wywandy Water Source, a portion of which could be temporarily purchased to permit the dewatering, if needed. A review of the NSW Water Register indicated sufficient availability to permit this to occur:

– 6 WALs comprise the 211 ML share component for unregulated rivers
– 211 ML has been historically made available within the water source; however no water usage has occurred for the water years between 2020 and 2024
– No historical temporary or historical water trades of share components have occurred in the water years between 2020 and 2024.

Revised estimates of the volume of water take would be undertaken during detailed design. Any water extracted for the project would be tested for suitability of reuse and reused on site, or removed from site by tanker with no discharge proposed.

5.6.2 Operation

The project would not require water supply for the operation of the transmission line. Impacts associated with operation are therefore not anticipated.

5.7 Wastewater

5.7.1 Construction

During the construction phase, a relatively minor volume of wastewater would be generated from the use of on-site portable amenity facilities by project personnel at construction compounds and existing amenities at the existing Transgrid substations. Based on the inputs of potable water usage, approximately 1.1 ML/year of wastewater over the construction period would be generated by construction personnel and contractors, based on an average water usage of 50 L per person per day, for the average workforce of 60 persons. This water would be contained on site within portable amenity facilities, with wastewater removed and disposed of at wastewater treatment facilities, likely by vacuum truck on a regular basis. It is not anticipated that wastewater generated would have a material impact on existing regional wastewater treatment facilities.

5.7.2 Operation

The project would generate minimal wastewater during operation with existing Transgrid and contractor operational and maintenance personnel utilising existing amenities at the nearby Transgrid substations. There would be negligible impacts to existing wastewater treatment facilities.

5.8 Cumulative impacts

Section 21.2 of the EIS outlines the assessment methodology for cumulative impacts including the methods for identifying what projects have been considered as part of the cumulative assessments for the project.

A total of 10 projects were identified for consideration as part of the cumulative assessment and are shown in Figure 5.4. The following projects have been considered:

- Wallerawang Battery Energy Storage System
- Mount Piper Battery Energy Storage System
- Great Western Battery Energy Storage System
- Pinecrest Battery Energy Storage System
- Lake Lyell Pumped Hydro Energy Storage
- Ben Bullen Wind Farm
- Sunny Corner Wind Farm
- Wallerawang Power Station Ash Dam
- Wallerawang residential subdivision (DA226/22)
- Wallerawang Station upgrades.

Table 5.3 outlines the potential cumulative impacts relevant to each assessment.

