
Technical report 13

Contamination preliminary site investigation





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Hunter Transmission Project

Technical Report 13 –
Contamination

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August 2025

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Hunter Transmission Project Technical Report 13 – Contamination

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Rev	Date	Details
F	5 August 2025	Final for EIS

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WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

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Glossary

Access tracks	Temporary and permanent tracks used to access the project. Refer to <i>Chapter 4 – Project description</i> of the EIS for further details.
Alluvial	Sediments deposited by flowing water.
Aquifer	Rock or sediment in a formation, group of formations or part of a formation that is saturated and sufficiently permeable to transmit economic quantities of water to wells and springs.
Bayswater Power Station	Existing power station at Bayswater owned by AGL.
Bayswater South switching station	The new switching station that would be constructed south of Bayswater Power Station.
Bore	Artificially constructed or improved groundwater cavity used for the purpose of accessing or recharging water from an aquifer. Interchangeable with borehole, piezometer.
Borehole	Includes a well, excavation, or other artificially constructed or improved groundwater cavity which can be used for the purpose of intercepting, collecting or storing water from an aquifer; observing or collecting data and information on water in an aquifer; or recharging an aquifer. Interchangeable with bores, wells, piezometers.
CLM Act	<i>Contaminated Land Management Act 1997</i>
Contamination study area	The wider area including and surrounding the project impact area, with the potential to be directly or indirectly affected by the project. For use within the contamination assessment, it incorporates a 1,000 m buffer surrounding the alignment.
Construction impact area	The area that would be directly impacted by the construction of the project, including (but not limited to) transmission towers and lines, stringing sites, access roads, access tracks, substations, switching stations, adjustments and upgrades to existing lines, communications infrastructure, temporary worker accommodation, construction support sites, laydown areas and utility adjustments.
Construction access routes	Roads used by construction vehicles (light and heavy).
Construction support sites	An area used as the base for construction activities, usually for the storage of plant/equipment and materials, processing facilities (concrete batching, aggregate crushing, grinding and screening), maintenance facilities/workshops, staff facilities, firefighting equipment, helicopter landing pad and support facilities, access and parking, and wastewater treatment. Some construction support sites would also include temporary worker accommodation. Construction support sites are discussed in <i>section 4.3.5</i> of the EIS.
Critical State significant infrastructure (CSSI) application area	The critical State significant infrastructure (CSSI) application for the HTP covers 5 local government areas (Muswellbrook, Singleton, Cessnock, Central Coast and Lake Macquarie).
Cumulative impact	The combined impacts of the project on a matter with other relevant future projects.
Detailed design	The stage of design where proposal elements are designed in detail, suitable for construction.

Discharge	The rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second. Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving (e.g. metres per second).
Disturbance area	This is a subset of the project impact area and used primarily to assess potential impacts on biodiversity values in <i>Technical Report 1 – Biodiversity development assessment report</i>. Includes the following categories: — Disturbance area A — Disturbance area A (centreline) — Disturbance area B — Disturbance area HZ.
Disturbance area A	The area where vegetation would be completely removed. It includes areas at and around transmission line towers (including tower pads and batters), stringing sites, laydown areas, switching stations, substations upgrades, construction support sites, new and upgraded access tracks and road upgrades. Impacts within this area would include sub-surface disturbance from construction activities such as grading, excavation, and full tree removal. With the exception of areas that only require temporary disturbance (i.e. temporary access tracks and stringing sites), this area would also be subject to ongoing maintenance during operation (including vegetation removal to ground level) for operational and safety requirements (including bushfire risk management).
Disturbance area A (centreline)	A 20 m wide centreline area between transmission towers where all vegetation would be removed to ground level during construction. This area would also be subject to ongoing maintenance during operation (i.e. removal to maintain vegetation clearance requirements) for operational and safety requirements (including bushfire risk management).
Disturbance area B	The area within the transmission line easement, excluding disturbance area A and disturbance area A (centreline), where partial clearing would be undertaken. Removal of vegetation (including trees) would be undertaken only where it has the potential to exceed vegetation clearance heights. These heights are set for operational and safety requirements, including bushfire risk management (a minimum of 13.5 m below the conductors at maximum operating temperature). Vegetation with mature growth heights up to 2 m can remain, while vegetation exceeding 2 m will be managed to maintain these clearance heights. This area would be subject to ongoing maintenance during operation.
Disturbance area hazard tree zone (HZ)	Hazard trees are those that have the potential to pose a risk to safe operation of the transmission line by falling onto the transmission towers, conductors and associated infrastructure within the easement. A hazard tree zone has been identified in limited areas on either side of the transmission line easement through LiDAR analysis of tree heights and topography. Hazard tree management would occur during operation to maintain safe operating clearances for the conductors and tower structures. The hazard tree zone will be inspected for trees in the height range of 20 m or more, which is typically in the high-risk category. High-risk category trees will be assessed for structural instability and managed according to the risk present, including tree removal if required.

EnergyCo	The Energy Corporation of New South Wales constituted by section 7 of the <i>NSW Energy and Utilities Administration Act 1987</i> as the NSW Government-controlled statutory authority appointed as the infrastructure planner under the <i>NSW Electricity Infrastructure Investment Act 2020</i> responsible for the delivery of NSW's REZs. The proponent for the HTP.
Eraring Power Station	Existing power station at Eraring operated by Origin Energy.
Exclusion zone	A safe clearance area around the transmission line and towers to protect public safety, the network and to maintain access to the asset. It delineates the area where most land use activities are prohibited. The zone is located within the easement and is defined according to the operational voltage and design of the infrastructure.
Earthworks	All operations involved in loosening, excavating, placing, shaping and compacting soil or rock.
Formation	General term used to describe a sequence of rock layers.
Groundwater	Water found in the subsurface in the saturated zone below the water table or piezometric surface i.e. the water table marks the upper surface of groundwater systems.
Groundwater flow	The movement of water through openings and pore spaces in rocks below the water table i.e. in the saturated zone.
Hunter Transmission Project (HTP) or project	The HTP is described in <i>Chapter 4</i> (Project description) of the EIS and identified in the overview figures of the EIS.
HTP Corridor	Comprises: — the transmission line corridor connecting Bayswater South switching station to Olney switching station — the transmission line corridor connecting the Bayswater South switching station to the existing 500 kV transmission line near Bayswater Power Station — the transmission line corridor connecting the Olney switching station to the existing 500 kV transmission line between Eraring and Kemps Creek The HTP corridor is around 140 metres wide.
Impact	An event that disrupts ecosystem, community, or population structure and alters the physical environment, directly or indirectly.
NEPM 2013	<i>National Environment Protection (Assessment of Site Contamination) Measure 1999</i> as amended in 2013
No clearing zone	Areas within the transmission line easement where vegetation removal is not required. These areas would occur where there is sufficient separation of 10m or more between the maximum operating temperature conductor position and the existing vegetation. This area is excluded from the disturbance area.
Olney switching station	The new switching station that would be constructed in Olney State Forest.

Operation impact area	The area that would be occupied by permanent components of the project and/or maintained, including transmission line easements, transmission lines and towers, substations, switching stations, communications infrastructure, maintenance facilities, permanent access roads to substations and switching stations and access tracks to the transmission line easement.
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
Project impact area	The area that has been assumed for the purpose of the EIS and technical assessments to be directly affected by the construction and operation of the project. It includes the indicative location of project infrastructure, the area that would be directly disturbed during construction and any easement required during operation.
(the) proponent	The Energy Corporation of NSW (EnergyCo).
Refinement	A change that fits within the limits set by the project description contained in the EIS for the HTP and does not change what the proponent is seeking approval for and/or does not require an amendment to the application for the HTP.
Renewable Energy Zone (REZ)	A geographic area identified and declared by the NSW Government as a Renewable Energy Zone.
Salinity	The concentration of dissolved salts in water, usually expressed in EC units or milligrams of total dissolved solids per litre (mg/L TDS).
Sensitive receivers	Land uses, landscape features and activities that are sensitive to changes in the environment such as water quality and quantity, noise, vibration, air and visual impacts. Sensitive receivers may include aquatic ecosystems, aquaculture areas, residential dwellings, schools and recreation areas.
Substation	A facility used to increase or decrease voltages between incoming and outgoing lines (e.g. 330 kV to 500 kV).
Switching station	A facility used to connect 2 or more distinct transmission lines of the same designated voltage.
Temporary worker accommodation	Temporary accommodation that would be erected and used during construction to house the construction workforce. Worker accommodation would be located at some construction support sites.
Transgrid	Preferred network operator for the HTP.
Transmission line easement	An area surrounding and including the transmission lines which is a legal proprietary right and allows for ongoing access and maintenance of the transmission lines. Landowners can typically continue to use most of the land within transmission line easements, subject to some restrictions for safety and operational reasons.
Transmission tower	For 500kV transmission lines, this is typically a free-standing steel lattice structure (suspension or tension tower). Transmission towers for the HTP would generally be up to 85 m high.
Water table	The surface in an unconfined aquifer or confining bed at which the pore water pressure is atmospheric; it can be measured by installing shallow wells extending a few feet into the zone of saturation and then measuring the water level in those wells.

Abbreviations

ADWG	Australian Drinking Water Guidelines 6
ACC	Area of Contamination Concern
ANZG	Australian and New Zealand Guidelines
AST	Above-ground storage tanks
BTEXN	Benzene, Toluene, Ethyl benzene, Xylenes (ortho and meta/para) and Naphthalene
CLM	Contaminated land management
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSM	Conceptual Site Model
CSSI	Critical State significant infrastructure
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DP	Deposited plan
EC	Electrical conductivity
EIL	Ecological investigation level
EIS	Environmental impact statement
EMS	Environmental Management Strategy
EPA	NSW Environmental Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPL	Environment Protection License
ESL	Ecological screening level
GIS	Geographical information system
HCM	High carbon material
HIL	Health Investigation Levels
HSL	Health Screening Levels
HTP	Hunter Transmission Project
HVO	Hunter Valley Operations
LEP	Local environmental plan
LGA	Local Government Area
LOR	Laboratory limit of reporting
m	metres
mAHD	metres relative to Australian Height Datum

mBGL	metres below ground level
NEPM	National Environment Protection Measure
NSW ASSMAC	NSW Acid Sulfate Soil Management Advisory Committee
NWQMS	National Water Quality Management Strategy
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PFAS	Per and poly fluoro alkyl substances
POEO	Protection of Environment Operations
PSI	Preliminary site investigation
SAQP	Sampling Analysis and Quality Plan
SEARs	Secretary's environmental assessment requirements
SMA	Singleton Military Area
SWIL	Surface water investigation level
SWMP	Soil and Water Management Plan
TRH	Total Recoverable Hydrocarbon
UST	underground storage tank
UFP	Unexpected finds procedure
UXO	Department of Defence unexploded ordnance

Executive summary

Introduction

The Hunter Transmission Project (HTP, the project) involves the construction of a new overhead 500 kilovolt (kV) transmission line of around 110 kilometres connecting the existing 500 kV transmission line at Bayswater to the existing 500 kV transmission line in the Olney State Forest near Eraring in the Hunter region of New South Wales (NSW).

Due to its strategic importance, the NSW Minister for Planning and Public Spaces has declared the HTP to be critical State significant infrastructure (CSSI) under the [NSW Environmental Planning and Assessment Act 1979](#) (EP&A Act).

Under this process, the Energy Corporation of NSW (EnergyCo, the proponent) is required to prepare an environmental impact statement (EIS) in accordance with the *NSW Environmental Planning and Assessment Regulation 2021*. This Contamination Assessment accompanies the EIS for the HTP and addresses the Secretary's environmental assessment requirements (SEARs) issued on 13 August 2024.

The project involves:

- a new overhead 500 kilovolt (kV) double circuit transmission line of around 100 kilometres
- two new switching stations (Bayswater South and Olney)
- upgrades to the existing Bayswater and Eraring substations
- adjustments to existing transmission lines
- ancillary works to support construction including road upgrades, establishment of new access tracks and upgrades to existing access tracks, construction support sites (some with temporary worker accommodation), and other construction facilities such as laydown areas.

Legislative and policy context

Contamination impacts to and from this project have been assessed in accordance with the relevant legislation and guidelines. Key legislation considered as part of this assessment is the *Contaminated Land Management Act 1997 (NSW)*.

Purpose of this report

This technical report assesses the potential impacts from contamination in relation to the construction and operation of the project. It has been prepared to support and inform the environmental impact statement (EIS). This assessment comprises a preliminary site investigation (also referred to as Phase 1) which assesses the potential for contamination to exist in the contamination study area. The preliminary site investigation is based on a desktop study.

Methodology

Contamination study area

The project would be constructed within the construction impact area, which refers to the area that would be directly impacted by construction including (but not limited to) transmission towers and lines, stringing sites, switching stations, construction support sites and laydown, staging areas, access tracks and intersection upgrades.

For the purposes of this assessment the project would be located within the contamination study area. The contamination study area for this EIS comprises a 500 metre (m) buffer around the project impact area.

Approach to assessment

This technical report constitutes a preliminary (Phase 1) site investigation and has been conducted in general accordance with the framework for assessment of site contamination outlined in the National Environment Protection (Assessment of Site Contamination) Measure 2013 (NEPM 2013). Specifically, this assessment comprises:

- the identification of potential areas of Acid Sulfate Soils, soil salinity and naturally occurring asbestos which may be disturbed by the project
- a review of publicly available information to identify current or historical potentially contaminating land uses and subsequent identification of potential areas of contamination concern
- the identification and assessment of potential sources of contamination, pollution linkages and receivers to determine a preliminary conceptual site model associated with the construction and operation of the project
- a construction phase impact assessment which identifies potential contamination impacts based on the current understanding of the existing contamination potential of the land within which the project is located, and the likely construction methodology as included and assessed in the EIS. A qualitative risk ranking is used to determine whether these potential impacts during construction are significant
- an operational phase impact assessment which identifies whether any long-term operational or maintenance activities have the potential to impact on land suitability
- the development of recommended mitigation measures to avoid, minimise and manage potential contamination impacts from construction and operation of the project, as relevant.

Potential impacts

High and medium risk contamination sources were identified within the contamination study area associated with 3 mine sites (Hunter Valley Operations (HVO), Mt Thorley (Warkworth Mine) and Bulga Coal Mines). A medium risk was assigned for the Singleton Military Area (SMA) and Redbank Power Station. A high risk was assigned to the Bayswater and Eraring Power Stations and Dyno Nobel Warkworth facility. These areas of contamination concern have been assessed to pose a medium-high risk during construction.

Outside of the mine lease areas the project impact area did not appear to be affected by broad-scale contamination. Most of the construction impact area is undisturbed native vegetation and open grazing land, with only minimal contamination concerns identified. Several farm dams (more than 40) and farm infrastructure were identified which represent a medium risk for isolated contamination associated with the accumulation of nutrients and pesticides from adjacent agricultural activities.

Operational impacts have been assessed as low and would be managed with an operational environmental management system.

Management measures

The mitigation measures detailed in this technical report are expected to reduce or minimise any impacts to levels generally considered acceptable for the works. Residual risks will be managed through an Environmental Management Strategy (EMS). If unexpected contamination is identified during site works, appropriate management and remediation measures will need to be implemented using the unexpected finds protocol.

1 Introduction

The Hunter Transmission Project (HTP, the project) involves the construction of a new overhead 500 kilovolt (kV) transmission line of around 110 kilometres connecting the existing 500 kV transmission line at Bayswater to the existing 500 kV transmission line in the Olney State Forest near Eraring in the Hunter region of New South Wales (NSW).

Due to its strategic importance, the NSW Minister for Planning and Public Spaces has declared the HTP to be critical State significant infrastructure (CSSI) under the [NSW Environmental Planning and Assessment Act 1979](#) (EP&A Act).

Under this process, the Energy Corporation of NSW (EnergyCo, the proponent) is required to prepare an environmental impact statement (EIS) in accordance with the [NSW Environmental Planning and Assessment Regulation 2021](#).

This preliminary site investigation (PSI) (also referred to as Phase 1 contamination assessment) accompanies the EIS for the HTP and addresses the [Secretary's Environmental Assessment Requirements](#) (SEARs) issued on 13 August 2024 (see Table 1.1). The PSI assesses the potential for contamination within the construction impact area based on a desktop study. This assessment also includes a qualitative assessment of the potential for the project to cause contamination during construction and operation.

In addition to the SEARs, advice from several government agencies was received on the HTP. Agency advice relevant to and considered in this PSI is provided on the [Major Projects website](#) maintained by the NSW Department of Planning, Housing and Infrastructure (DPHI).

Table 1.1 HTP SEARs – PSI

Reference	Assessment requirements	Section where it is addressed
Contamination	An assessment of the risk of soil contamination and disturbance of land (including associated with natural occurring asbestos, acid sulfate soils and salinity) in the vicinity of the site; including:	<i>Chapter 4, 5 and 6</i> <i>Section 6.1 (risk assessment)</i>
	— characterisation of the nature and extent of any contamination on the site and surrounding area.	<i>Section 6.1 (risk assessment)</i>
	— identification of any construction activities that could disturb or interact with any contaminated soil, groundwater or surface water, including PFAS.	<i>Section 6.1 (risk assessment)</i>
	— details of measures to manage contaminated impacted soils, groundwater or surface water that may be encountered during construction.	<i>Chapter 8</i>
	— if required, a contaminated land report prepared by a certified consultant in accordance with guidelines made or approved by the EPA under s105 of the <i>Contaminated Land Management Act 1997</i> , the Regulation, and the State Environmental Planning Policy (Resilience and Hazards) 2021, including reference to the PFAS National Environmental Management Plan 2.0 (Heads of EPAs of Australia and New Zealand, 2020) (NEMP).	<i>Not applicable to this project – a contaminated land report not required under the CLM Act</i>

2 The Hunter Transmission Project

The Hunter Transmission Project (HTP, the project) is Critical State Significant Infrastructure (CSSI). It must be built by the end of 2029 to protect energy security in NSW as the remaining coal-fired power stations close.

The project includes:

- a new overhead 500 kilovolt (kV) double circuit transmission line of around 100 kilometres
- two new substations (Bayswater South and Olney)
- upgrades to the existing Bayswater and Eraring substations
- adjustments to existing transmission lines
- ancillary works to support construction including road upgrades, establishment of new access tracks and upgrades to existing access tracks, construction support sites (some with temporary worker accommodation), and other construction facilities such as laydown areas.

The new transmission line will transport electricity generated in the Central-West Orana and New England Renewable Energy Zones (REZs). It will connect the existing 500 kV transmission line at Bayswater to the existing 500 kV transmission line in the Olney State Forest near Eraring. This will strengthen the State's core electricity grid and supply clean and reliable energy to NSW consumers for generations to come.

The HTP involves development across 5 local government areas (Muswellbrook, Singleton, Cessnock, Central Coast and Lake Macquarie). Most of this development will be concentrated in and around the HTP corridor.

An overview of the project is provided in Table 2.1 and shown in Figure 2.1.

The key project elements are shown in Figure 2.2.

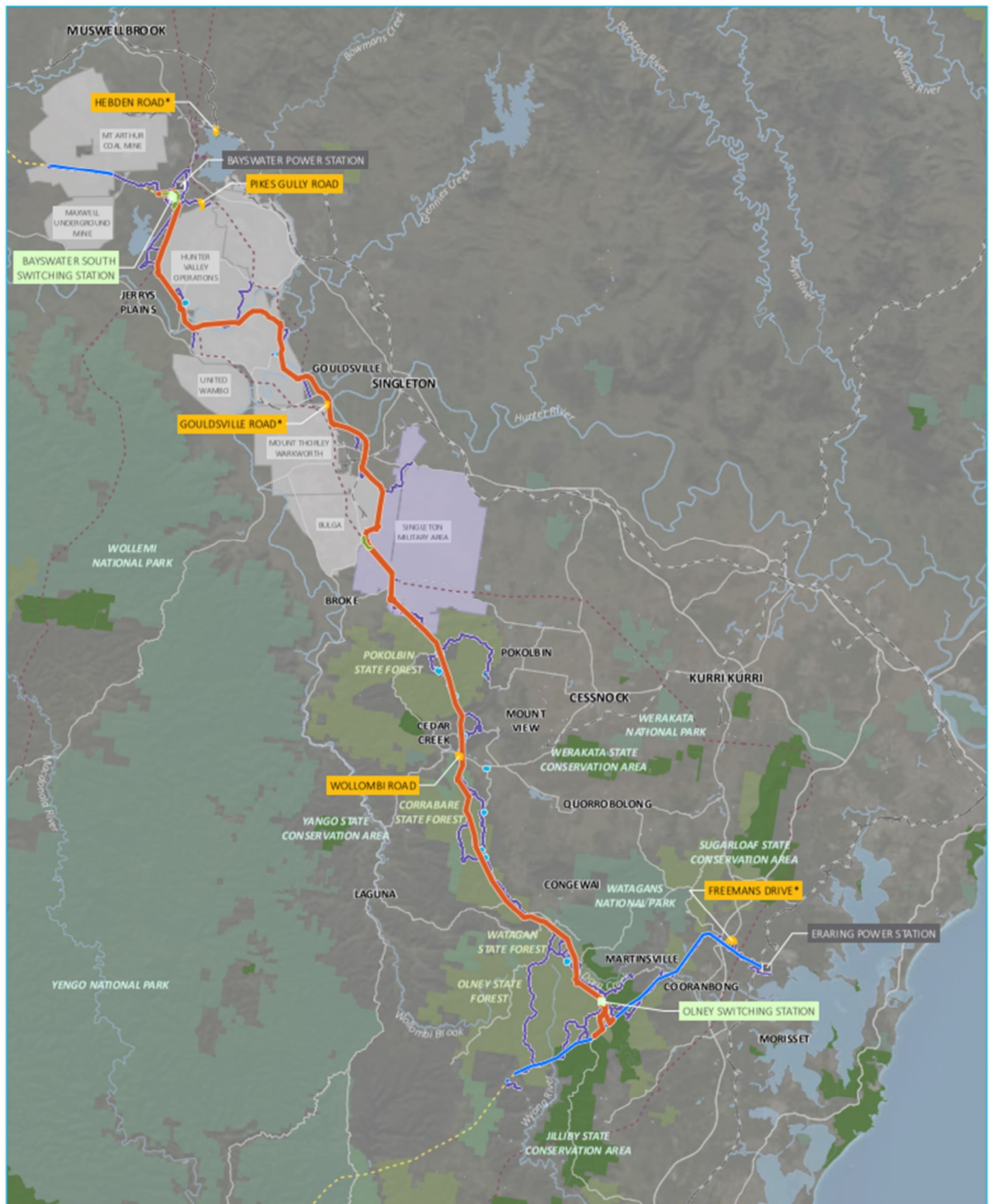
Further details are provided in *Chapter 4 (Project description)* of the HTP environmental impact statement (EIS).