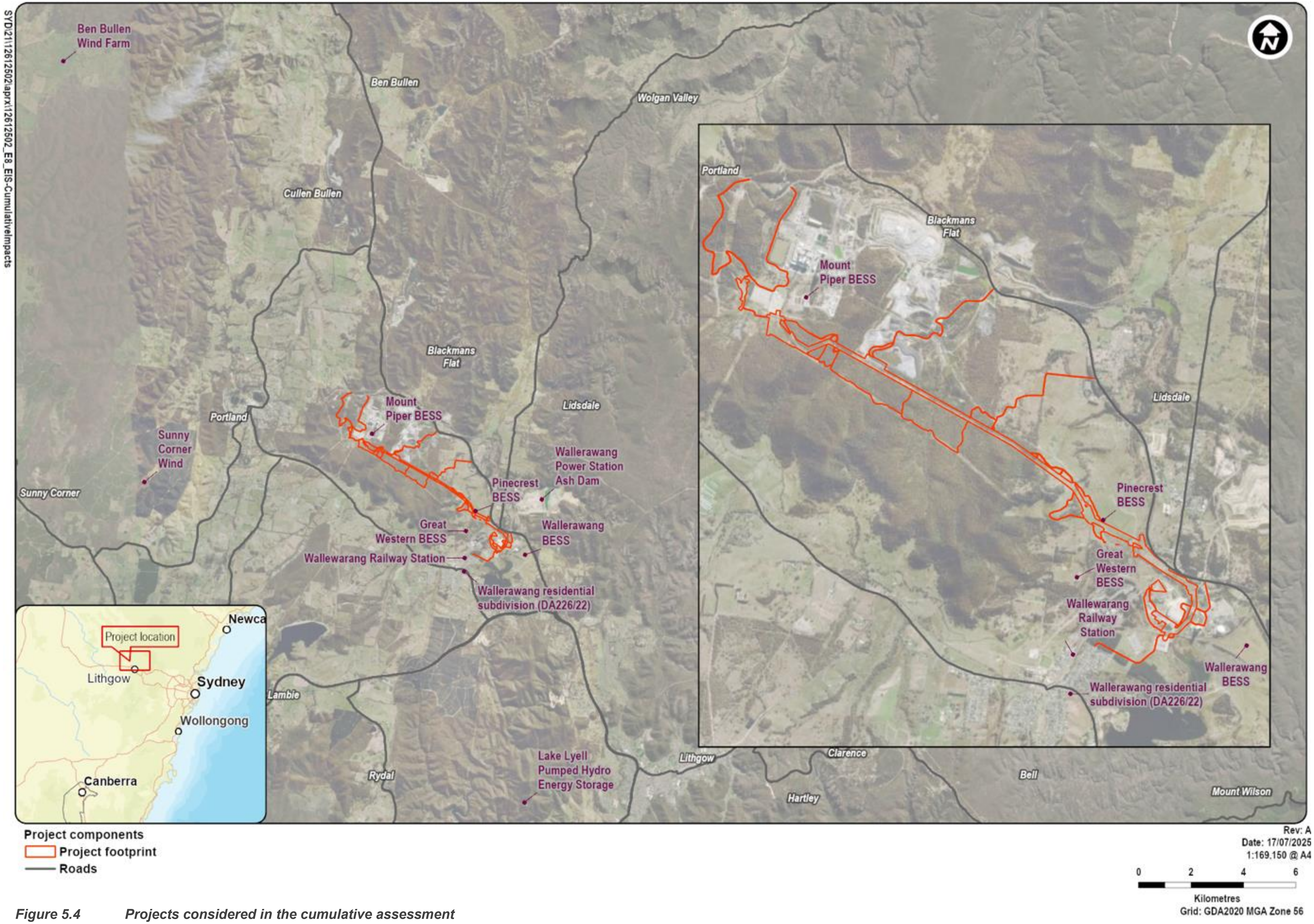


Figure 5.4 Projects considered in the cumulative assessment

Table 5.3 Cumulative impact assessment

Relevant future project	Scope	Approximate location	Status/timeframe/ operational period	Potential for cumulative impact
Wallerawang BESS	Design changes to optimise the layout of the approved Wallerawang BESS	500 m east of the project footprint	Approved 4/8/2022 Current modification at response to submissions stages Construction period of 1 to 2 years, expected to commence from 2025, construction does not appear to have commenced Operational period unchanged	The Water Quality Assessment prepared for the Wallerawang BESS modification indicates the proposed stormwater mitigation measures would allow the Wallerawang BESS to meet NorBE criteria, and therefore would not impact water quality per the guideline. Flooding impacts (HARC 2024) were also assessed which demonstrate maintenance of free passage of flood waters up to and including the 1% AEP event, with incremental flood impacts within the property owned by Greenspot, as leased to Shell. The initial EIS prepared for the Wallerawang BESS (Greenspot 2022) states impacts to groundwater are not expected to occur. Greenspot (2022) does not provide details of the proposed volume or source of construction phase water required. Therefore, with respect to water supply only, there may be negligible cumulative impacts associated with the project. No flooding or water quality cumulative impacts associated with the project are anticipated.
Mount Piper BESS	Development of a grid-scale BESS with a capacity of up to 500 MW	Immediately north of the project footprint	Approved 15/11/2024 Construction period of 18-24 months expected to commence from mid-2026 at the earliest Potentially operational by 2027/2028 and would operate for about 20 years	The Surface and Groundwater assessment (Aurecon 2024) identified that potential construction surface and groundwater impacts are minor and short duration, with the implementation of mitigation and management measures for erosion and sediment, hydrology and groundwater. While these impacts were considered unlikely, they would be limited to the period of construction. Minor cumulative impacts may therefore occur, particularly in the vicinity of the upper Wangcol Creek near Mount Piper substation. During operation, the Mount Piper BESS would achieve the NorBe water quality criteria through implementation of bioretention controls. No flooding impacts are anticipated as the Mount Piper BESS has a small footprint and is located at the headwaters of the Wangcol Creek catchment. Groundwater impacts are not expected on the basis that the project design will consider elevation of perched groundwater across the site. On this basis, no cumulative impacts to surface water or groundwater are therefore anticipated, when considered in conjunction with the project. Water supply quantities of 31.4 ML are required for construction, with 0.1 kL/year required during operation.

Relevant future project	Scope	Approximate location	Status/timeframe/ operational period	Potential for cumulative impact
				These are proposed to be sourced through scheme water through an existing pipeline. Cumulative impacts for the project are anticipated to be negligible as potable volumes required for the Mount Piper BESS are expected to be sourced within an existing entitlement and would not result in take from surface or groundwater within the Coxs River catchment.
Great Western BESS	Development of a 500 MW / 1,000 MWh BESS and associated infrastructure	300 m west of the project footprint	Approved 2/11/2023 Project has not yet commenced construction and construction start date is not known however is expected to occur over 12-14 months once the modification is approved The BESS is intended to have an operational life of up to 20 years	AECOM (2021) states negligible impacts to surface water, flooding and water use are expected as a result of the Great Western BESS. Raw water for construction is proposed to be trucked to site or sourced from existing site farm dams, with no volume provided in available documentation. Potable water during operations is negligible and will be supplied through a municipal connection at approximately 0.77 kL/day. Groundwater is not anticipated to be intercepted by the Great Western Battery BESS, and therefore potential impacts are considered to be low. Any cumulative impacts would be limited to the concurrent construction phases of the project and BESS. Therefore, negligible cumulative impacts may be expected, associated with construction phase water supply only.
Pinecrest BESS	Development of 500 MW battery storage capacity and 1,000 MWh of storage with (2-hour duration) connecting to the grid via underground cabling	Layout shown in scoping report is located within project footprint, with Transgrid undertaking ongoing consultation with Banpu Energy regarding positioning of the site.	Scoping report prepared with SEARs not yet issued EIS is expected to be submitted in early 2026 Construction period of 18 months commencing in late 2026 if approved. Operations proposed to start in 2028	Limited details of the Pinecrest BESS currently available to determine impacts on surface water, flooding and water use. Some cumulative impacts expected due to proximity to the project however the degree of these impacts would need to be confirmed once more details of the Pinecrest BESS are available.
Lake Lyell Pumped Hydro Energy Storage	Development of the Lakel Lyell Pumped Hydro Energy Storage (PHES) Scheme (that will provide between 300 to 350 MW of electricity generating capacity for up to 8 hours during peak demand	10 km south of the project footprint	EIS in preparation Technical design expected to conclude in 2025. Construction expected commence in late 2026 and to take four years with operation commencing in 2029	The scoping report states the Lake Lyell Pumped Hydro Energy Storage is within the upper Coxs River Catchment. Review of the footprint indicates the Lake Lyell Pumped Hydro Energy Storage would be located entirely downstream of the project and downstream of Lake Wallace. The scoping report identifies several potential impacts to surface water and groundwater during construction and operation phases.

Relevant future project	Scope	Approximate location	Status/timeframe/ operational period	Potential for cumulative impact
				The Lake Lyell Pumped Hydro Energy Storage has been assessed, with impacts to surface water and groundwater impacts expected to be within the Level 1 Minimal impacts criteria under the AIP. Surface water impacts and impacts to riparian zones are expected to be minimal and limited to the construction period. The projects minimal impacts on surface water and groundwater means that its contribution to any cumulative impact is negligible.
Ben Bullen Wind Farm	Construction of approximately 64 wind turbine generators (WTGs), a BESS and ancillary infrastructure 25 km northwest of Lithgow	20 km northwest of the project footprint	EIS in preparation Construction in 2028 for 18-24 months Operational life of 35 years+	The Ben Bullen Wind Farm is located 20 km away from the project footprint and is not located within the Coxs River catchment. The Ben Bullen Wind Farm is therefore not anticipated to interact with waters relevant to this assessment.
Sunny Corner Wind Farm	Construction of approximately 80 wind turbine generators, a BESS and ancillary infrastructure	6 km west of the project footprint	EIS in preparation Construction in 2030 for 36 months Operational life of 30 years	The Sunny Corner Wind Farm is located 6 km away from the project footprint and is not located within the Coxs River catchment. The Sunny Corner Wind Farm is therefore not anticipated to interact with waters relevant to this assessment.
Wallerawang Power Station – Mod 2 – Extension of Capping Transportation	Use of part of the lands lying north of the Castlereagh Highway that was once used by the former Wallerawang Power Station (WPS) as coal ash dam repositories	Immediately north of the project footprint	Approved 13/10/2023 The modification proposes an additional ten years for the importation of capping material	The EIS for the Wallerawang Power station Mod 2 indicates there is no change to approved water management proposed under the modification with no impacts to water resources identified. No cumulative impacts are therefore expected in conjunction with the project.
Residential subdivision DA226/22	Torrens Subdivision – 1 Lot into 54 Residential Allotments, 4 New Roads, 2 lots for drainage and public reserve Allotment	19 Barton Avenue Wallerawang 2 km south-west of the project footprint	Currently being re-exhibited till 13 June 2025	No relevant water impact assessment is publicly available for DA 226/22. However, as the site is anticipated to drain directly into Lake Wallace rather than waterways related to the project (i.e. Pipers Flat Creek and the Coxs River) no cumulative impacts with respect to water quality, hydrology or flooding are expected within these waterways. No statements regarding cumulative impacts with respect to water supply or groundwater impacts can be made as these are unknown and cannot be inferred.