Table 2.1 Project overview

The project	— The critical State significant infrastructure application for the HTP covers 5 local government areas. — Most development will be concentrated in and around the HTP corridor. Some ancillary development such as construction support sites and temporary worker accommodation, road upgrades and laydown areas would be outside the HTP corridor
Project impact area	— The area that has been assumed for the purpose of this EIS to be directly affected by the construction and operation of the project. It includes the indicative location of project infrastructure, the area that would be directly disturbed during construction and any easement required during operation.
Construction and operation	— Construction impact area around 2351 ha — Operation impact area around 1261
Disturbance area	— Disturbance area around 1266 ha. — Disturbance area A around 683 ha. — Disturbance area A (centreline) around 214 ha. — Disturbance area B around 367 ha. — Disturbance area HZ around 1.84 ha.
New transmission line and transmission towers	— Overhead 500 kV double circuit transmission line of around 110 km between Bayswater South 500 kV switching station and Olney 500 kV switching station — Steel lattice towers up to 85 m high and that are spaced anywhere between 75 m to around 1.3 km apart (typically between 300 m and 600 m) — 500 kV transmission lines with a minimum ground clearance of 13.5 m.

	— Ancillary infrastructure such as earth wire and communications systems. — Construction easement of around 140 m wide. — Operational easement around 70 m wide.
Switching stations/ substation works	— New Bayswater South 500 kV switching station – construction impact area around 26.6 ha — Modifications at the existing Bayswater 500 kV/330 kV substation within the existing footprint — New Olney 500 kV switching station – construction impact area around 20 ha — Augmentation and modifications at the existing Eraring 500 kV/330 kV substation, including installation of 2 new transformers
Adjustments and crossings – existing transmission lines	— Adjustments to existing double circuit 500 kV transmission lines: — Line 5A1 and 5A2: Eraring – Kemps Creek 500 kV at Ravensdale to connect to the new Olney 500 kV switching station — Line 5A3: Bayswater – Mt Piper 500 kV at Bayswater to connect to the new Bayswater South 500 kV switching station — Line 5A4: Bayswater – Wollar 500 kV at Bayswater to connect to the new Bayswater South 500 kV switching station — Adjustments to existing double circuit 330 kV transmission lines: — Line 31: Bayswater – Regentville 330 kV — Line 32: Bayswater – Sydney West 330 kV — Line 81: Newcastle – Liddell 330 kV — Crossing of existing double circuit 330 kV transmission lines: — Line 31: Bayswater – Regentville 330 kV at Bayswater — Line 32: Bayswater – Sydney West 330 kV at Bayswater — Line 81: 330 kV: Newcastle – Liddell 330 kV at Lemington and again at the Singleton Military Area — Line 82: 330 kV: Tomago – Liddell 300 kV at Warkworth and again at the Singleton Military Area
Upgrades – existing transmission lines and towers	— Upgraded earth wire on Line 5A3 and Line 5A4 — Upgraded earth wire and communications systems on Line 5A1 and Line 5A2 — Tower strengthening on various existing towers on Line 5A1, Line 5A2, Line 5A3 and Line 5A4
Road works	— Modifications to the existing public road network. — New and upgraded access tracks for construction and operation.
Construction support sites	— Five construction support sites: Hebden Road, Pikes Gully Road, Gouldsville Road, Wollombi Road and Freemans Drive — Helicopter pads (helipads) indicatively at: Hebden Road, Pikes Gully Road, Gouldsville Road and Freemans Drive
Ancillary sites	— Laydown areas, which would be established to allow for flexibility in construction and to minimise the need for vehicle movements to and from the construction support sites

Utility adjustments	— Third party utility works including gas, telecommunications, water, sewer and stormwater
Timing	— Construction to start in 2026 — Operation by the end of 2029



Source: EMM (2025); Beca (2025); ESRI (2025); DCSSS (2024); FCNSW (2022); DFSI (2017)

KEY

Project impact area

HTP corridor

Switching station

Construction support site (*with temporary worker accommodation)

Laydown area

Adjustment to existing transmission line

Upgrades to existing transmission line

Access track

Existing environment

Power station

330 kV transmission line

500 kV transmission line

Railway

Major road

Named watercourse

Named waterbody

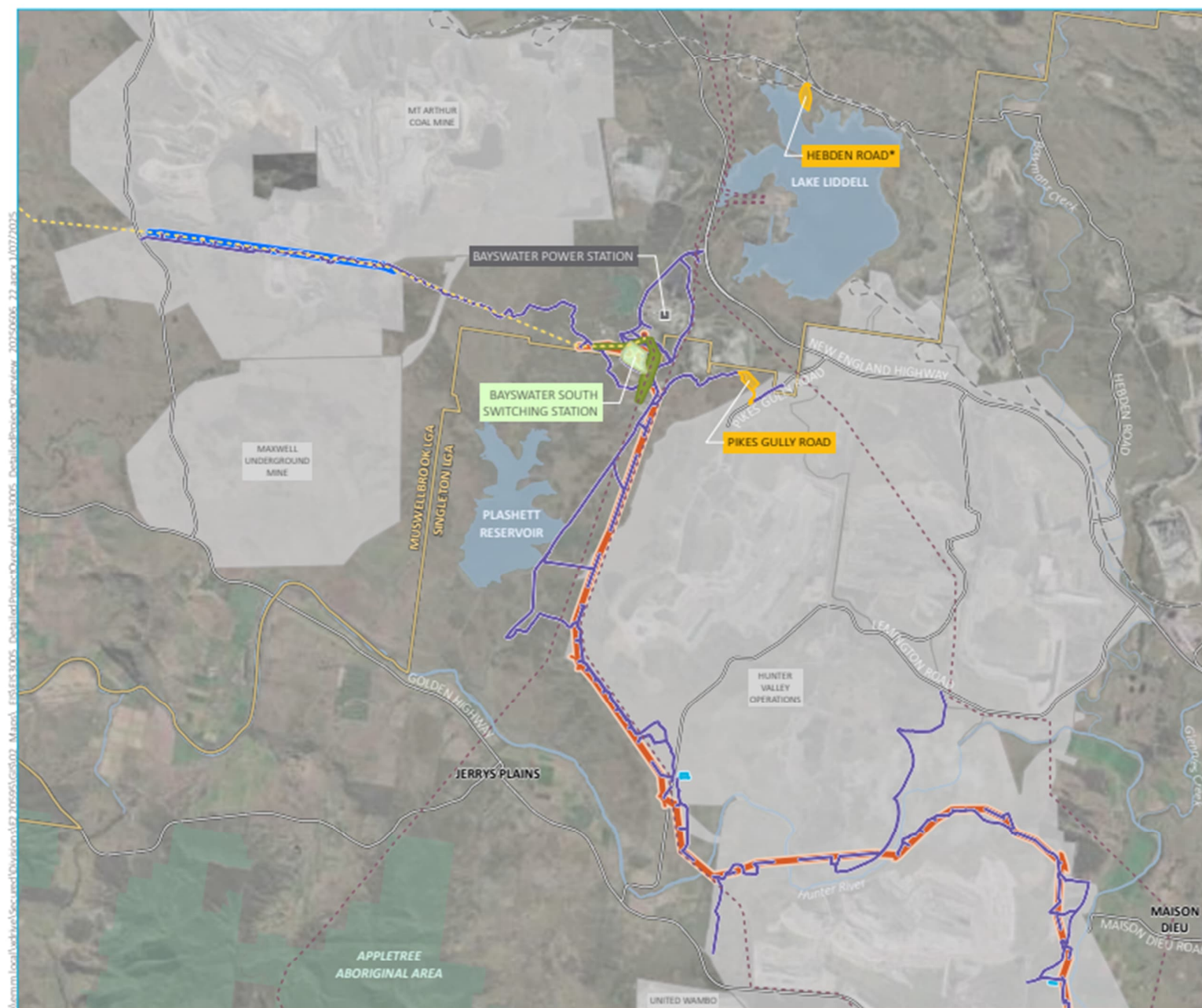
NPWS reserve

State conservation area

State forest

Defence

Mining



KEY

Project impact area

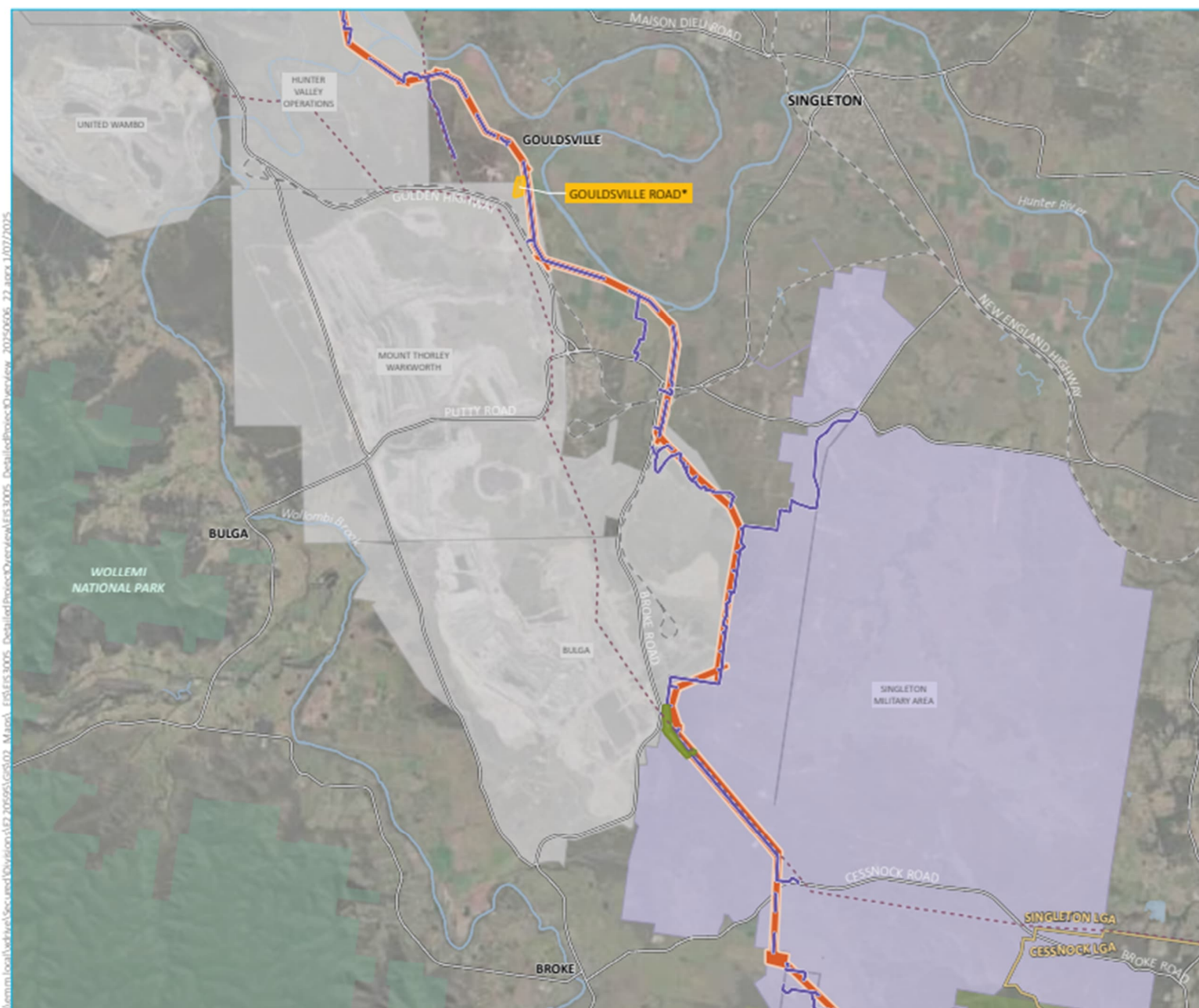
- HTP corridor
- Bayswater South switching station
- Construction support site (*with temporary worker accommodation)
- Laydown area
- Adjustment to existing transmission line (lines 31 and 32)
- Upgrades to existing transmission line (lines 5A3 and 5A4)
- Access track

Existing environment

- Power station
- 330 kV transmission line
- 500 kV transmission line
- Railway
- Major road
- Named watercourse
- Named waterbody
- NPWS reserve
- Mining
- Local government area

Source: EMM (2025); Beca (2025); ESRI (2025); DCSSS (2024); FCNSW (2022); ABS (2021); DFSI (2017); GA (2009)





KEY

Project impact area

HTP corridor

Construction support site (*with temporary worker accommodation)

Adjustment to existing transmission line (line 81)

Access track

Existing environment

330 kV transmission line

Railway

Major road

Named watercourse

Named waterbody

NPWS reserve

State forest

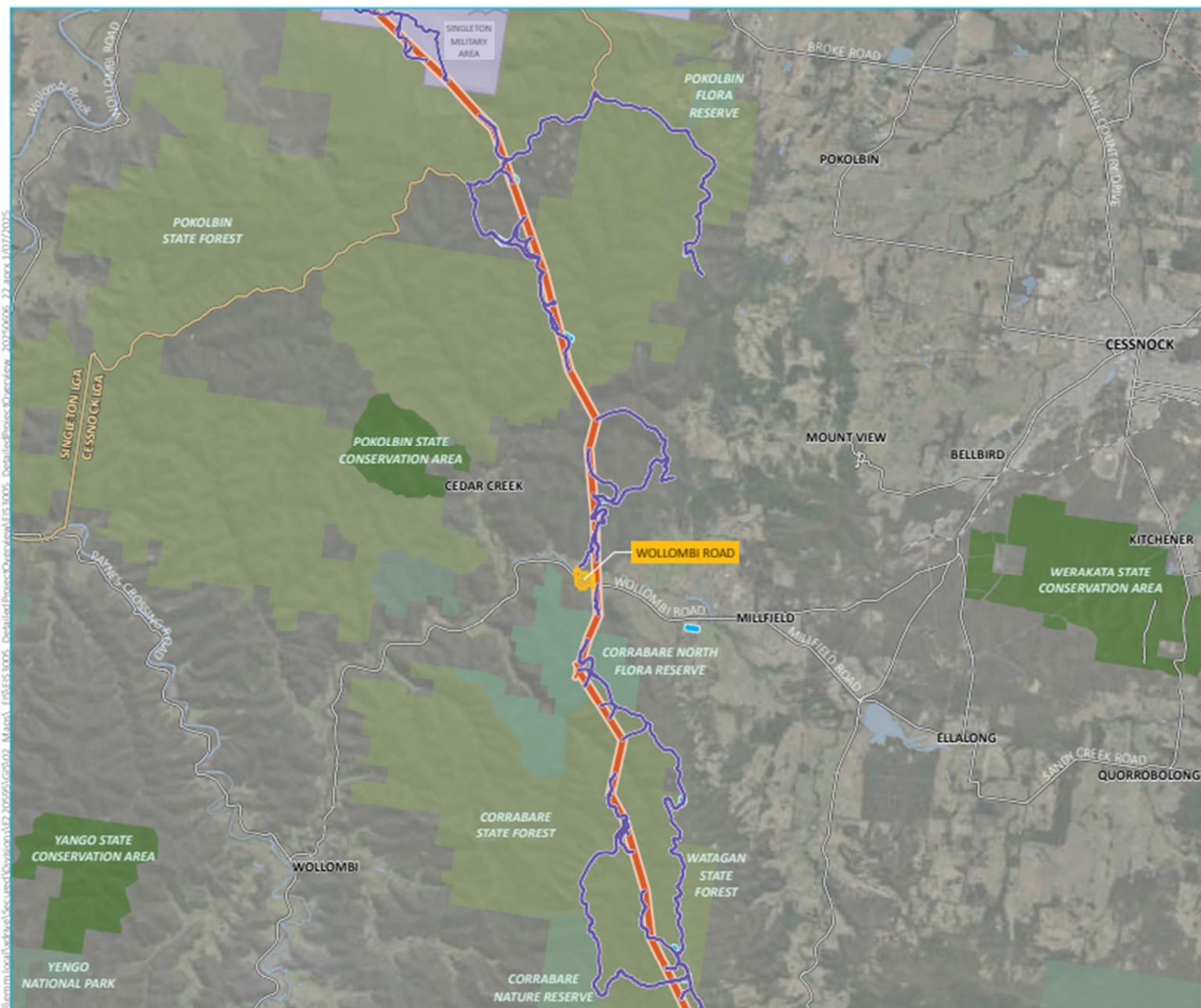
Defence

Mining

Local government area

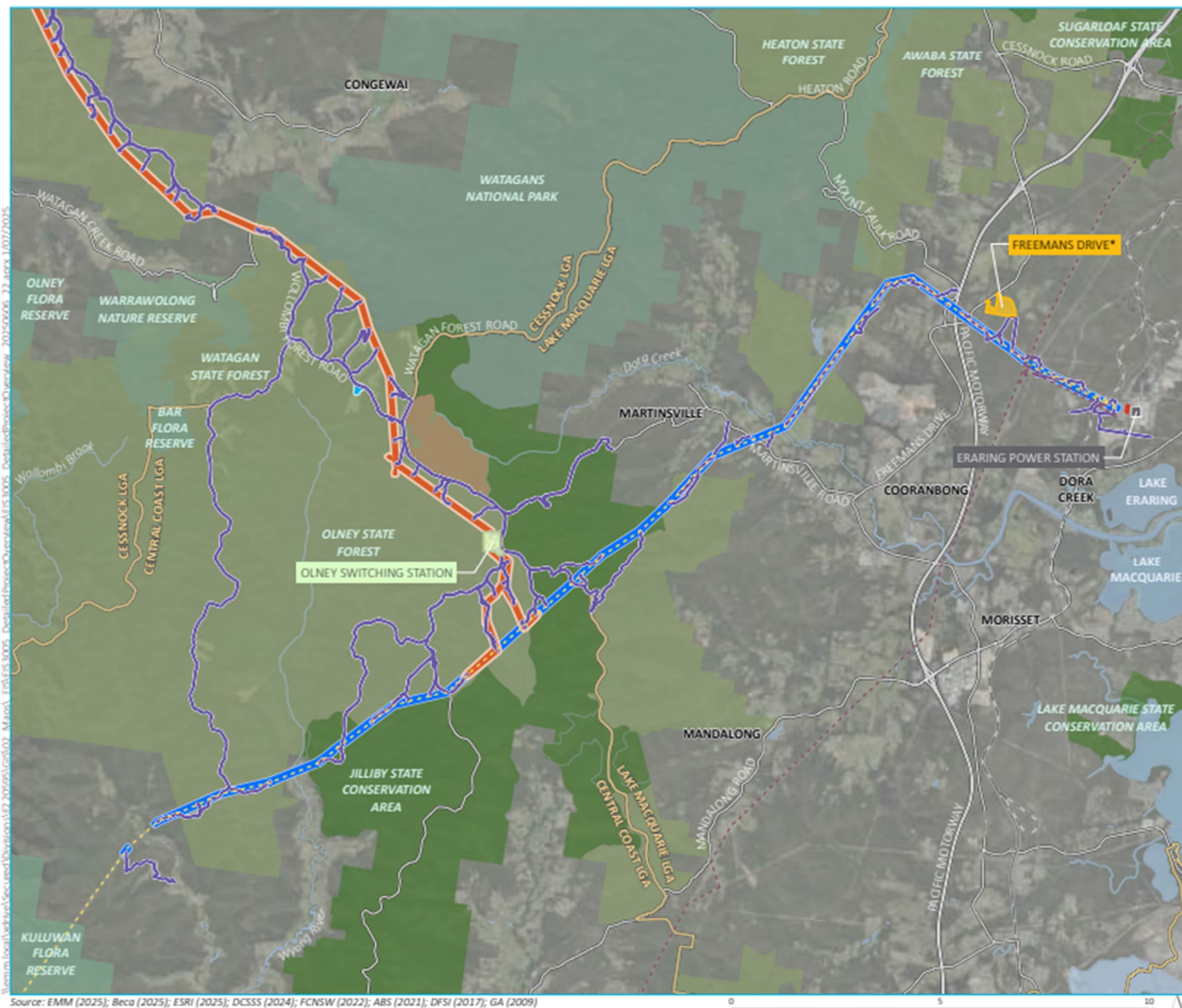
Source: EMM (2025); Beca (2025); ESRI (2025); DCSSS (2024); FCNSW (2022); ABS (2021); DFSI (2017); GA (2009)





- KEY**
- Project impact area
 - HTP corridor
 - Construction support site (*with temporary worker accommodation)
 - Laydown area
 - Access track
 - Existing environment
 - 330 kV transmission line
 - Railway
 - Major road
 - Named watercourse
 - Named waterbody
 - NPWS reserve
 - State conservation area
 - State forest
 - Defence
 - Local government area

Source: EMM (2025); Beca (2025); ESRI (2025); DCSSS (2024); FCNSW (2022); ABS (2021); DFSI (2017); GA (2009)



KEY

Project impact area

- HTP corridor
- Olney switching station
- Construction support site (*with temporary worker accommodation)
- Laydown area
- Eraring Substation upgrade
- Upgrades to existing transmission line (lines 5A1 and 5A2)
- Access track

Existing environment

- Power station
- 330 kV transmission line
- 500 kV transmission line
- Railway
- Major road
- Named watercourse
- Named waterbody
- NPWS reserve
- State conservation area
- State forest
- Recreation area
- Local government area

3 Legislation, policies, plans and guidelines

3.1 Setting the context

Approval for the project is required in accordance with the (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act). In July 2022, the minister declared the HTP to be CSSI under section 5.13 of the EP&A Act and clause 2.15 of State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP). The full declaration of the project is provided in clause 30 of Schedule 5 of the Planning Systems SEPP.