Relevant future project	Scope	Approximate location	Status/timeframe/ operational period	Potential for cumulative impact
Wallerawang Railway Station upgrade	Works to upgrade the existing station, closed in 1989, so that passenger services can be restarted	850 m southwest of project footprint	Project has been announced on Transport for NSW website Early enabling works will be carried out from March to August 2025. Once the design is finalised, construction will commence later in 2025, with re-opening of the station planned for late 2026	Details of the Wallerawang Railway Station upgrade are not available and therefore potential cumulative impacts are currently unknown.

6. Mitigation and management of impacts

6.1 Overview of approach

6.1.1 Construction

A detailed Soil and Water Management Plan (SWMP) would be prepared and implemented as part of the CEMP and would be prepared in accordance with WaterNSW's Current Recommended Practice (CRP): *Managing Urban Stormwater – Soils and Construction* (the Blue Book). The SWMP would manage the specific water quality impacts through proposed soil and water management controls.

The SWMP would contain appropriate measures as outlined in the Blue Book to, as a minimum:

- Minimise the extent of ground disturbance.
- Divert surface water runoff around construction locations and promoting separation of waters.
- Install erosion controls within construction locations as well as sediment controls.
- Collect and filter sediment from surface water runoff within construction locations.
- Store/stockpile materials away from receiving waters and overland flow paths.
- Manage stockpiles to minimise erosion and sediment transport.
- Minimise the potential of soil and water quality impacts during storage of project wastes and potentially polluting substances.
- Minimise the duration of soil exposure and progressively rehabilitate and stabilised disturbed areas.
- Manage unexpected finds of contaminated materials that may pose a risk to surface water or groundwater quality.
- Record groundwater inflow and disposal volumes should excavations reach groundwater.
- Management of dewatering processes, expected groundwater take/ impact and licencing requirements against the minimal impact criteria listed within the NSW Aquifer Interference Policy and relevant WSPs. A trigger action response plan should be developed for activities that may result in groundwater interception.
- Procedures for the appropriate handling, storage, transport and disposal of groundwater.
- Handling of hazardous materials and procedures to manage spills to reduce and address soil and water contamination.
- Construction of access tracks with consideration to *Volume 2C – Unsealed Roads* (DECC, 2008a).
- Flood response procedures, including the relocation of hazardous materials to high ground.

SWMPs would include Erosion and Sediment Control Plans (ESCP) to detail erosion and sediment controls to be implemented at specific sites and for specific construction activities and would include rehabilitation requirements. SWMPs and ESCPs would be prepared having regard of *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004) other relevant volumes and other relevant guidelines.

6.1.2 Operation

Permanent access tracks, waterway crossings and transmission structures would be designed and constructed in accordance with relevant guidelines, legislation and standards to minimise hydrology and water quality impacts during operation.

Transgrid has operational procedures to manage and mitigate environmental impacts during operation and maintenance of its assets. These include handling of hazardous materials as well as monitoring and maintenance of access tracks or similar infrastructure that poses an erosion or scour risk.

6.2 Summary of mitigation measures

Table 6.1 lists the mitigation and management measures that would be implemented to manage potential impacts to water identified in section 5.