EnergyCo referred the project to the Commonwealth Minister for the Environment and Water in May 2024 due to the potential for the project to significantly impact several listed threatened species or communities, and as a result of impacts to Commonwealth land, where the project intersects the Singleton Military Area (SMA). The Department of Climate Change, Energy, the Environment and Water (DCCEEW), as delegate for the Australian Minister for the Environment, determined on 14 March 2025 that the project is a controlled action and that it would be assessed under the NSW Assessment Bilateral Agreement.

This chapter provides a summary of the relevant State and Commonwealth legislative, policy and guideline context for the project as it relates to contamination.

3.2 Commonwealth legislation

3.2.1 *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by DCCEEW and provides a legal framework to protect and manage nationally important flora, fauna, ecological communities and heritage places defined as ‘matters of national environmental significance’.

Under the EPBC Act, proposed actions (i.e. activities or projects) with the potential to significantly impact matters protected by the EPBC Act must be referred to the Australian Minister for the Environment to determine whether they are controlled actions, requiring approval from the Minister. The following matters are defined as protected matters by Part 3 of the EPBC Act:

- matters of national environmental significance
- the environment of Commonwealth land
- the environment in general if they are being carried out by an Australian Government agency.

The project area transects Commonwealth Land at the Singleton Military Area (SMA) as such, the EPBC Act has been considered in this assessment through an assessment of whether project activities are likely to have significant impacts on the environment. The Department of Sustainability, Environment, Population Water and Communities 2013 ‘*Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies significant impact guidelines 1.2 Environment Protection and Biodiversity Conservation Act 1999*’ (DSEPMC 2013), Step 4 identifies a list of criteria which provide general guidance on the types of actions that are likely to have a significant impact on the environment. For this paper the assessment considers whether pollutants, chemicals, and toxic substances are present on the land and whether there is a real chance or possibility that the project would:

- substantially disturb contaminated or acid-sulphate soils
- result in the release, leakage, spillage, or explosion of flammable, explosive, toxic, radioactive, carcinogenic, or mutagenic substances, through use, storage, transport, or disposal.

3.3 NSW Legislation

3.3.1 *Protection of the Environment Operations Act 1997*

The *Protection of the Environment Operations Act 1997* (POEO Act) provides the legislative framework for the protection and enhancement of the environment in NSW. Its primary objectives are to reduce risks to harmless levels through pollution prevention, cleaner production, application of waste management hierarchy, continual environmental improvement and environmental monitoring.

3.3.2 *Contaminated Land Management Act 1997*

The *Contaminated Land Management Act 1997* (CLM Act) is part of the management framework for contaminated land in NSW. The CLM Act enables the NSW Environment Protection Authority (the EPA) to respond to and manage site contamination when it considers that contamination is significant enough to require regulation. Site contamination requires regulation under the CLM Act when a site is declared ‘significantly contaminated land’ (defined as land described in a notice having effect under section 11 of the CLM Act) or when land is subject to a management order or an approved voluntary management project. At the time of undertaking this assessment, there was no land(s) within the contamination study area that is known to be declared as ‘significantly contaminated land’ or subject to a management order under the CLM Act.

The CLM Act outlines the circumstances in which notification to the EPA is required in relation to the contamination of land. This may become relevant during construction of the project if contamination is encountered.

Section 105 of the CLM Act allows the EPA to make or approve guidelines for the purposes connected with the objectives of the CLM Act. Contaminated sites not regulated by the EPA can be managed through the planning process by the relevant planning consent authority.

The EPA holds records of sites that have been notified under section 60 of the CLM Act or otherwise reported to the EPA. This assessment includes a search of the record of sites held by EPA to identify sites which may impact soil and/or groundwater quality within the contamination study area.

3.4 Policy, standards and guidelines

3.4.1 *National Environment Protection (Assessment of Site Contamination) Measure 1999 as amended in 2013*

The National Environment Protection (Assessment of Site Contamination) Measure 2013 (NEPM 2013) is made under the *National Environment Protection Council Act 1994* to establish a nationally consistent approach to the assessment of site contamination to ensure sound environmental management practices by the community, which includes regulators, site assessors, environmental auditors, landowners, developers, and industry. The NEPM is given effect by individual legislation and guidelines in each State and territory and in NSW is approved by the EPA under section 105 of the CLM Act.

The desired environmental outcome for the NEPM 2013 is to provide adequate protection of human health and the environment, where site contamination has occurred, through the development of an efficient and effective national approach to the assessment of site contamination.

Authorities at local and state government level that consent to development or changes in land use are required to consider the land’s suitability for its intended use. To determine if a site is suitable, a site’s history of use and whether it is indicative of potential contamination should be considered.

Under the NEPM 2013, site contamination assessment is generally carried out in stages involving progressively more detailed levels of data collection and analysis, such as a Phase 1 contamination assessment, detailed site investigations and site-specific risk assessment.

This technical report includes a Phase 1 contamination assessment, which assesses the potential for contamination to exist based on a desktop study and review of previous reports/assessments undertaken within the contamination study area.

In general, as per the guidance in the NEPM 2013, to achieve the desired environmental outcome, the process of the assessment of site contamination should be placed within the context of the broader site assessment and management process.

3.4.2 *National Water Quality Management Strategy*

The *National Water Quality Management Strategy* (NWQMS) (Australian Government 2018) aims to protect the nation's water resources by improving water quality while supporting the businesses, industry, environment, and communities that depend on water for their continued development. The main policy objective of the NWQMS is to achieve sustainable use of water resources, by protecting and enhancing their quality, while maintaining economic and social development.

The NWQMS includes water quality guidelines that define desirable ranges and maximum levels for specific parameters that can be allowed (based on scientific evidence and judgement) for specific uses of waters or for protection of specific values. They are generally set at a low level of contamination to offer long-term protection of environmental values. The NWQMS water quality guidelines include the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG 2018) and the *Australian Drinking Water Guidelines* (NHMRC 2011).

3.4.3 *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*

The *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG 2018) is a key guideline within the NWQMS that is used to identify catchment and watercourse specific water quality management goals. These guidelines are an updated version of the previous guidelines referred to as the ANZECC 2000 guidelines.

The ANZG 2018 guidelines provide a process for assessing existing water quality conditions and developing water quality objectives to sustain current or likely future community values for water resources. Default guideline values for parameters are provided for different community values as generic starting points for assessing water quality where site specific information is not available. The default guideline values are used to evaluate the existing water quality conditions against long term water quality goals.

The ANZG 2018 guidelines provide the most up to date databases to derive guideline values for toxicants and sediments in aquaculture and aquatic foods, physical and chemical stressors, and guideline values for agricultural water users. Where the ANZG 2018 does not provide a value, the values as used in the previous ANZECC 2000 guidelines still apply.

The default guideline values have not been designed for direct application in activities such as discharge licences, recycled water quality or stormwater quality. These values are provided for various levels of protection of watercourses which are considered when describing the existing water quality and key indicators of concern. The level of protection applied in this assessment when assessing ambient water quality is for slightly disturbed to moderately disturbed ecosystems.

3.4.4 *Acid Sulfate Soil manual*

Acid sulfate soils are naturally occurring soils, sediments, or organic substrates (e.g., peat) that are formed under waterlogged conditions. These soils contain iron sulphide minerals (predominantly as the mineral pyrite) or their oxidation products. In an undisturbed state below the water table, acid sulfate soils are benign. However, if the soils are drained, excavated, or exposed to air by a lowering of the water table, the sulphides react with oxygen to form sulfuric acid.

The management of acid sulfate soils is coordinated by the NSW Acid Sulfate Soil Management Advisory Committee (NSW ASSMAC), made up of representatives from various government organisations and other affected parties. The NSW ASSMAC published the *Acid Sulfate Soil Manual* (ASSMAC, 1998) to provide best practice guidance in the assessment and management of projects in areas potentially affected by acid sulfate soils in NSW.

The acid sulfate soil manual sets out a process (see Figure 3.1) which has been adopted for this assessment to decide whether acid sulfate soils is present on-site and how to mitigate potential impacts associated with its disturbance. The initial stage of this process establishes whether the general parameters of the proposed works are likely to affect acid sulfate soils if they are present (described in *Chapter 4*).

When works involving the disturbance of soil or a change in groundwater levels are proposed, the acid sulfate soils manual requires a preliminary assessment be undertaken to determine whether acid sulfate soils are present and if the proposed works are likely to disturb these soils. The purpose of the preliminary assessment is:

- to establish the characteristics of the proposed works (described in *Chapter 6*)
- to establish whether acid sulfate soils is present on the site and if they are at such concentrations to warrant the preparation of an acid sulfate soil management plan (review of published acid sulfate soil mapping is summarised in *section 5.2.4*)
- to provide information to assist in designing a soil and water assessment program (discussed in *Chapter 6*).

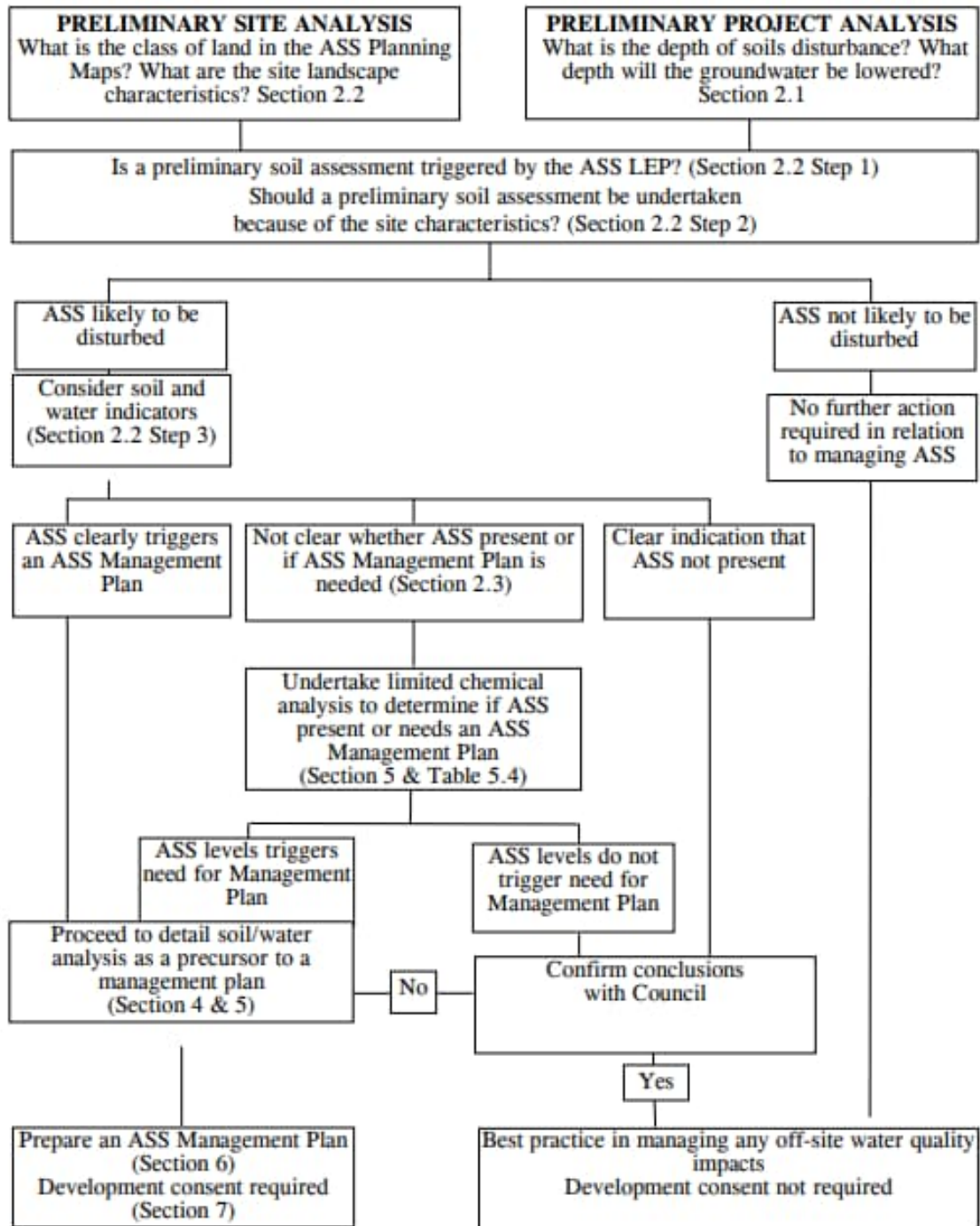


Figure 3.1 Preliminary assessment phase from the Acid Sulfate Soil Manual (Source: New South Wales – Acid Sulfate Soil Management Advisory Committee, 1998)

3.4.5 Managing asbestos in or on soil

The *Managing Asbestos in or on Soil guide* (SafeWork NSW 2014) provides general guidance on the assessment of asbestos in soil. Managing asbestos in soil has implications for the current and future occupants of the land and/or any worker employed to work within the project impact area. The principles underlying the guidance in this document are those endorsed by the NSW Heads of Asbestos Coordination Authorities and contained in the NSW Asbestos Blueprint (SafeWork NSW, 2017). Work health and safety, land use planning and environmental legislation, and the amended NEPM 2013 are referenced where they apply.

The NEPM 2013 emphasises that the assessment and management of asbestos contamination should consider the condition of the asbestos materials, the potential for damage, and the resulting release of asbestos fibres. Bonded asbestos in sound condition represents a low risk to human health. However, both friable and fibrous asbestos materials have a significantly higher potential to generate, or be associated with, free asbestos fibres, and may represent a significant human health risk if disturbed and fibres are made airborne.

The objective of the approach outlined in *Managing asbestos in or on soil guide* is to ensure that proportionate and practicable controls are applied per regulatory requirements and a manner commensurate with actual risk.

3.4.6 Other guidelines

Other guidelines, which are relevant to the management of contamination, were considered in the preparation of this technical report and shown in Table 3.1.

Table 3.1 Other guidelines

Guideline	Consideration of guideline in this technical report
Guidelines for the Assessment, Remediation and Management of Asbestos – Contaminated Sites in Western Australia (WA Department of Health 2009)	The guidelines provide a framework and best practice for the assessment, remediation, and management of asbestos-contaminated sites. The guidelines would need to be considered if there is an unexpected find(s) during construction which results in the need for an asbestos management plan to be prepared for the project.
Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997 (EPA 2015)	The guidelines detail circumstances in which contamination at a site triggers the requirement to notify the NSW EPA. The guidelines are made under section 105 of the CLM Act. The duty to report lies with landowners and those responsible for the contamination. The triggers would need to be considered if contamination is encountered within the construction impact area.
Guidelines for the NSW Site Auditor Scheme (3rd edition) (EPA 2017)	The guidelines describe the obligations of accredited site auditors undertaking site audits in NSW. The guidelines are made under section 105 of the CLM Act. These guidelines would need to be considered if reports are required to be prepared that may be reviewed by a site-auditor (e.g., investigation report or remediation action plan). This would only occur as a result of certain unexpected find incidents and the need would be determined at that time.
Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004)	The guidelines provide best practice guidance on erosion controls that need to be implemented during construction. The guidelines would need to be considered during the preparation of the Environmental Management Strategy (EMS) and associated Soil and Water Management Plan (SWMP) for the project.

Guideline	Consideration of guideline in this technical report
Per- and Poly-fluorinated Alkyl Substances (PFAS) National Environmental Management Plan 2.0 (Department of Agriculture, Water and the Environment 2020)	The PFAS National Environmental Management Plan (NEMP) establishes a practical basis for nationally consistent environmental guidance and standards for managing PFAS contamination. The plan has been developed by all jurisdictions and recognises the need for implementation of best practice regulation through individual jurisdictional mechanisms. It represents a how-to guide for the investigation and management of PFAS contamination and waste management.
Site Investigations for Urban Salinity (Department of Land and Water Conservation 2002) NSW DLWC (2002)	This guideline provides a methodology to assess and quantify the impact of salinity on a proposed urban development as well as the impact of the development on the salt and water processes.

4 Assessment methodology

4.1 Contamination study area

The contamination study area for this EIS comprises a 500 m buffer around the project impact area (shown in Figure 4.2). The project impact area would contain all construction related activities.

4.2 Approach to assessment

This technical report constitutes a preliminary (Phase 1) contamination assessment. The assessment methodology that has been used to prepare it is in general accordance with the framework for assessment of site contamination outlined in the NEPM 2013. The NEPM 2013 states that ‘the preliminary investigation and initial assessment of site contamination should consider the possibility of all forms of potential contamination based on past use’. The preliminary (Phase 1) contamination investigation should be sufficient to identify whether there is potential for contamination to exist on the land subject to assessment. Depending on the proposed use of the land subject to assessment, and the results of initial site history investigations, the assessment of a site may involve both preliminary (Phase 1) and detailed investigations. Many site investigations proceed in multiple stages due to the complexity of the site and the discovery of unexpected contamination. For this technical report, the staged process presented in NEPM 2013 is summarised in Figure 4.1.

This assessment also includes a qualitative assessment of the potential for the project to cause contamination during construction and operation.

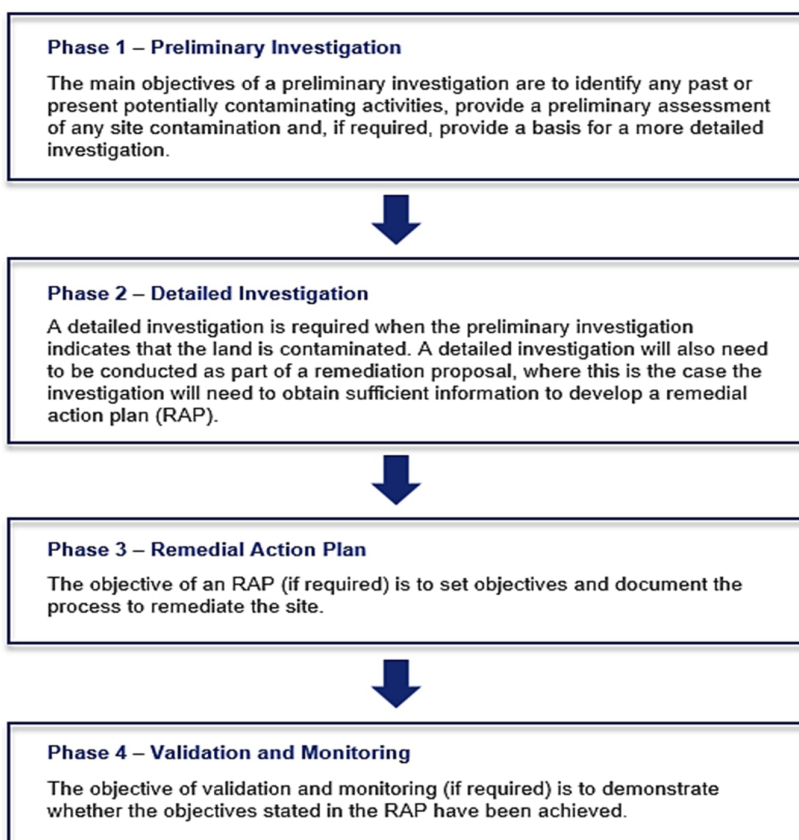
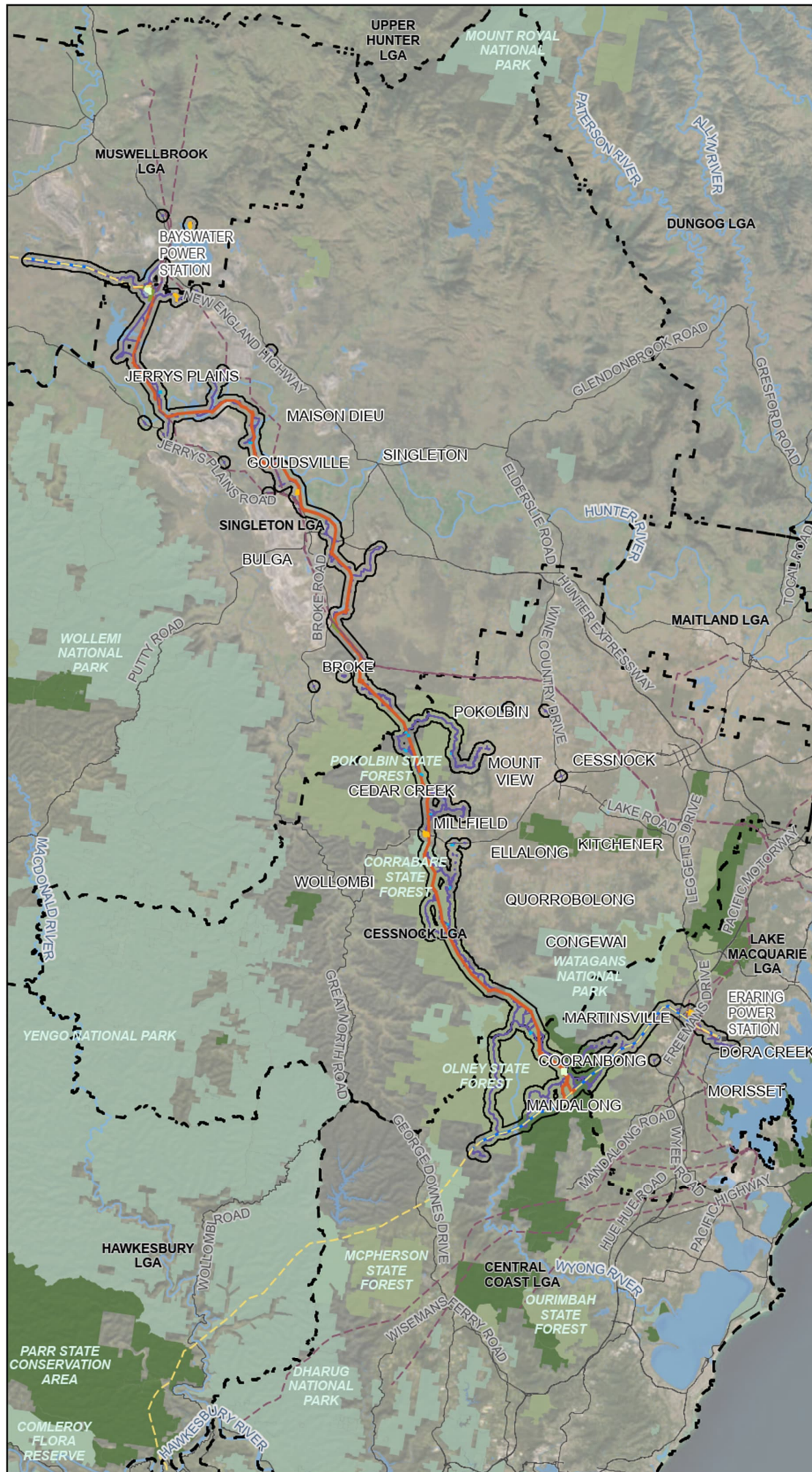
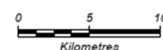


Figure 4.1 Staged site investigation process as presented in the NEPM 2013



Legend

- Study area
- Project impact area
 - HTP corridor
 - Switching station
 - Construction support site
 - Laydown area
 - Adjustment to existing transmission line
 - Upgrades to existing transmission line
 - Access track
- Existing environment
 - Road
 - Power station
 - 330 kV transmission line
 - 500 kV transmission line
 - River
 - Waterbody
 - NPWS reserve
 - State conservation area
 - State forest
 - Local government area



Coordinate system: GDA2020 MGA Zone 58
Scale ratio correct when printed at A4



1:500,000

Date: 26/02/2025

Data sources: EMM, Geoscience Australia, NSW State Government, WSP
World Imagery: Earthstar Geographics

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4.3 Preliminary site investigation methodology

This technical report comprises a preliminary (Phase 1) site investigation which assesses the potential for contamination to exist based on a desktop study and review of any available previous investigation reports and included the following key activities:

- a review of publicly available information to identify current or historical potentially contaminating land uses and subsequent identification of potential areas of contamination concern within the contamination study area completion of an inspection of selected publicly available and private (where authorised) areas along the alignment, noting:
 - identification of key site features
 - existing infrastructure
 - potential contamination sources.
- identification of potential areas of acid sulfate soils, soil salinity and naturally occurring asbestos which may be disturbed by the project in accordance with identified guidelines from *Chapter 3*
- identification and assessment of potential sources of contamination, pollution linkages and receivers to determine a preliminary conceptual site model (CSM) associated with the construction and operation of the project to inform the impact assessment of the project
- a construction phase impact assessment which identifies potential contamination impacts based on the current understanding of the existing contamination potential of the land within which the project is located, and the likely construction methodology as included and assessed in the EIS to identify the potential for the project to result in new contamination. A qualitative risk ranking is used to determine whether these potential impacts during construction are significant.
- an operational phase impact assessment which identifies whether any long-term operational or maintenance activities have the potential to impact on land suitability
- development of recommended mitigation measures to avoid, minimise and manage potential contamination impacts from construction and operation of the project, as relevant.

4.3.1 Desktop assessment

In preparing this technical report, the following sources of information were reviewed:

- databases to identify areas of known and potential contamination, including:
 - Department of Defence database for unexploded ordnance (UXO)
 - Australian Government Defence Singleton Military Area, Unexploded Ordnance Report, section 1, in Sector 4/Vere, Sector 7, Sector 8
 - Department of Primary Industries register of cattle dip sites
 - NSW EPA PFAS Investigation database
 - Defence PFAS investigation and management program
 - NSW EPA register of contaminated sites and list of notified sites, under sections 58 and 60 of the CLM Act, for sites located within 2 kilometres of the contamination study area
 - NSW EPA's environment protection licence records under section 308 of the POEO Act
 - NSW Government database of former gasworks sites.
- publicly available data and web-based information searches, background information relevant to the contamination study area, survey data, and topography including:
 - historical aerial photographs from the NSW Government Land and Property Information website
 - Australian Soil Resource Information System (maintained by the Commonwealth Scientific and Industrial Research Organisation (CSIRO))

- geology of the construction area (Geological Survey of New South Wales 1983)
- NSW Soil and Land Information System
- NSW Government acid sulfate soils risk mapping
- NSW Government’s Heads of Asbestos Coordination Authorities naturally occurring asbestos risk mapping
- maps published by the Geological Survey of NSW, former Department of Conservation and Land Management, and Australian Soils Resource Information System.

4.3.2 Field survey

Field surveys of selected areas within the contamination study area were conducted on 13 June 2024 by an appropriately qualified WSP senior contaminated land consultant. The surveys targeted specific areas of contamination concern (ACCs) identified through the preliminary desktop review to assess potential contamination risk of these ACCs to the project. Site inspections were undertaken at the following ACCs:

- Dyno Nobel Warkworth
- Dyno Nobel Mount Thorley
- Mushroom Composters
- SMA
- Bayswater Power Station
- Mount Thorley Industrial Estate
- Hunter Valley Operations
- Bulga Coal Mine Deep Pit.

It is noted that several private properties could not be accessed due to permission request not approved by the time of inspections. Where site access was not able to be obtained, observations were made from the site boundary. *Section 5.9* summarises the observations and findings of the field surveys.

4.4 Risk identification

Potential contamination risks associated with construction and operation were identified and rated according to likelihood, consequence, and overall level of risk, in general accordance with AS/NZS ISO 31000:2009 Risk management – Principles and guidelines.

4.4.1 Qualitative risk ranking

The assessment includes a preliminary evaluation of contamination risks, focusing on areas of concern in the absence of controls or remediation measures. This evaluation considers the likelihood of contamination and its potential consequences. By combining these factors using a risk matrix, the overall level of contamination risk is determined.

Likelihood

Categories and definitions for the likelihood of contamination to be present based on the assessment of current regulated activities, and historical land uses/activities within the contamination study area are described in Table 4.1.

Table 4.1 Likelihood for land contamination to be present

Likelihood	Description	Basis for ranking
High	Widespread contamination potentially present at concentrations above the relevant guideline criteria.	The available information indicates that the location(s) of contamination within the project impact area: — is currently identified as being contaminated on a public register of contaminated sites maintained by a regulator or has been the subject of an activity which is frequently associated with contamination.

Medium	Contamination potentially present at concentrations above the relevant guideline criteria and limited in extent.	The available information indicates that the location(s) within the project impact area: — is or has been the subject of an activity which in some circumstances is known to be associated with contamination — has been historically filled with imported material, the origin of which is unknown; and/or — has groundwater records indicating the potential for contamination. The available information indicates that land within 500 m of the project impact area: — is currently identified as being contaminated on a public register of contaminated sites maintained by a regulator — is or has been the subject of an activity which is frequently associated with contamination — has groundwater records indicating the potential for contamination — is identified as land that may be affected by naturally occurring asbestos or serpentine minerals.
Low	Contamination unlikely to be present above relevant guideline criteria and limited in extent.	The location(s) within the project impact area has been partially cleared for agricultural and/or infrastructure (including roads) purposes, however no distinct contamination sources have been identified. The available information does not indicate that land within 500 m of the construction impact area: — is currently identified as being contaminated on a public register of contaminated sites maintained by a regulator — is or has been the subject of an activity which is frequently associated with contamination — has groundwater records indicating the potential for contamination — is identified as land that may be affected by Naturally occurring asbestos or serpentine minerals.
Insignificant	No contamination sources identified.	The available information indicates that the location within the project impact area, or land within 500 m of the project impact area is generally undisturbed bushland.

Consequence

The consequence/pathway risk for identified contamination has been qualitatively classified as:

- **Minor:** minor localised levels of environmental impact or low levels of human exposure below the occupational exposure scenarios.
- **Moderate:** significant localised environmental impact or exposure to humans above occupational exposure scenarios
- **Significant:** off-site environmental impact or an immediate and/or long-term harm to human health or the environment.

Risk categories

The risk matrix combines likelihood and consequence to evaluate the construction risk associated with source pathway receptor scenarios.

A qualitative assessment and ranking of construction risk has been completed in Table 6.1 of this technical report, by assessing the pollutant linkages in the CSM and identifying a range of potential hazards. Potential risk associated with unexpected contamination finds have not been assessed. The following risk categories have been assigned:

- **Low risk:** impact can be managed by implementing standard construction management practices in accordance with relevant guidelines
- **Medium risk:** contamination specific management plans and controls are required
- **High risk:** engineered controls and/or environmental/health monitoring are required.

Table 4.2 Risk assessment matrix

Consequence/pathway	Likelihood			
	Insignificant	Low	Medium	High
Minor	Low	Low	Low	Medium
Moderate	Low	Low	Medium	High
Significant	Low	Medium	High	High

4.5 Limitations

The assessment completed within this technical report is based on datasets which were available at the date of the assessment and findings from available investigations. These datasets are continually updated as more information becomes available, and additional data obtained in the future may change the outcome of the assessment. As such, no expressed warranty is given by WSP in relation to the accuracy or completeness of the data reported, the actual state or condition of the project impact area, or the suitability of the site for any current or proposed use.

The datasets reviewed were selected to provide an indication of the presence of contamination on and surrounding the project impact area. However, they may not identify all historical uses and activities which may have caused the site and/or its surrounds to become contaminated. In particular, many sites are impacted by the presence of asbestos in fill material from unknown sources usually associated with poor demolition practices, for which a dataset is not available.

The technical report provides an indication of the likelihood of contamination to be present at, or impact, the project. It does not constitute advice as to the value of the project impact area, or the suitability of the project impact area for purposes other than the construction and operation of the project.

5 Existing environment

This chapter outlines the conditions of the existing environment as it relates to the HTP contamination study area.

The HTP corridor runs mostly through power station, mining and government land between Bayswater and Broke in the upper Hunter region. It then traverses the Pokolbin, Corrabare, Watagan and Olney State forests in the lower Hunter region (see Figure 2.1).

The proposed new transmission line would connect the new the Bayswater South switching station to the existing 500 kV transmission line near the Baywater Power Station and the new Olney switching station to the existing 500 kV transmission line between Eraring and Kemps Creek.

5.1 Topography and landscape

The Hunter Valley was formed as a wide valley with rolling hills carved by watercourses, including the Hunter River. These areas would have historically been dominated by open woodland and are now subject to pastoralism and coal mining activities that have resulted in modified landscapes.

The southern edge of the Hunter Valley is defined by sandstone plateaus that are intersected with steep ravines and gorges. Most of these mountainous plateaus are contained within the State forests.

The local topography varies substantially across the project impact area. The northern portion of the project impact area is in the Hunter Valley where the topography is a mix of fertile plains and undulating hills centred around the floodplains of the Hunter River. Elevations in the northern portion of the project area typically vary between 45 and 125 metres Australian Height Datum (AHD).

Towards the centre of the project impact area, relief increases, and the terrain is more rolling and gently undulating with low hills and ridges.

The southern half of the project impact area climbs up the Watagan mountain range, located in the Pokolbin, Corrabare, Olney and Watagan State forests. Elevations quickly ascend to greater than 500 metres AHD. The project continues along the mountain ridges and crosses several valleys for around 40 kilometres before descending into the Dora Creek valley of Lake Macquarie. In the southwest, the project terminates at Eraring substation adjacent to Lake Macquarie where elevations are around 10 to 20 metres AHD.

5.2 Soils and geology

5.2.1 Soil landscapes

The northern portion of the project impact area are dominated by the Dochra and Ravensworth Soil Landscapes (Hunter Region NSW DPIE 2020). This area is characterised by low undulating hills and creek flats overtopping sandstone, mud/siltstone, shale, tuff, coal and conglomerate. Much of this landscape type would have regular drainage lines (farming) and has been extensively cleared to enable livestock grazing and coal mining.

The central and southern areas are dominated by the Watagan Soil Landscape group throughout the State forests which are characterised by rolling to very steep hills and slopes, often containing sandstone boulders. Although soils in this landscape are located on steep slopes in areas with high rainfall, soils are stabilised by good groundcover. Access tracks, fire trails or areas exposed to bushfire experience rill erosion and/or sheet erosion.

The dominant soils in the project impact area are mapped as predominantly kurosols, sodosols, dermasols and rudosols, with some minor areas of tenosols and chromosols in south according to Australian Soil Classification (CSIRO 2016). The predominant soil types are typically loam and clay or a mixture of the 2.

Further details on soil landscapes related to soil composition and potential for erosion can be found in *Technical Report 9 – Soil and Land impact assessment*.

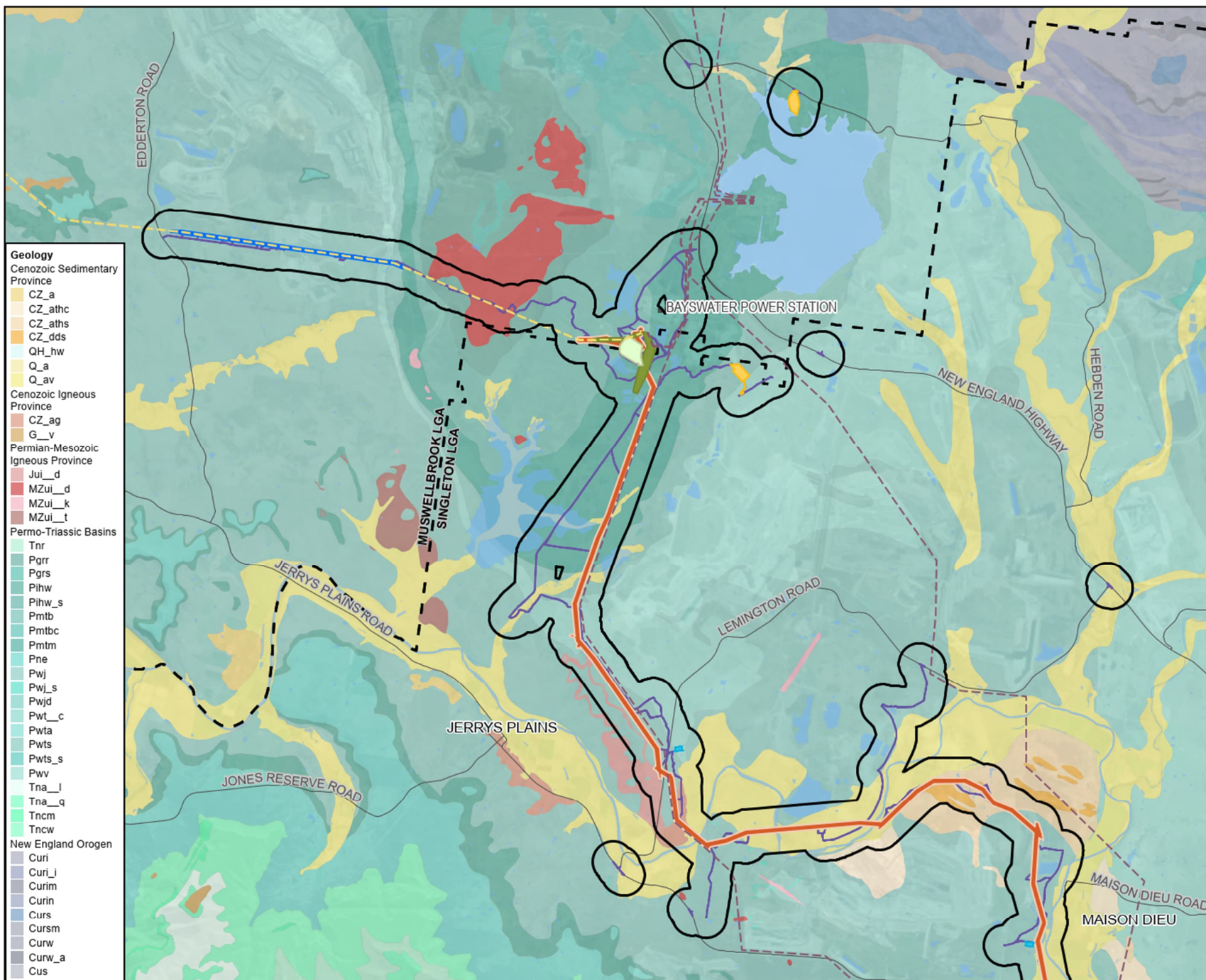
5.2.2 Regional geology

The project is located within the Singleton 1: 250,000 Geological Series Sheet (Soil Conservation Service of NSW, 1991). Reference to the NSW Seamless Geology dataset (data.nsw.gov.au/data/dataset/nsw-seamless-geology) indicates that the project is underlain by the units listed and described in Table 5.1 and mapped on Figure 5.1.

Table 5.1 Regional geological units

Unit name	Code	Description
Alluvial floodplain deposits	Q_af	Silt, very fine- to medium-grained lithic to quartz-rich sand, clay.
Alluvial valley deposits	Q_av	Silt, clay, (fluvially deposited) lithic to quartz-lithic sand, gravel.
Munmorah Conglomerate	Tncm	Medium- to coarse-grained lithic to quartz-lithic sandstone, granule to pebble polymictic conglomerate; minor siltstone and white claystone, thin lenticular coal seams.
Alluvial terrace deposits	QP_at	Silt, clay, (fluvially-deposited) fine- to medium-grained quartz-lithic sand, polymictic gravel.
Tuggerah Formation	Tnct	Grey to green-grey laminite, to red-brown claystone and siltstone, (in turn interbedded with) fine- to medium-grained green-grey sandstone.
Patonga Claystone	Tncp	Red-brown claystone and siltstone, light green-grey fine-grained sandstone.
Terrigal Formation	Tngt	Interbedded laminite, shale and fine- to coarse-grained quartz- to quartz-lithic sandstone; minor red claystone.
Grose Subgroup	Tnr	Cross-bedded, quartz to quartz-lithic sandstone, red-brown claystone and shale. Prominent cliff-forming unit in the Blue Mountains, comprising the basal Burra-Moko Head Sandstone, overlain by the Mount York Claystone, with the Banks Wall Sandstone (top).
Hawkesbury Sandstone	Tuth	Medium- to coarse-grained quartz sandstone with minor shale and laminite lenses.
Banks Wall Sandstone	Tnrb	Quartzose sandstone.
Burra-Moko Head Sandstone	Tnru	Quartzose to quartz-lithic sandstone.
Alluvium	Q_a	Unconsolidated grey to brown to beige humic (±)micaceous silty clay, quartz-(±)lithic silt, fine- to medium-grained quartz-rich to quartz-lithic sand, polymictic pebble to cobble gravel (as sporadic lenses); sporadic palaeosol horizons.
Newcastle Coal Measures	Pne	Fine- to medium-grained quartz-lithic sandstone, polymictic conglomerate, carbonaceous claystone, coal, laminated very fine-grained sandstone or siltstone with claystone/mudstone, tuffaceous claystone/mudstone; abundant plant fossils and bioturbation.
Jerrys Plains Subgroup	Pwj	Coarse-grained sandstone, fine- to medium-grained lithic (to quartz-lithic) sandstone, mudstone, coal seams and thin coaly partings, carbonaceous claystone, tuffaceous claystone and siltstone with fossil plant debris, pebble paraconglomerate.
Jerrys Plains Subgroup - sandstone	Pwj_s	Top: medium-grained sandstone and siltstone, coal and tuffaceous claystone. Middle: persistent coal seams cut by conglomerate and upward-

Unit name	Code	Description
		fining sandstone, tuffaceous claystone. Bottom: thick coal seam with fine sandstone and siltstone.
Saltwater Creek Formation	Pwts	Quartz-lithic sandstone with rare shaly partings and laminae, siltstone, tuffaceous claystone beds and sporadic thin coal plies.
Vane Subgroup	Pwv	Light-grey, fine- to medium-grained quartz-lithic sandstone, laminated siltstone, siltstone with fossil plant fragments, carbonaceous claystone, tuffaceous claystone and mudstone, sporadic pebble paraconglomerate, coal seams with bright and dull bands.
Mulbring Siltstone	Pmtm	Medium- to dark-grey siltstone, minor claystone, sporadic thin cherty beds (resistant), rare thin sandstone and limestone beds, sporadic marine fossils.
Muree Sandstone	Pmtu	Fine- to coarse-grained sandstone, conglomerate, minor claystone.
Branxton Formation	Pmtb	Conglomerate, sandstone, siltstone.
Alluvial gravel deposits	CZ_ag	Unconsolidated alluvial gravel, sand, silt and clay with variable humic content. Gravels commonly clast-supported.
Source-bordering dunes	CZ_dds	Red-brown to light-brown, poorly sorted to bi-modal, very fine- to medium-grained feldspathic quartz sand.
Alluvial terrace deposits - high-stand sand facies	CZ_aths	High-level sand and sandstone.
Alluvial terrace deposits - high-stand gravel facies	CZ_athc	High-level gravel and conglomerate.