Table 6.1 Water mitigation and management measures

Impact	Environmental safeguard	Timing
Water quality and erosion impacts	A Soil and Water Management Plan (SWMP) will be prepared as part of the CEMP. The SWMP will include: – Erosion and Sediment Control Plans (ESCP) prepared in consultation with a Certified Professional in Erosion and Sediment Control (CPESC). – detail on processes, responsibilities and measures to manage potential soil and water quality impacts during construction. The SWMP and ESCP will be prepared in accordance with the principles and requirements in: – Managing Urban Stormwater – Soils and Construction, Volume 1 (Landcom, 2004) Volume 2A (DECC, 2008a) and Volume 2C (DECC, 2008b) – Best Practice Erosion and Sediment Control (IECA, 2008) – Controlled activities – Guidelines for instream works on waterfront land (DPE 2022) – Controlled activities – Guidelines for riparian corridors on waterfront land (DPE 2022) – Controlled activities – Guidelines for watercourse crossings on waterfront land (DPE 2022).	Pre-construction
Flooding of project footprint at Coxs River	An Emergency Management Plan will include a Flood Risk Management Plan (FRMP) to be prepared in consultation with the SES. The FRMP will include a Trigger Action Response Plan to detail how and when actions will be taken. The plan will also outline the following: – workers and visitors will be inducted onto the Plan. – works will not commence, or continue in construction areas that are at risk of flooding. – people, machinery and materials will be removed from construction areas prior to any flood event that is predicted to impact the construction area. The construction program will schedule and carry out works in flood-risk areas in periods of dry, stable weather as far as practicable. To further manage risk, resources will be made available to reduce the duration of works within flood-risk areas.	Pre-construction Construction
Flooding of project footprint at Coxs River	Structures within flood liable areas will be designed and constructed to withstand a 1% Average Recurrence Interval (or 1 in 100 year) event.	Design
Flooding of project footprint at Coxs River	No maintenance activities will be undertaken where flood risk exists, and conditions monitored during maintenance to ensure safety of people and environment. As soon as practicable after flood events, structures shall be checked for damage, and remediation undertaken if required.	Operation
Groundwater impacts and dewatering	A groundwater dewatering procedure will be prepared and implemented as part of the SWMP. The procedure will define measures for the appropriate management of extracted groundwater, including: – reviewing groundwater volumes, such as inflows and extraction – identifying licencing requirements – water quality testing of intercepted groundwater to inform treatment (if required), disposal and/or discharge requirements – a groundwater trigger action response plan that will be implemented in the event that groundwater inflows are greater than expected.	Pre-construction

7. Conclusion

This surface water and groundwater assessment considers potential impacts on surface water and groundwater resources as required by the SEARs. This included consideration of water quality and existing conditions of waterways in the study area, informed by a desktop assessment.

The desktop assessment identified the existing environmental factors influencing surface water management and erosion and sediment control, as well as assessment methodologies undertaken to analyse riparian management, flooding, water quality, water sourcing, groundwater and erosion and sediment control practices during construction.

The water assessment identifies typical risks associated with construction projects could occur for the project, including:

- construction works that disturb soils that pose a potential risk to waterways associated with turbidity, particularly those located within the riparian zone or in waterfront land.
- interactions of construction compounds and activities with waterways and drainage.
- foundation and footing earthworks at depths that may intercept groundwater.

Through the implementation of standard control measures in-built to the project, the project could be undertaken with minimal impacts in relation to water-related impacts and anticipated to be of neutral effect to the Sydney Drinking Water Catchment, with the implementation of mitigation including the following key measures:

- Development of a Soil and Water Management Plan, including an Erosion and Sediment Control Plans, in accordance with *Landcom* (2004) and *DECC* (2008a, 2008b) to manage potential impacts during construction and operation of the project on water quality. This will include establishment of flood emergency procedures to appropriately manage construction within areas that are flood liable.
- Development of a groundwater dewatering procedure and a Trigger Action Response Plan to manage groundwater during construction.

Overall, with the implementation of the proposed mitigation and management measures outlined in this report and the EIS, the project is expected to result in temporary, minor impacts on surface water and groundwater during construction, and negligible impacts during operation (including maintenance).

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Appendices

Appendix A

Groundwater inflow estimate

Overview

As discussed in section 5.4.3, there is potential that excavation for construction of transmission structures will intercept groundwater. Groundwater inflow estimates have been developed to assess potential impacts.

Methodology

Groundwater inflow estimates have been carried out using the analytical equations and approach outlined in Marinelli and Niccoli (2000). The equations presented by Marinelli and Niccoli (2000) provide a simple means of estimating steady state or long-term average inflows to a pit or excavation.