- Geology**
- Cenozoic Sedimentary Province**
- CZ_a
 - CZ_athc
 - CZ_aths
 - CZ_dds
 - QH_hw
 - Q_a
 - Q_av
- Cenozoic Igneous Province**
- CZ_ag
 - G_y
- Permian-Mesozoic Igneous Province**
- Jui_d
 - MZui_d
 - MZui_k
 - MZui_t
- Permo-Triassic Basins**
- Tnr
 - Pqrr
 - Pgrs
 - Pihw
 - Pihw_s
 - Pmtb
 - Pmtbc
 - Pmtm
 - Pne
 - Pwj
 - Pwj_s
 - Pwj_d
 - Pwt_c
 - Pwta
 - Pwts_s
 - Pwv
 - Tna_l
 - Tna_q
 - Tncm
 - Tncw
- New England Orogen**
- Curi
 - Curi_l
 - Curim
 - Curin
 - Curs
 - Cursm
 - Curw
 - Curw_a
 - Cus

Legend

- Study area
- Project impact area
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- Adjustment to existing transmission line (lines 31 and 32)
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- Access track
- Existing environment
- Road
- Power station
- 330 kV transmission line
- 500 kV transmission line
- River
- Waterbody
- Local government area



0 2 4
Kilometres



Coordinate system: GDA2020 MGA Zone 56

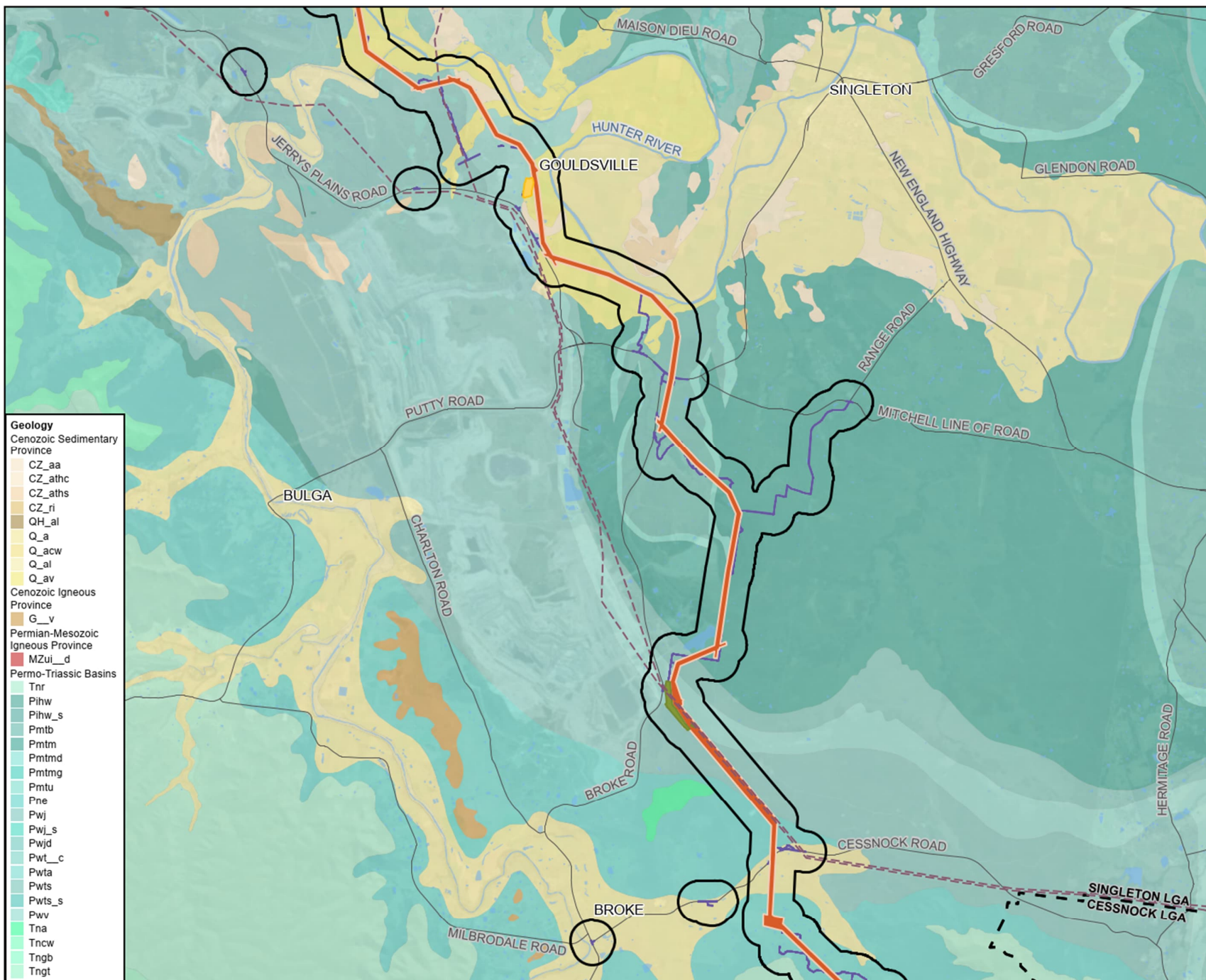
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Data sources: EMM, Geoscience Australia, NSW State Government, WSP

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Kilometres



Coordinate system: GDA2020 MGA Zone 56

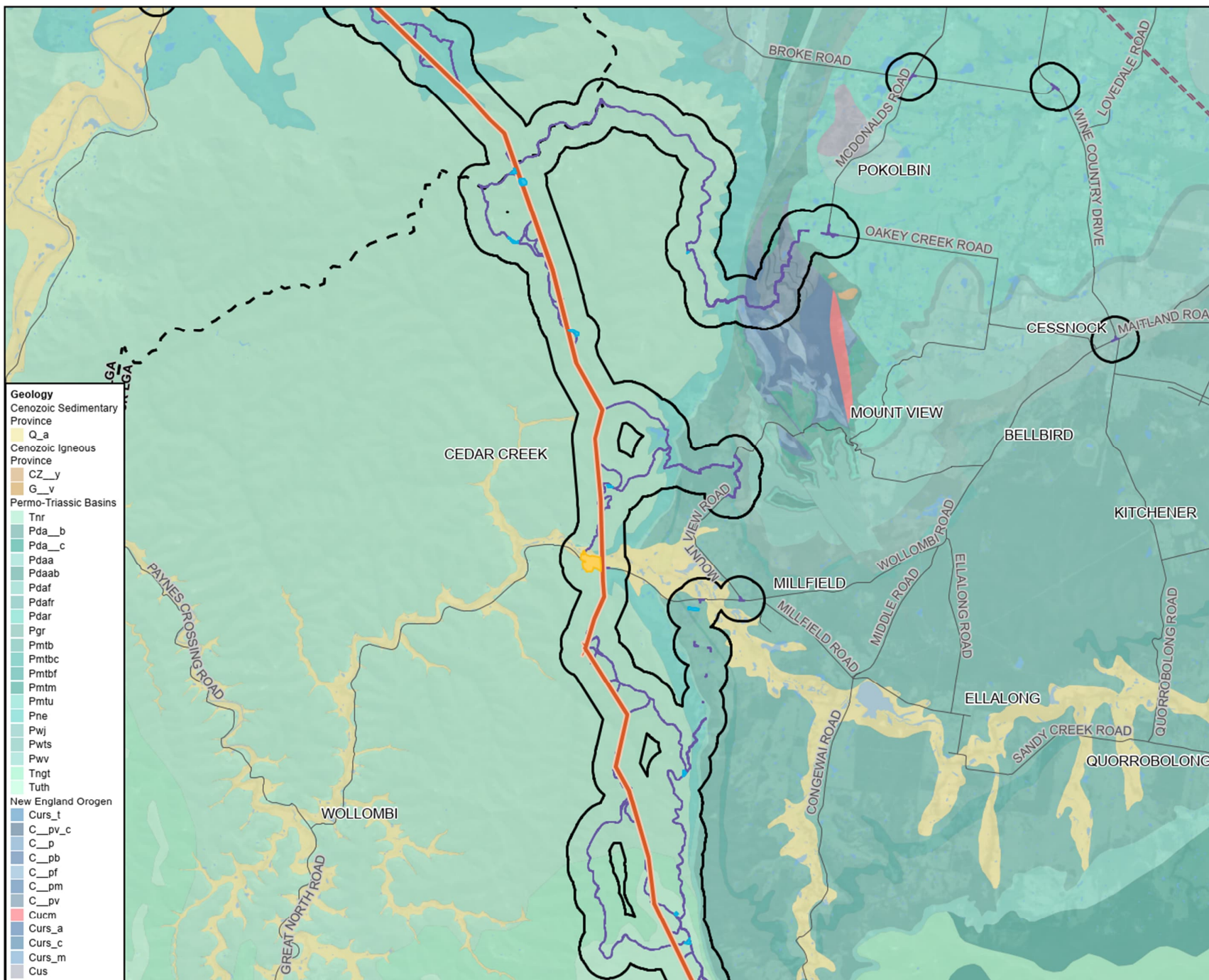
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Legend

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- Road
- - - 330 kV transmission line
- Waterbody
- Local government area

- Geology**
- Cenozoic Sedimentary Province
- Q_a
- Cenozoic Igneous Province
- CZ_y
 - G_v
- Permo-Triassic Basins
- Tnr
 - Pda_b
 - Pda_c
 - Pdaa
 - Pdaab
 - Pdaf
 - Pdafr
 - Pdar
 - Pgr
 - Pmtb
 - Pmtbc
 - Pmtbf
 - Pmtm
 - Pmtu
 - Pne
 - Pwj
 - Pwts
 - Pwv
 - Tngt
 - Tuth
- New England Orogen
- Curs_t
 - C_pv_c
 - C_p
 - C_pb
 - C_pf
 - C_pm
 - C_pv
 - Cucm
 - Curs_a
 - Curs_c
 - Curs_m
 - Cus



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Kilometres



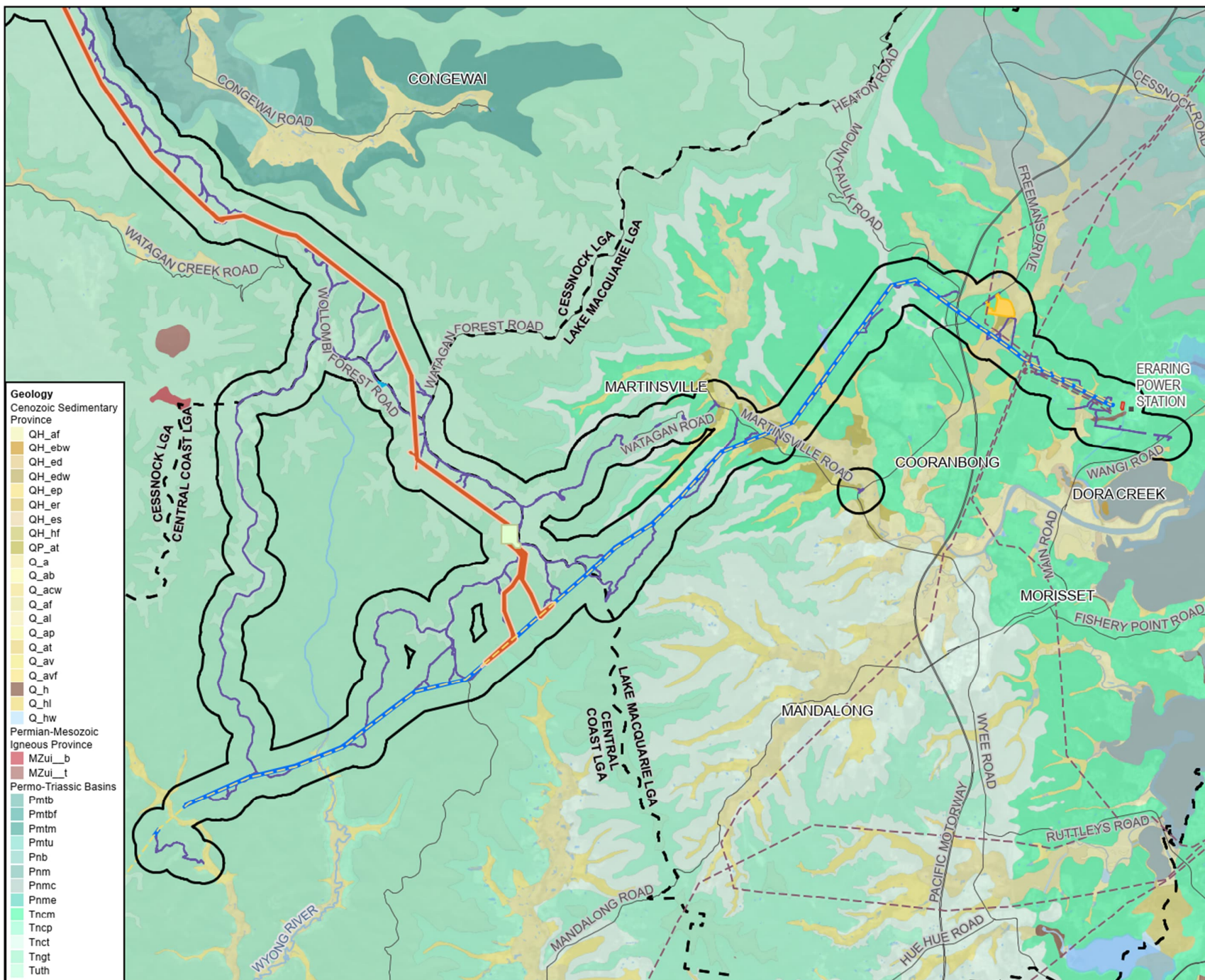
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Geology

Cenozoic Sedimentary Province

- QH_af
- QH_ebw
- QH_ed
- QH_edw
- QH_ep
- QH_er
- QH_es
- QH_hf
- QP_at
- Q_a
- Q_ab
- Q_acw
- Q_af
- Q_al
- Q_ap
- Q_at
- Q_av
- Q_avf
- Q_h
- Q_hl
- Q_hw

Permian-Mesozoic Igneous Province

- MZul_b
- MZul_t

Permo-Triassic Basins

- Pmtb
- Pmtbf
- Pmtm
- Pmtu
- Pnb
- Pnm
- Pnmc
- Pnme
- Tncm
- Tncp
- Tnct
- Tngt
- Tuth

Legend

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- Existing environment
- Road
- Power station
- 330 kV transmission line
- 500 kV transmission line
- River
- Waterbody
- Local government area



0 2 4
Kilometres



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5.2.3 *Soil salinity and sodicity*

Salinity includes dryland salinity, irrigation and river salinity, and urban salinity. Salts naturally occur in soil from sources such as weathering of rock and soil, soils formed on old seabeds, salt lakes or other saline soils, or from the ocean via wind and rain.

Irrigation salinity occurs where saline groundwater tables rise, under the direct influence of irrigation, to a level which limits plant growth. River salinity is caused by saline discharges from dryland, irrigation and urban salinity into creeks and rivers. Urban salinity is caused by the mobilisation of salts in the soil profile by surface water or groundwater.

Dryland salinity is the accumulation of salts in the soil surface and in groundwater in non-irrigated areas. Salinity is commonly caused by the mobilisation of salts in the soil profile by surface water or groundwater. The broad processes for groundwater mobilisation include groundwater recharge (or deep drainage), groundwater movement or groundwater discharge.

Dryland salinity may also be caused by the exposure of naturally saline soils such as hypersaline clays. Saline soils can often also be sodic soils (soils with an exchangeable sodium percentage (ESP) of more than 6%). Soil landscapes commonly associated with sodic soils within the project impact area include Bayswater, Braxton, Bulga, Jerrys Plains, Liddell and Mandalong.

Sodicity in soil is the presence of a high proportion of sodium ions relative to other cations. As sodium salts are leached through the soil, some sodium remains bound to clay particles—displacing other cations. Soils are often considered sodic when the amount of sodium impacts soil structure.

Soil sodicity can lead to:

- reduced flow of water through soil—which limits leaching and can cause salt to accumulate over time and the development of saline subsoils
- dispersion in the soil surface, causing crusting and sealing, which then impedes water infiltration
- dispersion in the subsoil, accelerating erosion, which can cause the appearance of gullies and tunnels.

A search conducted on the NSW Government eSpade online tool 27 August 2024 generally indicates a low likelihood of salinity within the project impact area. However, evidence of salting has been mapped within the Bulga Mining Operation (Mount Thorley Warkworth Mine site), HVO mine area and Bayswater Power Station (see Figure 5.2).

Based on the map of NSW highlighting sodic soils (DLWC) 2002 the project impact area is generally mapped as an area with localised significant sodicity.

5.2.4 *Acid sulfate soils*

Acid sulfate soils and potential acid sulfate soils are naturally occurring soils containing iron sulphides. On exposure to air, iron sulphides oxidise and create sulfuric acid. This increase in acidity can result in the mobilisation of aluminium, iron, and manganese from the soils.

The published digital geographical information system (GIS) and the CSIRO Australian Soil Resource Information System indicates that there is a low or extremely low probability of acid sulfate soils being present within the project impact area (see Figure 5.3). There is a potential for localised areas of acid sulfate soils in low lying waterlogged areas (i.e. surrounding creeks or dams).

Department of Land and Water Conservation (DLWC) 1997, Acid Sulfate Soil Risk Mapping is used to derive planning maps presented in local environmental plans (LEPs). The project impact area is not located on land categorised as Class 1 to Class 5 acid sulfate soils under the applicable LEPs.

5.2.5 *Naturally occurring asbestos*

The term ‘naturally occurring asbestos’ refers to the mineral as a natural component of soils or rocks as opposed to asbestos in commercial products, mining, or processing operations. Naturally occurring asbestos can be released from

rocks or soils by routine human activities, such as construction, or natural weathering processes. If naturally occurring asbestos is not disturbed, and fibres are not released into the air, then it is not a health risk. Asbestos is a commercial and industrial term describing a group of specific silicate minerals that forms bundles of long, very thin mineral fibres. The form and structure of these fibres are called asbestiform. In addition to asbestos, there are additional minerals that are asbestiform, including winchite and richterite that are not technically considered asbestos.

Asbestos is most commonly found in 3 rock types: serpentinites, altered ultramafic rocks, and some mafic rocks.

The NSW Government's Heads of Asbestos Coordination Authorities (HACA) has published digital GIS data on naturally occurring asbestos. Depending on the probability of naturally occurring asbestos being present, NSW has been mapped into low, medium, or high potential regions.

There are no known occurrences of naturally occurring asbestos within the project impact area.

Legend

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- Construction support site
- Laydown area
- Adjustment to existing transmission line (lines 31 and 32)
- Upgrades to existing transmission line (lines 5A3 and 5A4)
- Access track
- Existing environment
- Road
- Power station
- 330 kV transmission line
- 500 kV transmission line
- River
- Waterbody
- NPWS reserve
- State forest
- Local government area
- Soil profile - salinity
- Strongly evident



0 2 4
Kilometres



Coordinate system: GDA2020 MGA Zone 56

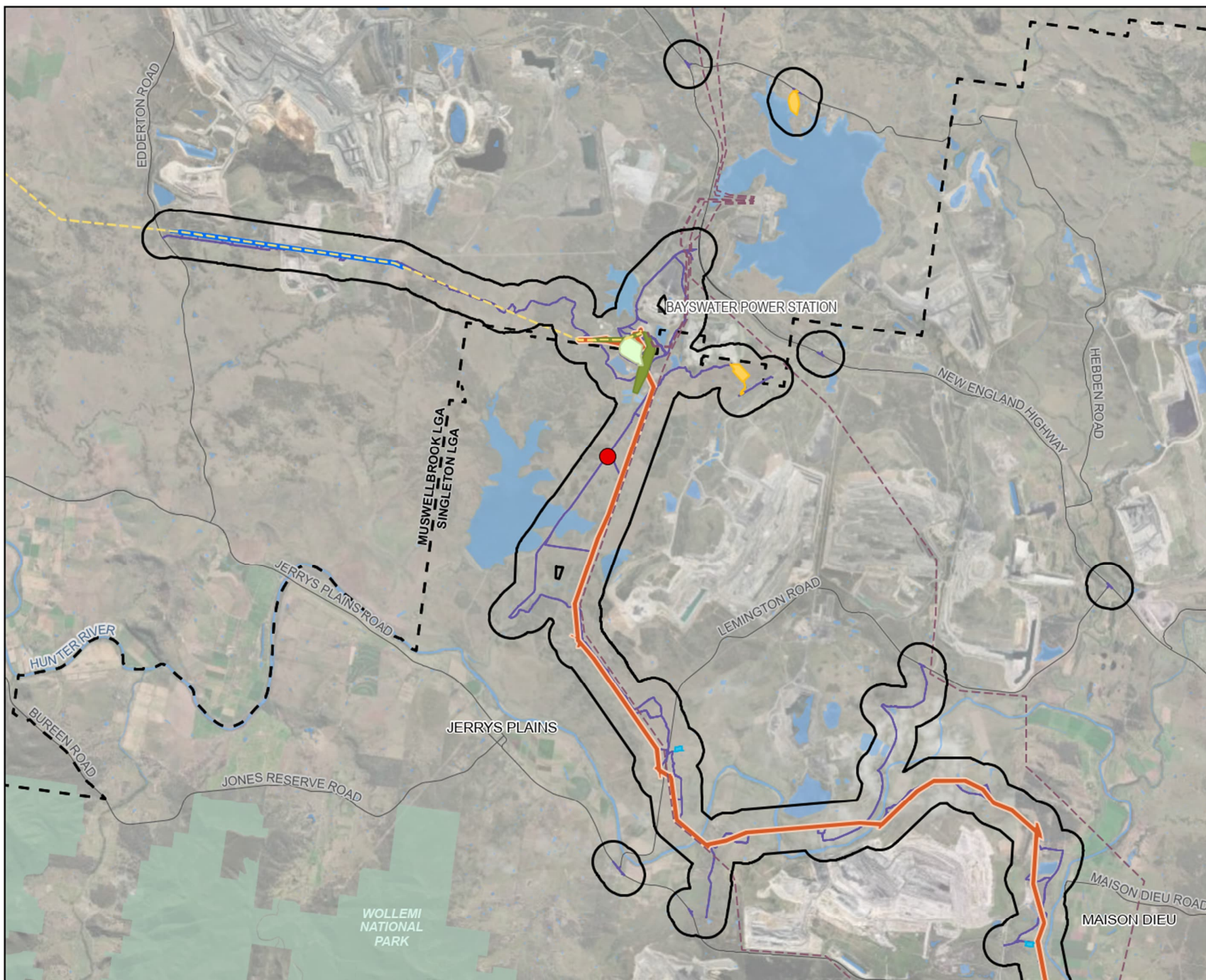
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Legend

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- HTP corridor
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- Adjustment to existing transmission line (line 81)
- Access track
- Existing environment
- Road
- - - 330 kV transmission line
- River
- Waterbody
- NPWS reserve
- State forest
- Local government area
- Soil profile - salinity
- Strongly evident



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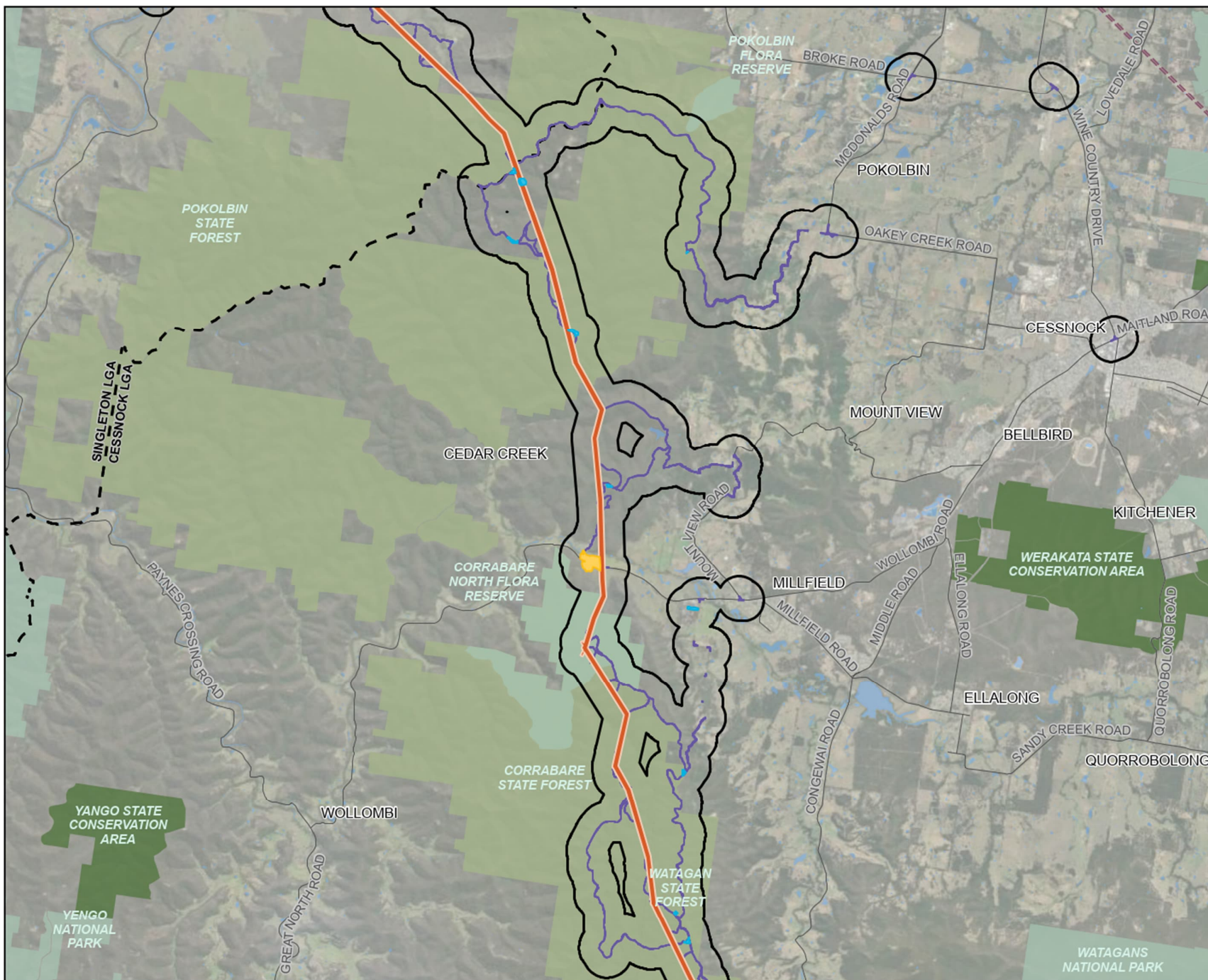
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- Waterbody
- NPWS reserve
- State conservation area
- State forest
- Local government area



Coordinate system: GDA2020 MGA Zone 56

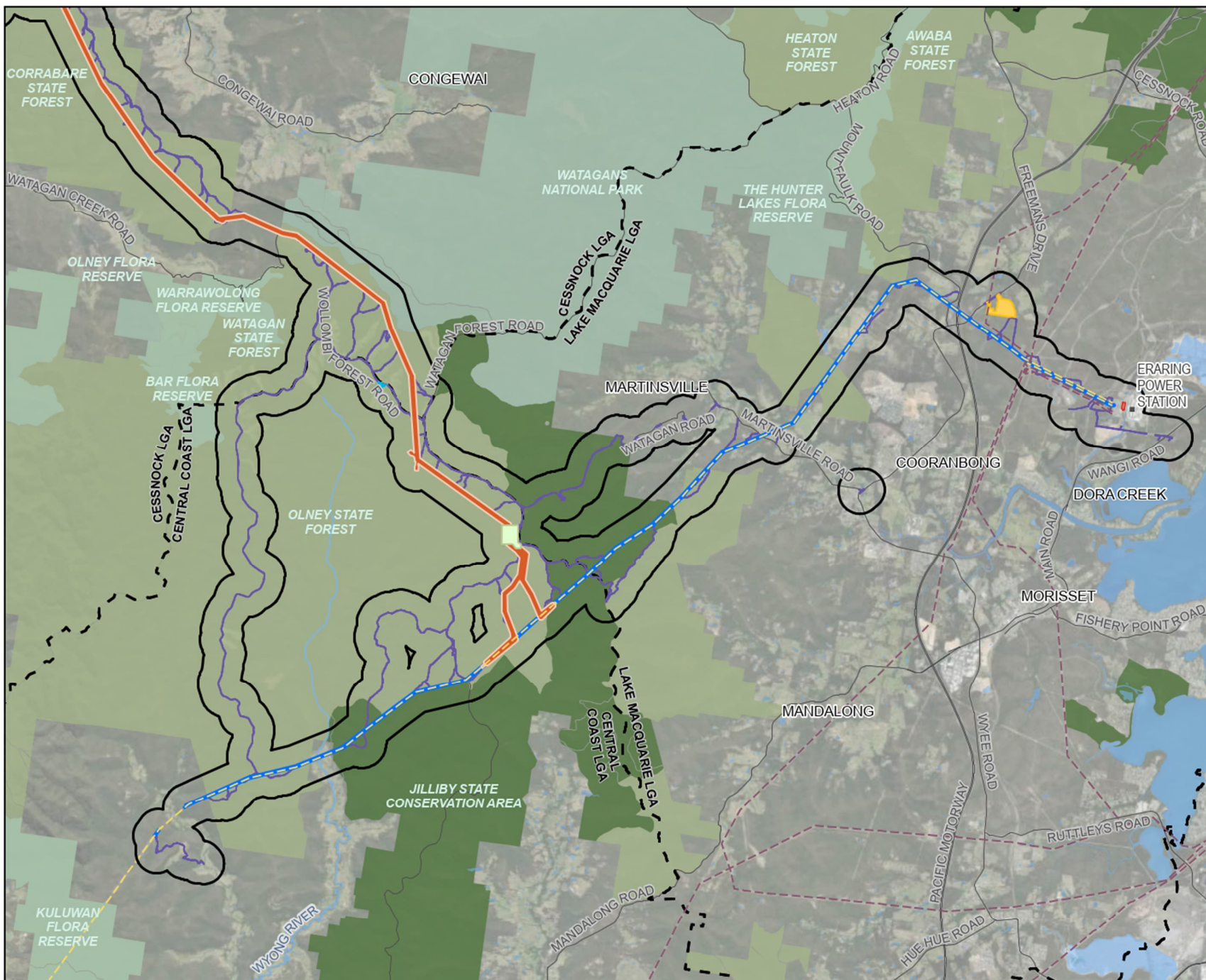
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Kilometres



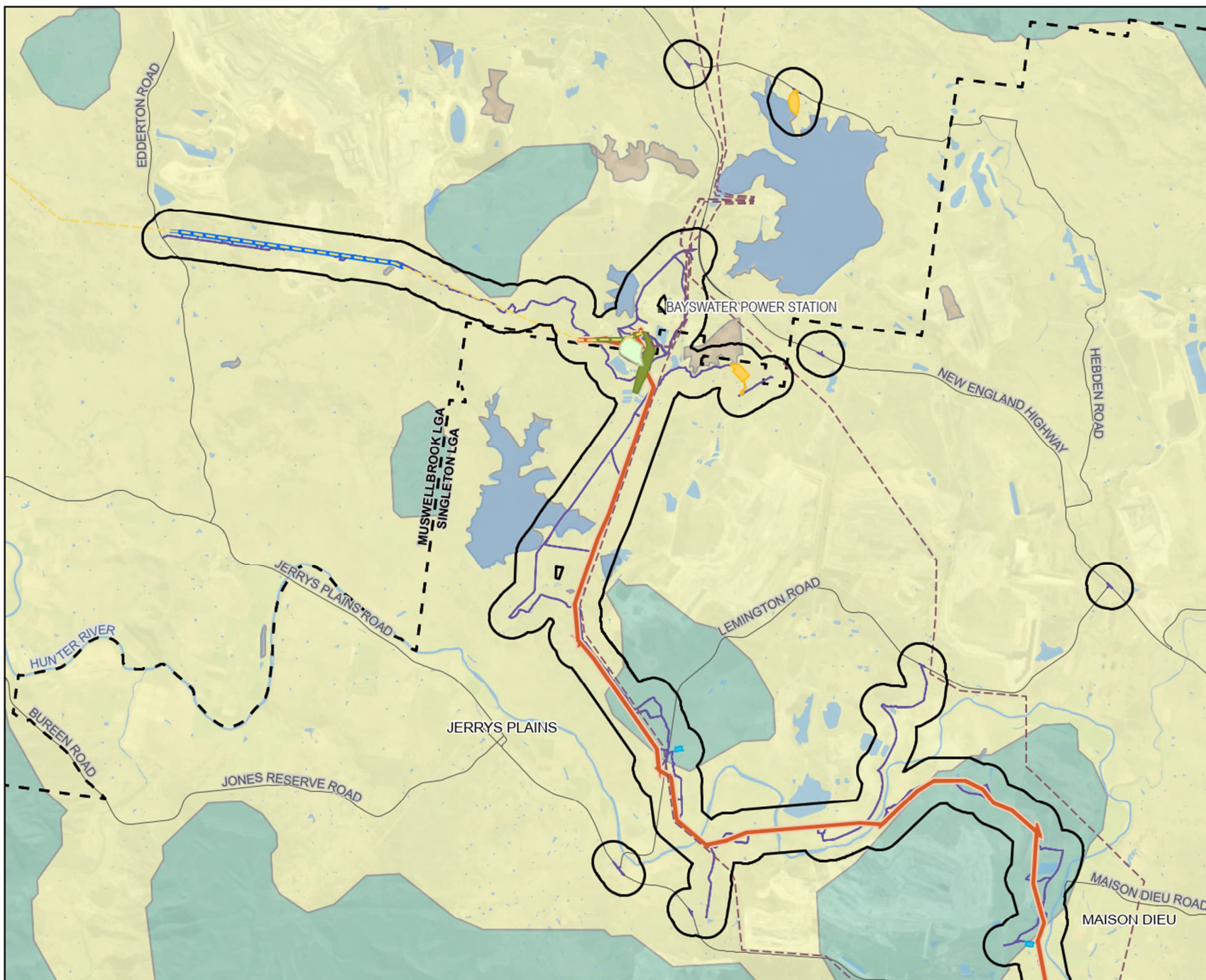
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- 500 kV transmission line
- River
- Waterbody
- Local government area
- Acid sulfate soil
- A4 High Probability/Very Low Confidence
- B4 Low Probability/Very Low Confidence
- C4 Extremely Low Probability/Very Low Confidence



0 2 4
Kilometres



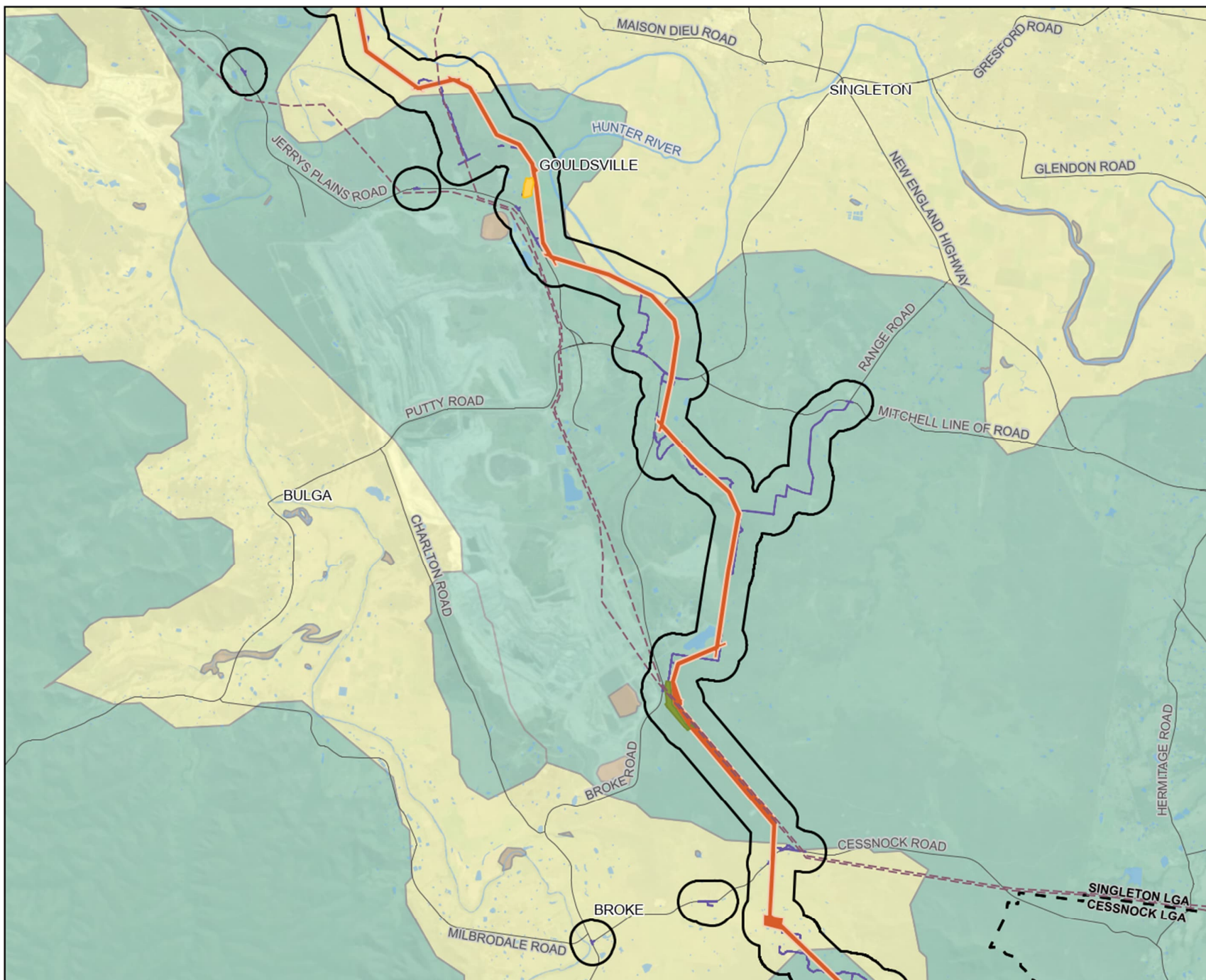
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Hunter Transmission Project Figure 5.3

Acid sulfate soil mapping
Page 3 of 4

Legend

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- Acid sulfate soil
 - A4 High Probability/Very Low Confidence
 - B4 Low Probability/Very Low Confidence
 - C4 Extremely Low Probability/Very Low Confidence