The solutions presented consider:

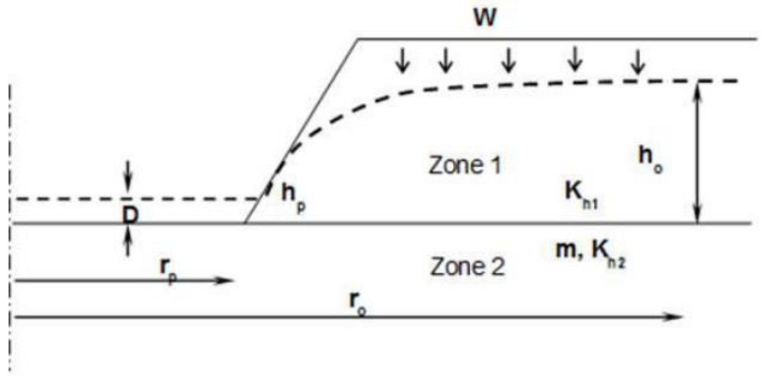
– the effect of decreased saturated thickness near the pit walls
– distributed recharge to the water table
– upward flow through the pit bottom.

Separate flow calculations are carried out for inflow into the pit walls (Q1, Zone 1) and pit base (Q2, Zone 2) (see figure below). Assumptions inherent in the flow calculation for Zone 1 include:

– pit walls are approximated as circular cylinders
– groundwater flow is horizontal (Dupuit – Forchheimer approximation is valid)
– the static (pre-construction) water table is horizontal
– groundwater flow toward the pit is axially symmetric
– uniform distributed recharge occurs across the site as a result of surface infiltration
– all recharge in the radius of influence is captured by the pit
– the perched aquifer extends below the base of the pit.

Assumptions relevant to Zone 2 include:

– Hydraulic head is initially uniform throughout the zone. The initial head is equal to the elevation of the initial water table in Zone 1.
– The disk sink has constant hydraulic head equal to the elevation of the pit late water surface. If the pit is completely dewatered the disk sink is equal to the elevation of the pit bottom.
– The flow to the disk sink is three dimensional and axially symmetric.
– Materials in Zone 2 are anisotropic and the principal co-ordinate directions for hydraulic conductivity are horizontal and vertical.



Relevant equations presented in Marinelli and Niccoli (2000) are:

$$h_0 = \sqrt{h_p^2 + \frac{W}{K_{h1}}\left(r_0^2 ln\left(\frac{r_0}{r_p}\right) - \left(\frac{r_0^2 - r_p^2}{2}\right)\right)}$$

$$Q_1 = W\pi\left(r_0^2 - r_p^2\right)$$

$$Q_2 = 4r_P\left(\frac{K_{h2}}{m_2}\right)(h_0 - d)$$

$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

Where:

- h_o = Initial (pre-excavation) saturated thickness (metres above base of pit) – based on observed groundwater level data discussed in section 4.7.2 an observed groundwater level of 0.5 m bgl was adopted. Excavation for foundations for transmission structures will extend to 5 m bgl.
- h_p = Saturated thickness at pit wall (metres above base of pit) – adopted as zero, excavation will be fully dewatered.
- W = Distributed recharge flux (metres per day) – based on rainfall data. Annual median rainfall sourced from SILO Long Paddock patched point grid data which provides spatially, and temporally continuous climatic data is 771.8 millimetres per year. Rainfall recharge has been assumed to be 6% based on rainfall recharge adopted by NOW (2011). Therefore, recharge of 0.000127 m per day has been adopted.
- Kh_1 = Horizontal hydraulic conductivity Zone 1 (metres per day) – values for clay, sand and gravel mixes adopted based on the subsurface conditions encountered in the vicinity of Coxs River (Douglas Partners, 2009). A horizontal hydraulic conductivity of 0.1 m per day was adopted based on typical hydraulic conductivity for clay, sand and gravel mixes (Kruseman & de Ridder, 1994).
- Kh_2 = Horizontal hydraulic conductivity Zone 2 (metres per day) – values for clay, sand and gravel mixes adopted based on the subsurface conditions encountered in the vicinity of Coxs River (Douglas Partners, 2009). A horizontal hydraulic conductivity of 0.1 m per day was adopted, as discussed above.
- Kv_2 = Vertical hydraulic conductivity Zone 2 (metres per day) – assumed that horizontal hydraulic conductivity is ten times vertical hydraulic conductivity. Therefore, a vertical hydraulic conductivity of 0.01 m per day was adopted.
- r_p = Effective pit radius (metres) – conservatively assumed 5 m wide and 5 m long excavation for excavations associated with transmission structures. The area was input into the formulae for the area of a circle (ie A = π $r_{p\,2}$) in order to calculate the effective radius.
- r_o = Radius of influence (metres) – calculated as part of the assessment.
- d = Depth of the pit lake (metres) – adopted as zero, excavation will be fully dewatered.