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Kilometres



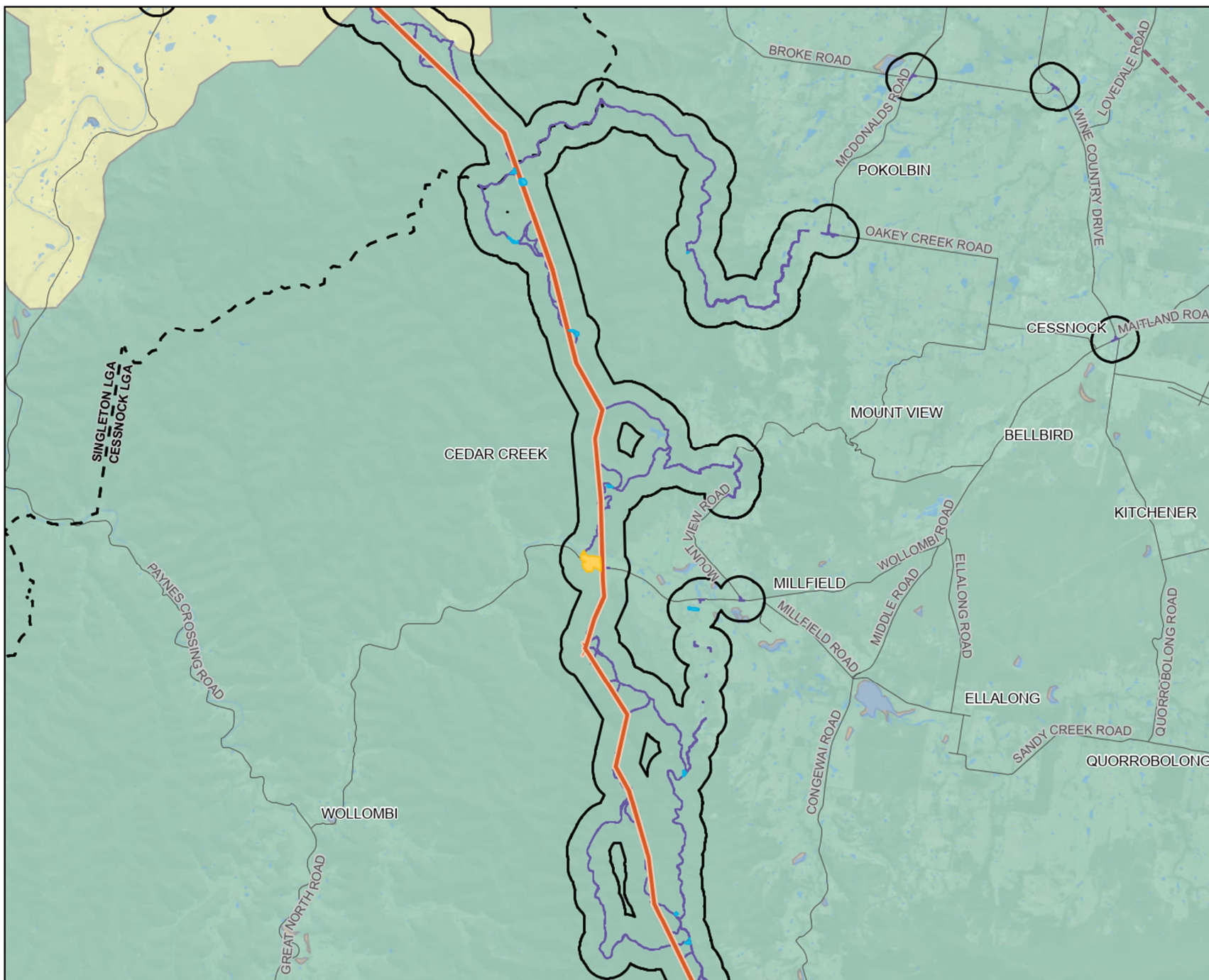
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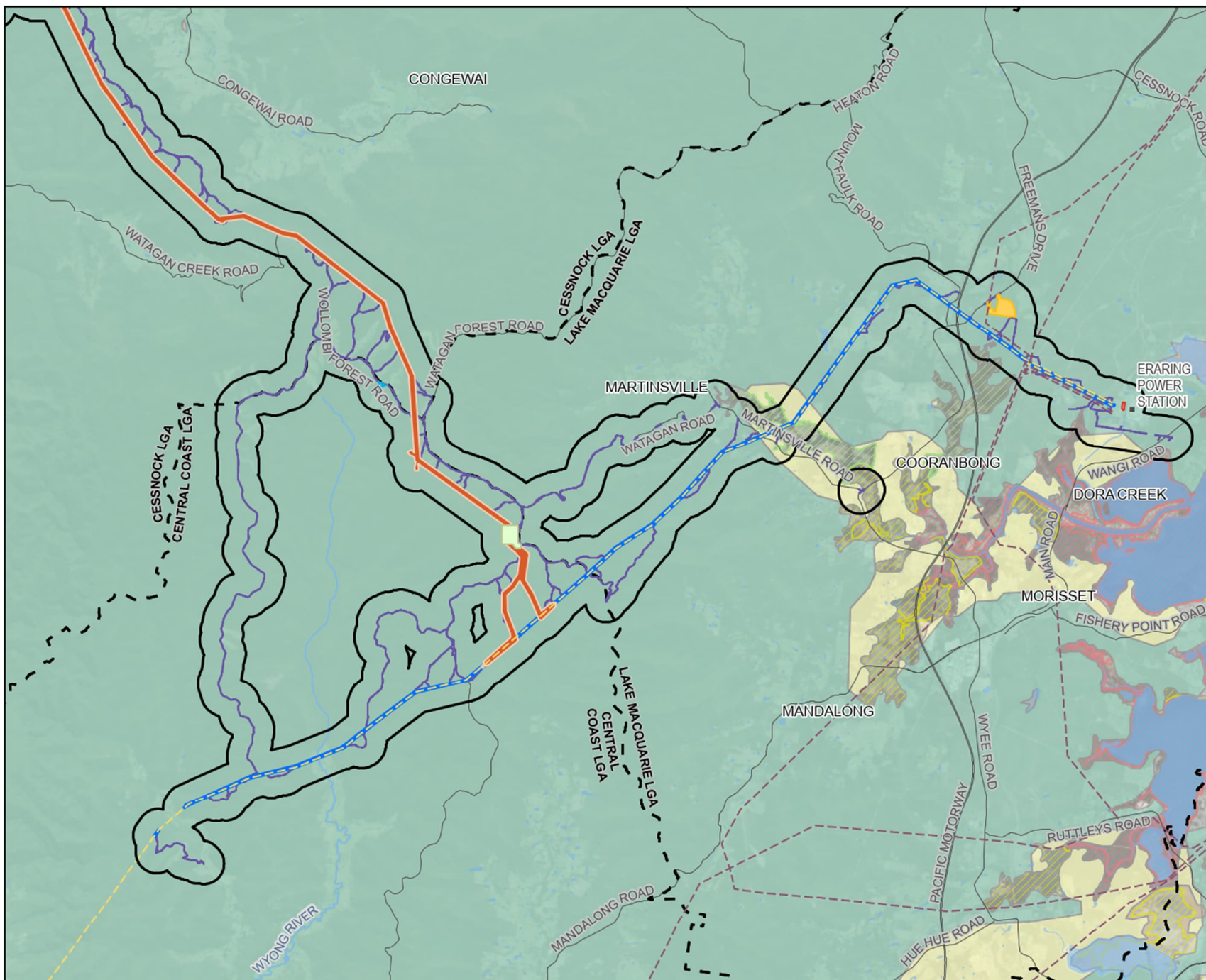
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 - River
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 - Local government area
 - Acid sulfate soil
 - A- High Probability/Confidence Unknown
 - A4 High Probability/Very Low Confidence
 - B- Low Probability/Confidence Unknown
 - B4 Low Probability/Very Low Confidence
 - C- Extremely Low Probability/Confidence Unknown
 - C4 Extremely Low Probability/Very Low Confidence



0 2 4
Kilometres



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5.3 Surface water

5.3.1 Catchment and features

The project impact area extends across the Hunter River catchment in the northern and central areas, as well as interacting with the Lake Macquarie and Tuggerah Lake catchments in south.

The Hunter River catchment is about 21,500 square kilometres and is the largest coastal catchment in NSW. The Hunter River is regulated by 2 main storages (Glenbawn and Glennies Creek Dams), as well as several smaller storages. Around 90% of the project impact area is in the Hunter River catchment, with the HTP corridor crossing the Hunter River at 3 locations.

Wollombi Brook, a major tributary to the Hunter River, is crossed by the HTP corridor just upstream of its confluence with the Hunter River. In addition to the HTP corridor, project infrastructure such as construction support sites, access roads and ancillary infrastructure would be in the Hunter River catchment.

The Lake Macquarie catchment covers around 600 square kilometers. It is Australia's largest coastal saltwater lake and supports a diversity of habitat types including seagrass meadows, mangroves, saltmarsh, rocky reefs, oyster reefs, sand flats, mud flats and deep open waters. Several access roads and upgrades to existing transmission lines are proposed to occur in the Lake Macquarie catchment, in addition to the proposed Freemans Drive construction support site, located adjacent to Jigadee Creek.

The Lake Macquarie and Tuggerah Lake catchments cover an area of 1,630 square kilometres and are bordered by a series of east flowing streams in the north, and the Sugarloaf Ranges to the northwest.

The Tuggerah Lakes catchment has an area of 714 square kilometers. Tuggerah Lakes drains Lake Munmorah and Budgewoi to the Tasman Sea through a tidal channel at its southern end. Tuggerah Lake is relatively shallow but a highly productive system that contains a large biomass of aquatic vegetation. The Olney State Forest gantry and several access roads are proposed within the Tuggerah Lakes catchment.

Catchment conditions vary greatly across the project area from highly disturbed areas such as coal mines in the north to elevated State forests in the south with a mix of agricultural and small townships interspersed throughout.

Surface water features within the contamination study area as shown in Figure 5.4 are potential sensitive receivers (aquatic) if contamination is disturbed during the project.

5.3.2 Existing aquatic environment

Surface water quality near the project impact area varies significantly, influenced by the diverse land uses present. These land uses vary from National parks, State forests and conservation areas in the upland regions to agricultural land use and areas dominated by coal mining and energy generation in the Hunter Valley.

The nearest Ramsar wetlands are the Hunter Estuary Wetlands, which consist of the Kooragang Nature Reserve and the Shortland Wetland Reserve, located in the lower reaches of the Hunter River. Although lower reaches of the project impact area are located within 26 kilometres of Ramsar wetlands, streamflow connection between the project impact area and the wetlands occurs around 120 kilometres upstream of the Hunter River and its tributaries.

Further details related to surface water and the existing aquatic environment can be found in *Technical Report 10 – Surface water impact assessment*.

5.4 Hydrogeology

The project impact area is in the Hunter region of the Permo-Triassic Sydney Geological Basin, which includes the groundwater systems that are generally defined by their host geology. This includes:

- local, shallow groundwater hosted by unconsolidated Quaternary Alluvium associated with the Hunter River and its tributaries in the north and central sections of the HTP corridor. Hydraulic connectivity between the local alluvial groundwater and surface water systems is expected. These deposits typically comprise basal gravels and boulders overlain by an upwards-fining sequence of sands, silts and clays
- local to regional groundwater systems associated with the Triassic-aged porous sedimentary rock units (Narrabeen Group and the Hawkesbury Sandstone), comprising sandstones and siltstones. These units outcrop in the elevated terrains of the Hunter Valley, in the central and southern areas of the HTP corridor, south of the Singleton Military Area
- local to regional groundwater systems associated with the Permian aged porous sedimentary rock units, comprising sandstones, siltstones and coal measures. The central Hunter Valley floor comprises exposed sedimentary Permian rocks which are overlain by sedimentary Triassic rocks in the central and southern areas of the HTP corridor. The regional, Permian sedimentary groundwater system is overlain in parts by local shallow alluvium, particularly in north of the HTP corridor in association with the Hunter River.

These groundwater systems have different hydrogeological properties. Groundwater occurs in the pore spaces between the alluvial sediments in the unconsolidated alluvial aquifers, and conversely in rock mass pore spaces and secondary porosity features, such as joints, faults and voids in the sedimentary fractured rock units (i.e. sandstones, siltstones and coal measures). The depth to groundwater is shallow, i.e. between 2–10 metres below ground level (mBGL) in the alluvial system, and variable in the sedimentary rock groundwater system (i.e. between 7–35 mBGL).

There are numerous groundwater monitoring wells located within the project impact area which are listed for beneficial use (including domestic water supply, irrigation, livestock water supply and recreation purposes). Further details are provided in *Technical Report 11 – Groundwater*.

Approximate median depths to groundwater obtained from registered bore data via the publicly available WasterNSW real time data source includes:

- Alluvium in the upper Hunter Valley (near Singleton) – Median water level 9.5 mBGL
- Alluvium in the central Hunter Valley (near Broke) – Median water level 2.8 mBGL
- Permian sedimentary systems - Median water level 16.8 mBGL
- Triassic sedimentary systems - Median water level 17.3 mBGL.

Legend

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- Adjustment to existing transmission line (lines 31 and 32)
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- Access track
- Existing environment
- Road
- Power station
- 330 kV transmission line
- 500 kV transmission line
- River
- Waterbody
- NPWS reserve
- State forest
- Local government area
- Indicative riparian zone



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Kilometres



Coordinate system: GDA2020 MGA Zone 56

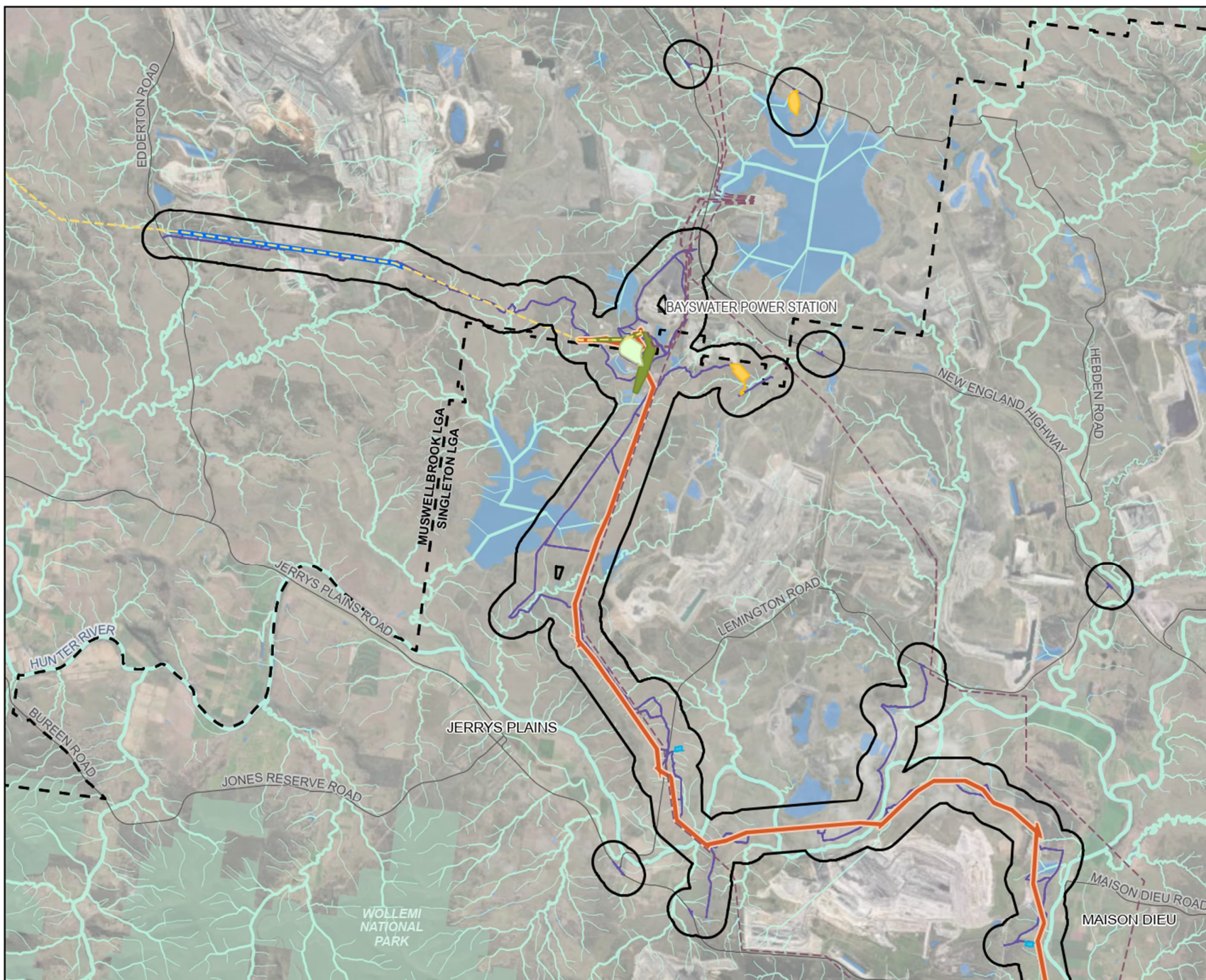
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Data sources: EMM, Geoscience Australia, NSW State Government, WSP

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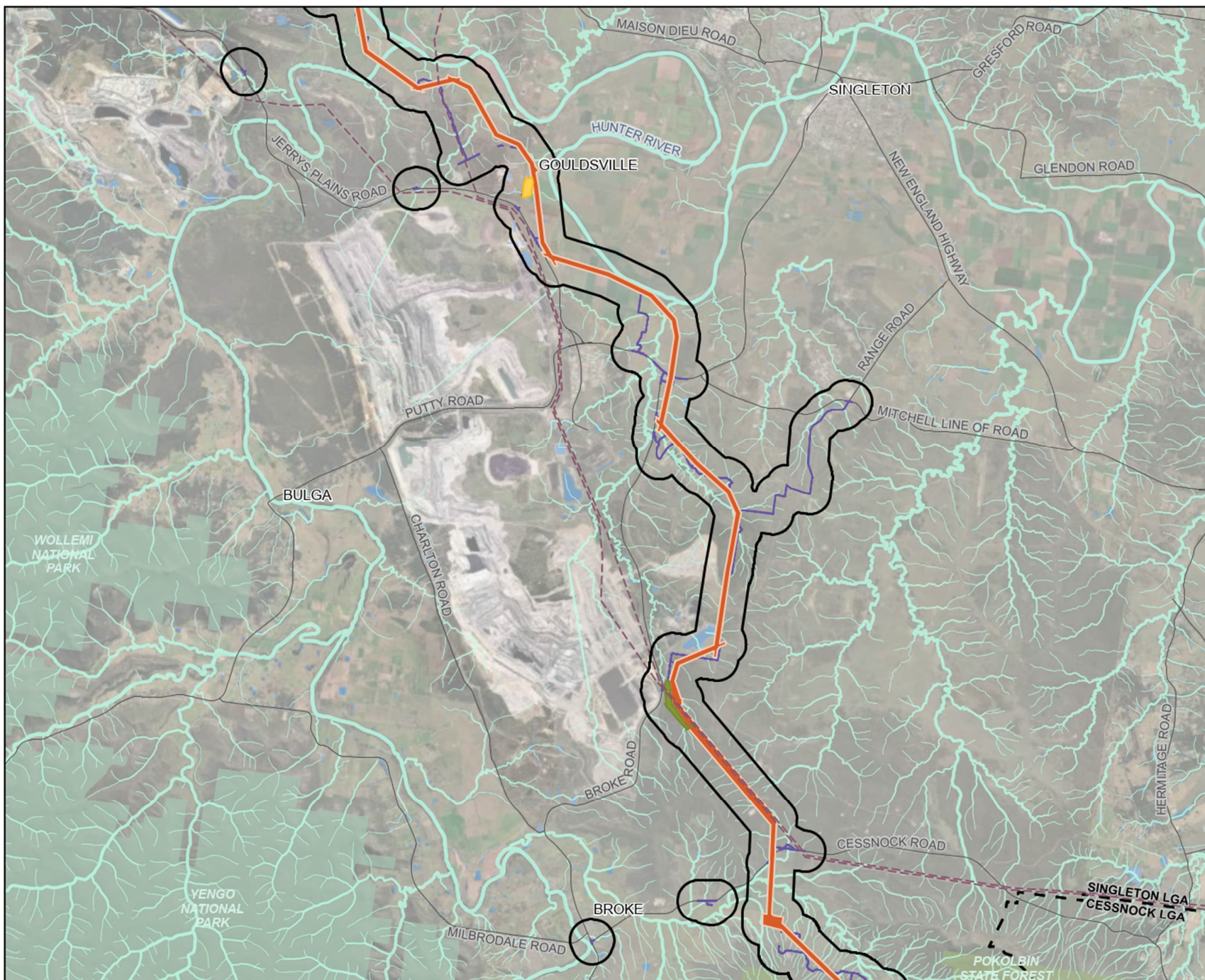
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Hunter Transmission Project Figure 5.4