Results

Groundwater inflows were calculated for transmission structures, where the review of groundwater levels indicated that groundwater may be intercepted. The calculation is based on inputs outlined in Table A.1.

Table A.1 Analytical inputs – transmission structures

Parameter	Data
Pit length (m)	5
Pit width (m)	5
Distributed recharge flux W (m/day)	0.000127
Hydraulic conductivity (horizontal) Zone 1 K_{h1} (m/day)	0.1
Hydraulic conductivity (horizontal) Zone 2 K_{h2} (m/s)	0.1
Hydraulic conductivity (vertical) Zone 2 K_{v2} (m/s)	0.01
Initial saturated thickness h_0 (m)	4.5

Table A.2 Dewatering results

Construction element	Rate of groundwater inflow (m^3/day)	Radius of influence (m)
Transmission structure	3.88	75.6

Appendix B

Registered landholder bores

Table B.1 Registered bores within 1 km of the project footprint (BoM 2024a, WaterNSW 2024c)

Bore name	Bore Depth (m)	Drilled Date	Latitude	Longitude	Purpose	Salinity	Lithology	Yield (L/s)	Water bearing zone (m bgl)	Standing water level (m bgl)
GW053071	15.2	1/12/1980	-33.3978791	150.0694998	Domestic, Stock, Irrigation	Unknown	Shale	18.19	9.1, 10.7, 12.2	Unknown
GW101461	45	8/01/1998	-33.3923234	150.0833885	Domestic	Unknown	Shale	0.63	32-33	15
GW106737	90	25/11/2004	-33.3770007	150.0764758	Domestic	Unknown	Shale	0.65	84-84.5	33
GW109261	18.03	2/11/1985	-33.3931978	150.0951385	Monitoring Bore	Unknown	Clayey sand, gravel, siltstone, claystone, sandstone, mudstone, conglomerate and coal	Unknown	Unknown	9.8
GW110157	9	14/10/2005	-33.366254	150.0695727	Monitoring Bore	Unknown	Weathered sandstone	Unknown	Unknown	Unknown
GW110158	9	14/10/2005	-33.3666874	150.0722764	Monitoring Bore	Unknown	Weathered sandstone	Unknown	Unknown	Unknown
GW110159	10.3	13/10/2005	-33.3662698	150.0748259	Monitoring Bore	Unknown	Sandstone	Unknown	Unknown	Unknown
GW110437	90	9/03/2009	-33.4003083	150.0743833	Test Bore	Unknown	Gravel and shale	0.063	3-4	Unknown
GW110481	15.8	28/07/2009	-33.390722	150.0883643	Monitoring Bore	Unknown	Siltstone, sandstone	Unknown	Unknown	Unknown
GW110520	12	8/05/2015	-33.39761	150.07671	Industrial	Unknown	Sand and gravel and siltstone	1.25	1.73-3.5, 3.5-12	1.73
GW110861	24	19/02/2010	-33.3725777	150.0662888	Monitoring Bore	Unknown	Sandstone, shale and coal	Unknown	Unknown	Unknown
GW111027	24	23/02/2004	-33.3726772	150.0655643	Monitoring Bore	Unknown	Sandstone, shale and coal	Unknown	Unknown	Unknown
GW111028	24	23/02/2004	-33.3726482	150.0651032	Monitoring Bore	Unknown	Sandstone, shale and coal	Unknown	Unknown	Unknown
GW111029	24	21/02/2010	-33.3723725	150.0660258	Monitoring Bore	Unknown	Coal, sandstone, shale	Unknown	Unknown	Unknown
GW111030	24	20/02/2010	-33.3724998	150.0664513	Monitoring Bore	Unknown	Coal, sandstone, shale	Unknown	Unknown	Unknown
GW111334	12	14/02/2010	-33.3660222	150.0732999	Test Bore	Unknown	Coal, sandstone, siltstone	Unknown	5-12	Unknown
GW111358	6.4	10/02/2011	-33.4096388	150.0657638	Monitoring Bore	Unknown	Sandy clay and silty sand	1.00	3.4-6.4	2.57
GW111359	6	10/02/2011	-33.4096138	150.0656444	Monitoring Bore	Unknown	Sandy clay and silty clay	1.00	3-6	1.58
GW111360	6	10/02/2011	-33.4096944	150.0656194	Monitoring Bore	Unknown	Sandy clay and silty clay	1.00	3-6	1.98
GW111471	24	23/02/2010	-33.3709926	150.0667598	Monitoring Bore	Unknown	Siltstone, mudstone, sandstone and coal	Unknown	Unknown	Unknown
GW111472	23.9	23/02/2010	-33.3709641	150.0663202	Monitoring Bore	Unknown	Siltstone, mudstone, sandstone and coal	Unknown	Unknown	Unknown
GW111473	80.8	23/03/2010	-33.3726472	150.0688972	Monitoring Bore	Unknown	Siltstone, coal and shale	Unknown	Unknown	Unknown
GW112897	5.36	2/05/2011	-33.4089305	150.0656666	Monitoring Bore	Unknown	Unknown	1.00	Unknown	0.5
GW112898	5.1	2/05/2011	-33.4089178	150.0655599	Monitoring Bore	Unknown	Unknown	1.00	Unknown	0.44
GW112899	5	2/05/2011	-33.4088167	150.0654773	Monitoring Bore	Unknown	Unknown	1.00	Unknown	0.58
GW115010	7.5	9/05/2015	-33.39898	150.07738	Monitoring Bore	Unknown	Sandy clay, weathered siltstone	Unknown	3.85-7	3.85
GW115011	5	13/08/2015	-33.39823	150.07699	Monitoring Bore	Unknown	Siltstone	0.50	1.64-3.3	1.64
GW115075	20	6/06/2012	-33.35037	150.03107	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	16.5
GW115076	9.8	4/06/2012	-33.3512	150.03175	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115077	11	4/06/2012	-33.35308	150.03102	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	9
GW115078	22	6/06/2012	-33.35444	150.02904	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	9.5
GW115079	8.9	8/06/2012	-33.35521	150.0292	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	7
GW115080	5	8/06/2012	-33.35518	150.0283	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	3
GW115081	20	12/06/2012	-33.35576	150.03015	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115082	7	12/06/2012	-33.3559	150.02803	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	5.5
GW115083	7.7	12/06/2012	-33.35649	150.02967	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	5.6
GW115084	10	13/06/2012	-33.35714	150.0294	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	6.2
GW115085	6	13/06/2012	-33.35747	150.02753	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	2.4
GW115086	20	13/06/2012	-33.35857	150.02872	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown

Bore name	Bore Depth (m)	Drilled Date	Latitude	Longitude	Purpose	Salinity	Lithology	Yield (L/s)	Water bearing zone (m bgl)	Standing water level (m bgl)
GW115087	10	14/06/2012	-33.35937	150.02747	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	5
GW115088	4	7/06/2012	-33.36069	150.02769	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	1.5
GW115089	5	7/06/2012	-33.35907	150.02488	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	3
GW115090	4.8	7/06/2012	-33.35482	150.02608	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	3
GW115170	20	22/12/2015	-33.3561958	150.0279928	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115260	7.5	9/05/2015	-33.3989832	150.0773837	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115261	5	8/05/2015	-33.3982346	150.0769896	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115412	12	17/07/2012	-33.360194	150.0531243	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115413	36	19/07/2012	-33.3658616	150.0454232	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115414	33.5	16/07/2012	-33.3642881	150.0493871	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115415	43.4	12/07/2012	-33.3617838	150.0475701	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115441	12	17/07/2012	-33.360194	150.0531243	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115464	36	19/07/2012	-33.3658616	150.0454232	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115465	33.5	16/07/2012	-33.3642881	150.0493871	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115466	43.4	12/07/2012	-33.3617838	150.0475701	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115565	33	26/08/2013	-33.3763228	150.0493672	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115566	33	26/08/2013	-33.3763228	150.0493672	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115620	36	19/07/2012	-33.3658572	150.0454276	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115621	33.5	16/07/2012	-33.3642812	150.0493969	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115622	43.4	12/07/2012	-33.361784	150.0475798	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115623	12	17/07/2012	-33.3601941	150.0531275	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown
GW115625	33	26/08/2013	-33.3763228	150.0493672	Monitoring Bore	Unknown	Unknown	Unknown	Unknown	Unknown