Rivers, streams, wetlands and
estuaries
Page 3 of 4

Legend

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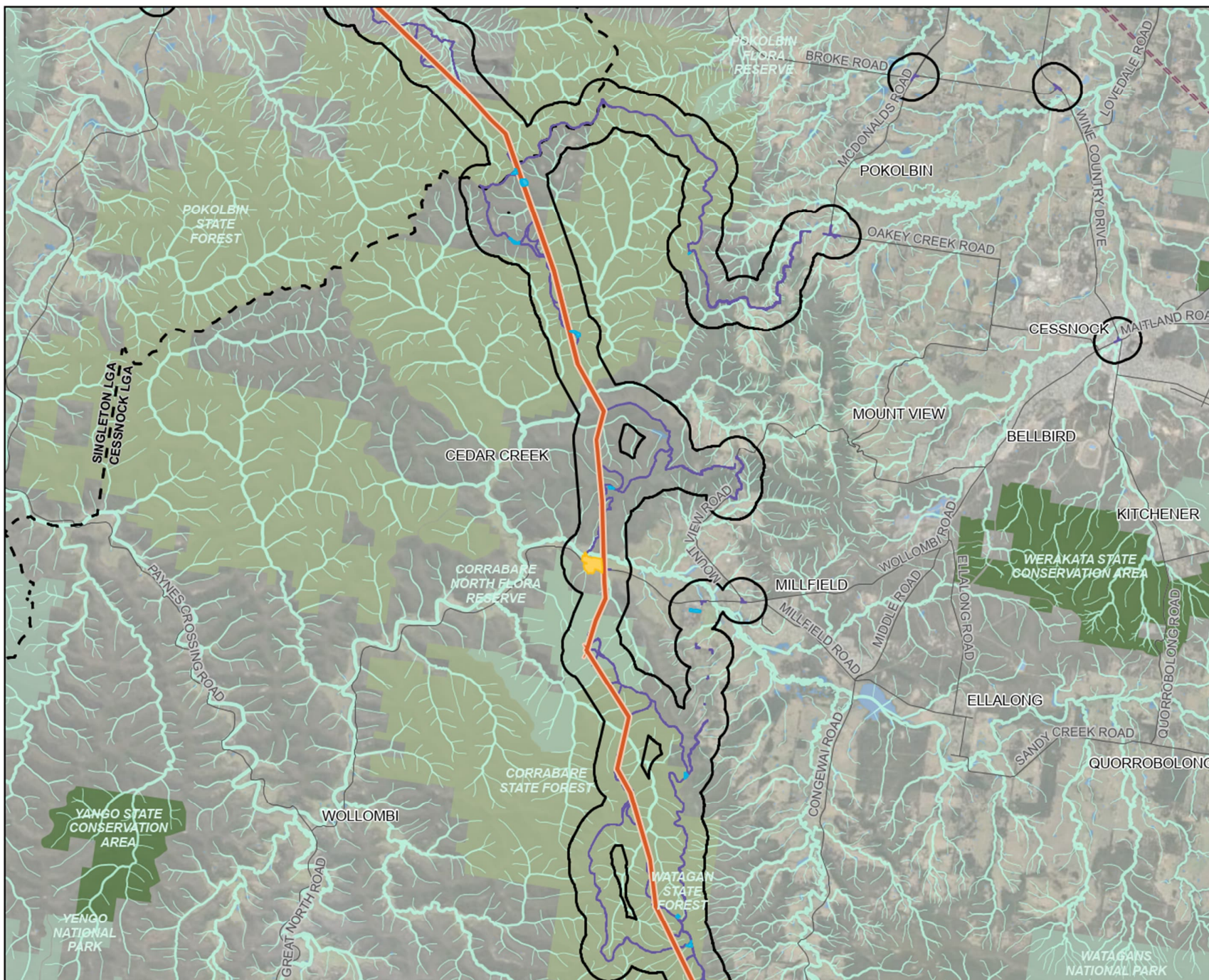
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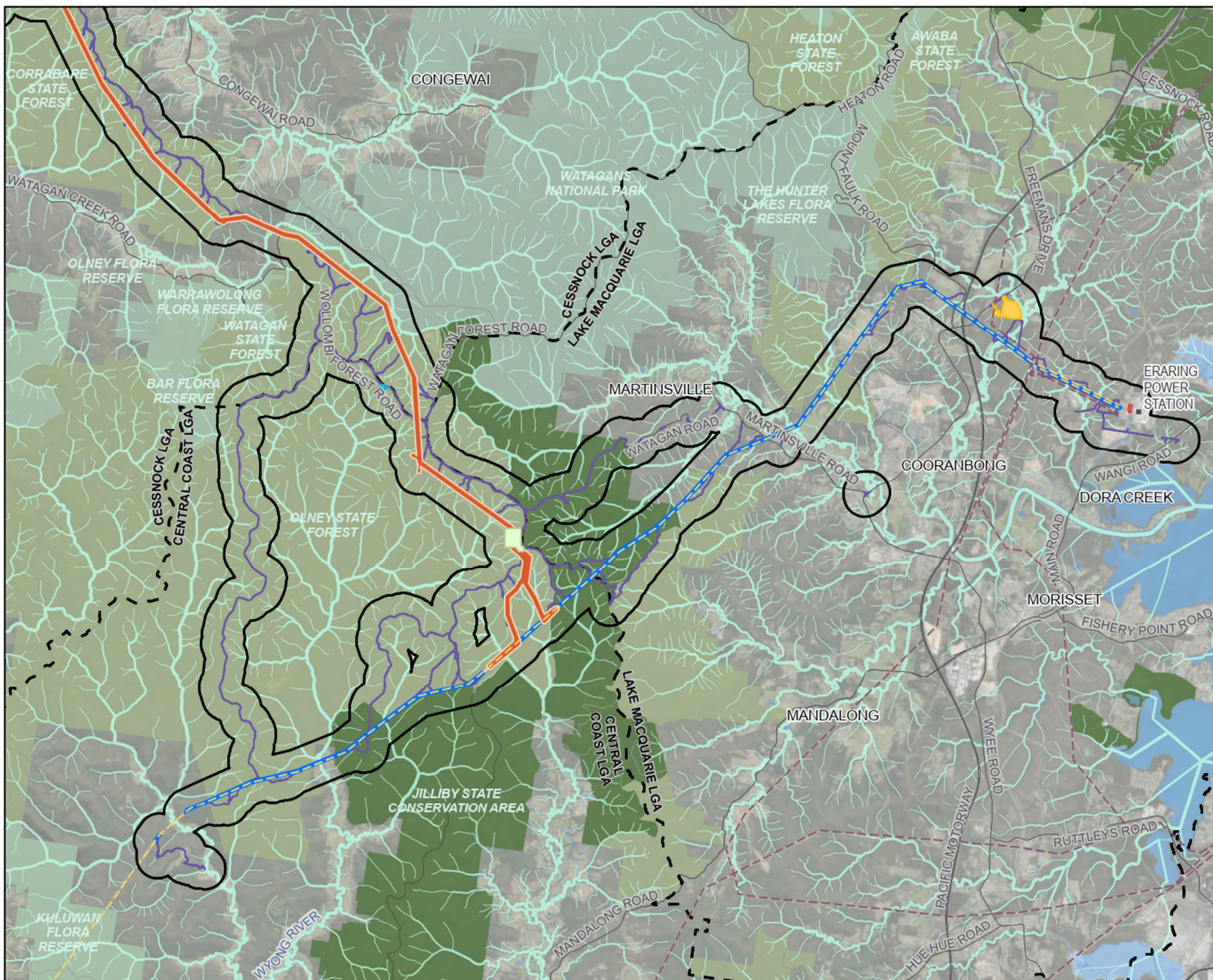
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- Road
- Power station
- 330 kV transmission line
- 500 kV transmission line
- River
- Waterbody
- NPWS reserve
- State conservation area
- Flora reserve
- State forest
- Local government area
- Indicative riparian zone



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5.5 General site land use

The HTP corridor runs mostly through energy, mining, agricultural and government land between Bayswater and Broke in the Upper Hunter Region. It then traverses the Pokolbin, Corrabare, Watagans and Olney State forests, as well as smaller rural residential areas, and land managed by the NSW National Parks and Wildlife Service (NPWS) in the lower Hunter Region.

5.6 Zoning

The Muswellbrook Local Environmental Plan 2009, Singleton Local Environmental Plan 2013, Cessnock Local Environmental Plan 2011, Central Coast Local Environmental Plan 2022 and the Lake Macquarie Local Environmental Plan 2014 were reviewed as a general indicator of previous land uses that could have contaminated the land. Table 5.2 provides a summary of land zoning within the project impact area, under each applicable Local Environmental Plan (LEP). Figure 5.5 shows land zoning within the project impact area.

In the north, land zoning within the project impact area is mostly RU1 Primary Production. Smaller areas are zoned SP2 Infrastructure, associated with the Bayswater Power Station. The Singleton Military Area, also present in the north is zoned SP2 Defence. It is noted a portion of the land zoned RU1 Primary Production in the north forms part of existing mining operations.

The central area is dominated by land zoned RU3 Forestry (associated with Pokolbin and Corrabare State forests and RU2 Rural Landscape (associated with rural residential areas at Cedar Creek, Millfield and Laguna).

The south contains a mix of land zoning, with areas zoned RU3 Forestry, C1 National Parks, C2 Environmental Conservation and C3 Environmental Management. These areas are associated with Watagans and Olney State Forests and residential areas in Martinsville and Cooranbong. In addition, areas of RU2 Rural Landscape are also present in the south near Martinsville and Cooranbong. The Eraring Power Station is zoned SP2 Infrastructure.

Table 5.2 Land zoning

ID	Zone	Category	Intended use
RU1	Primary Production	Rural	Identifies land used for most kinds of commercial primary industry production, including extensive agriculture, intensive livestock and intensive plant agriculture, aquaculture, forestry, mining and extractive industries.
RU3	Forestry	Rural	Identifies and protects land that is to be used for long-term forestry use, such as State forests.
RU2	Rural Landscape	Rural	Rural land used for commercial primary production that is compatible with ecological or scenic landscape qualities that have been conserved (often due to topography).
C1	National Parks and Nature Reserves	Environmental protection	Intended to cover existing national parks and nature reserves, and new conservation areas proposed for reservation that have been identified and agreed by the NSW Government.
C2	Environmental Conservation	Environmental protection	Intended to protect land that has high conservation values outside the national parks and nature reserve system.
SP2	Infrastructure (Power Station)	Special purpose	Land used for infrastructure purposes that is highly unlikely to be used for a different purpose in the future. In this instance, power stations.

ID	Zone	Category	Intended use
C3	Environmental Management	Environmental protection	Intended to be applied to land that has special ecological, scientific, cultural or aesthetic attributes, or land highly constrained by geotechnical or other hazards.
RU4	Primary Production (Small Lots)	Rural	Commercial primary industry production, including emerging primary industries and agricultural uses that operate on smaller rural holdings.
SP2	Infrastructure (Electricity Generating Works)	Special purpose	Infrastructure land that is highly unlikely to be used for a different purpose in the future. In this instance major state infrastructure associated with electricity generating works.
SP2	SP2 Infrastructure (Classified Road)	Special purpose	Infrastructure land that is highly unlikely to be used for a different purpose in the future. In this instance major state infrastructure associated with electricity generating works. In this instance state classified roads.
SP1	SP1 Mining	Special purpose	Intended for land uses or sites with special characteristics that cannot be accommodated in other zones. In this case mining activities.
SP2	SP2 Infrastructure (Railway Corridor)	Special purpose	Infrastructure land that is highly unlikely to be used for a different purpose in the future. In this instance railway infrastructure.
R2	R2 Low Density Residential	Residential	Land where primarily low-density housing is to be established or maintained.
R5	R5 Large Lot Residential	Residential	Development that provides for residential housing in a rural setting, often adjacent to towns or metropolitan areas.
RE1	RE1 Public Recreation	Recreation	Intended for a wide range of public recreational areas and activities including local and regional parks and open space.
RU5	RU5 Village	Rural	Flexible zone for centres where a mix of residential, retail, business, industrial and other compatible land uses may be provided to service the local rural community.

Legend

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- Power station
- 330 kV transmission line
- 500 kV transmission line
- Local government area
- Land zoning (within project impact area)
- C2 - Environmental Conservation/Management
- RE1 - Public Recreation
- RU1 - Primary Production
- SP2 - Infrastructure



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Kilometres



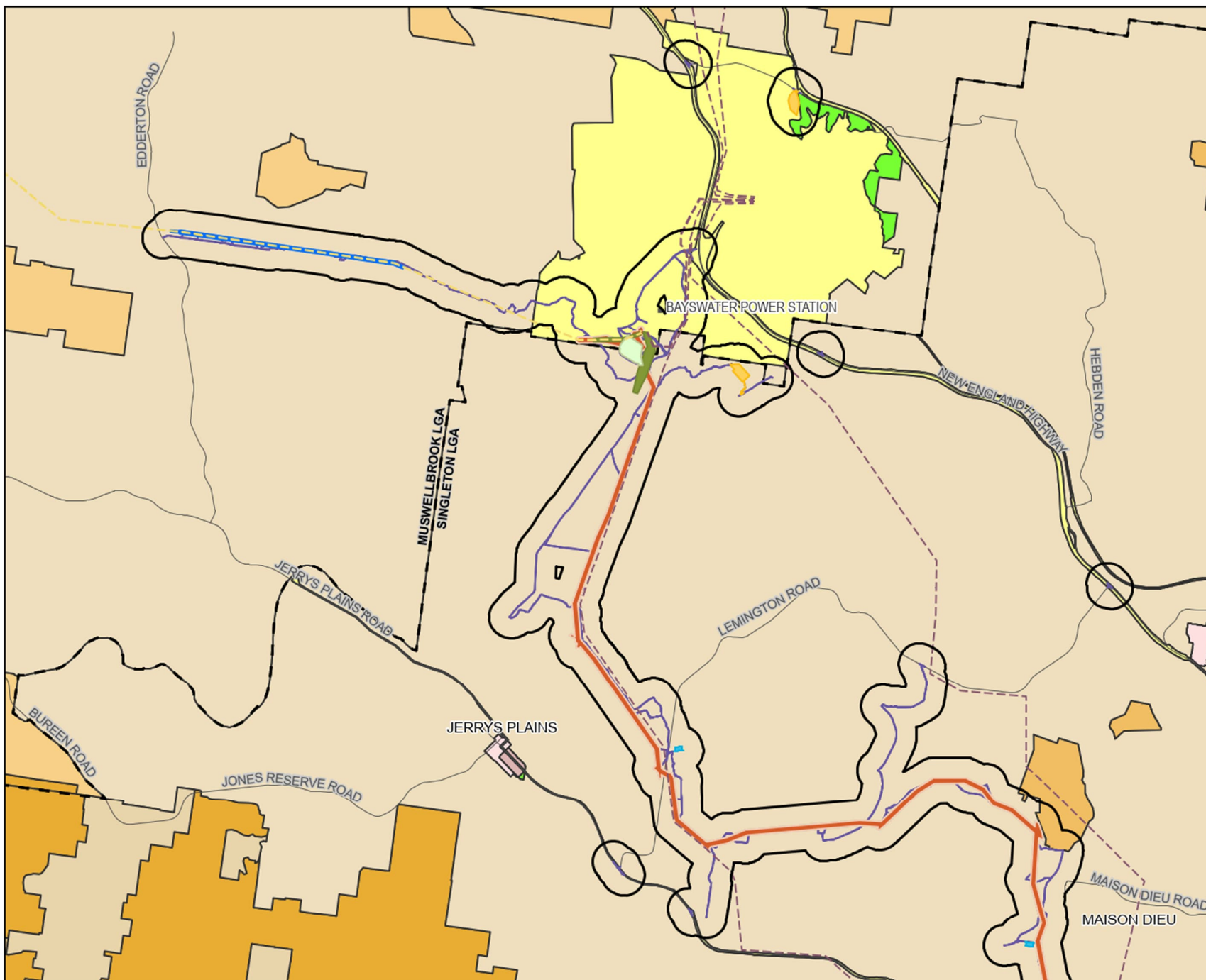
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- Existing environment
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- 330 kV transmission line
- Local government area
- Land zoning (within project impact area)
 - R5 - Large Lot Residential
 - RU1 - Primary Production
 - RU4 - Primary Production Small Lots
 - SP2 - Infrastructure



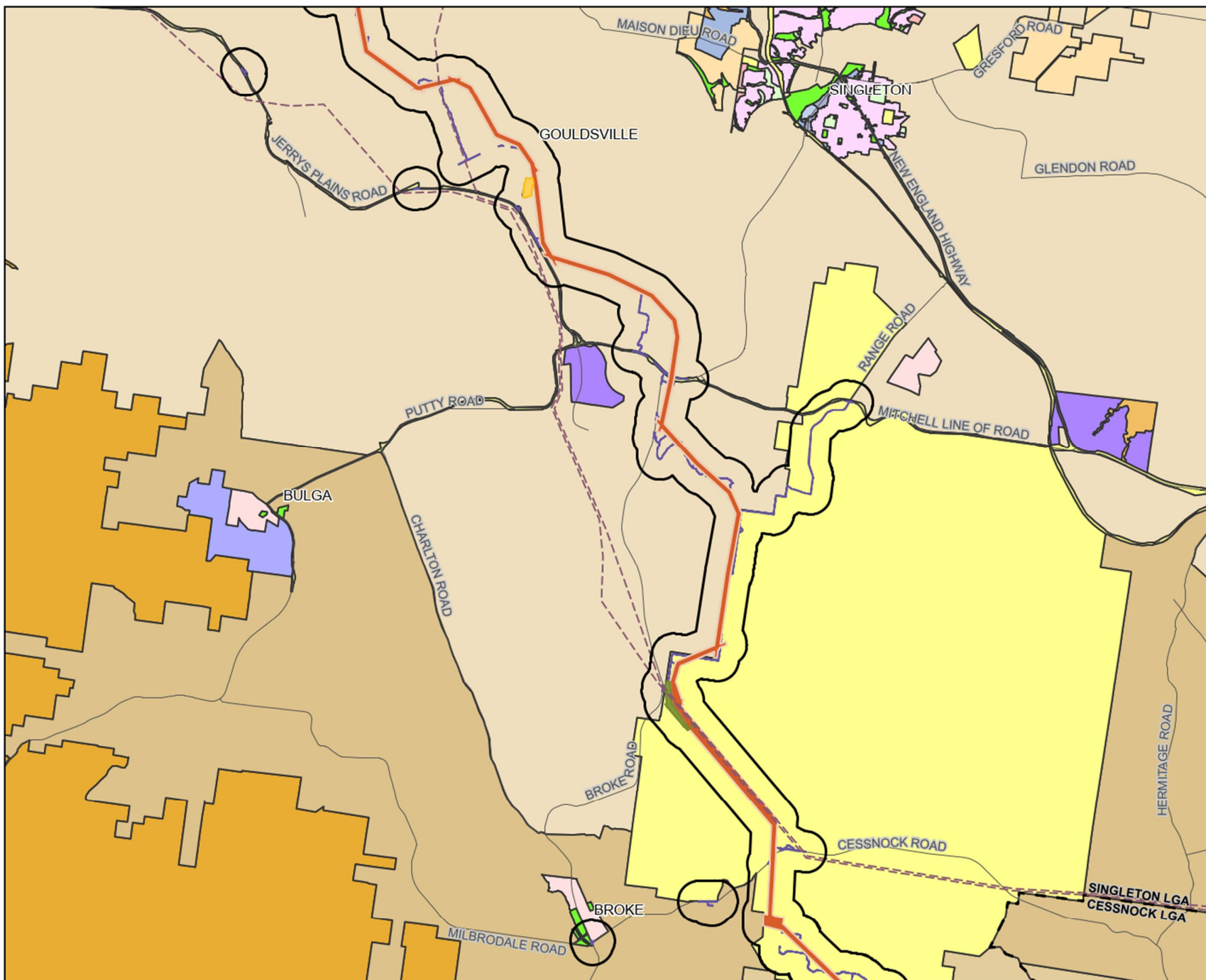
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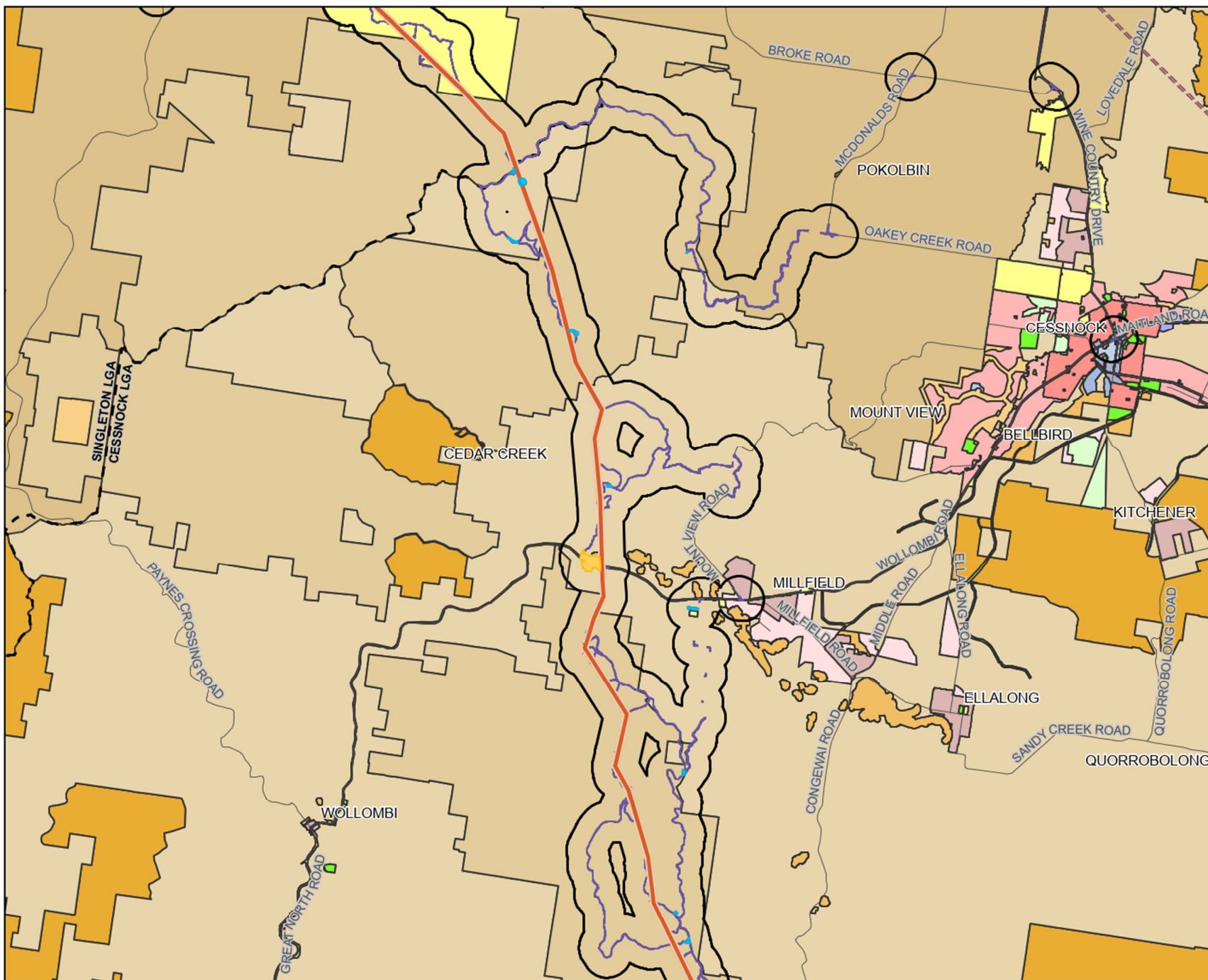
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- Local government area
- Land zoning (within project impact area)
 - C2 - Environmental Conservation/Management
 - E2 - Commercial Centre
 - R5 - Large Lot Residential
 - RE1 - Public Recreation
 - RU2 - Rural Landscape
 - RU3 - Forestry
 - RU4 - Primary Production Small Lots
 - RU5 - Village
 - SP2 - Infrastructure



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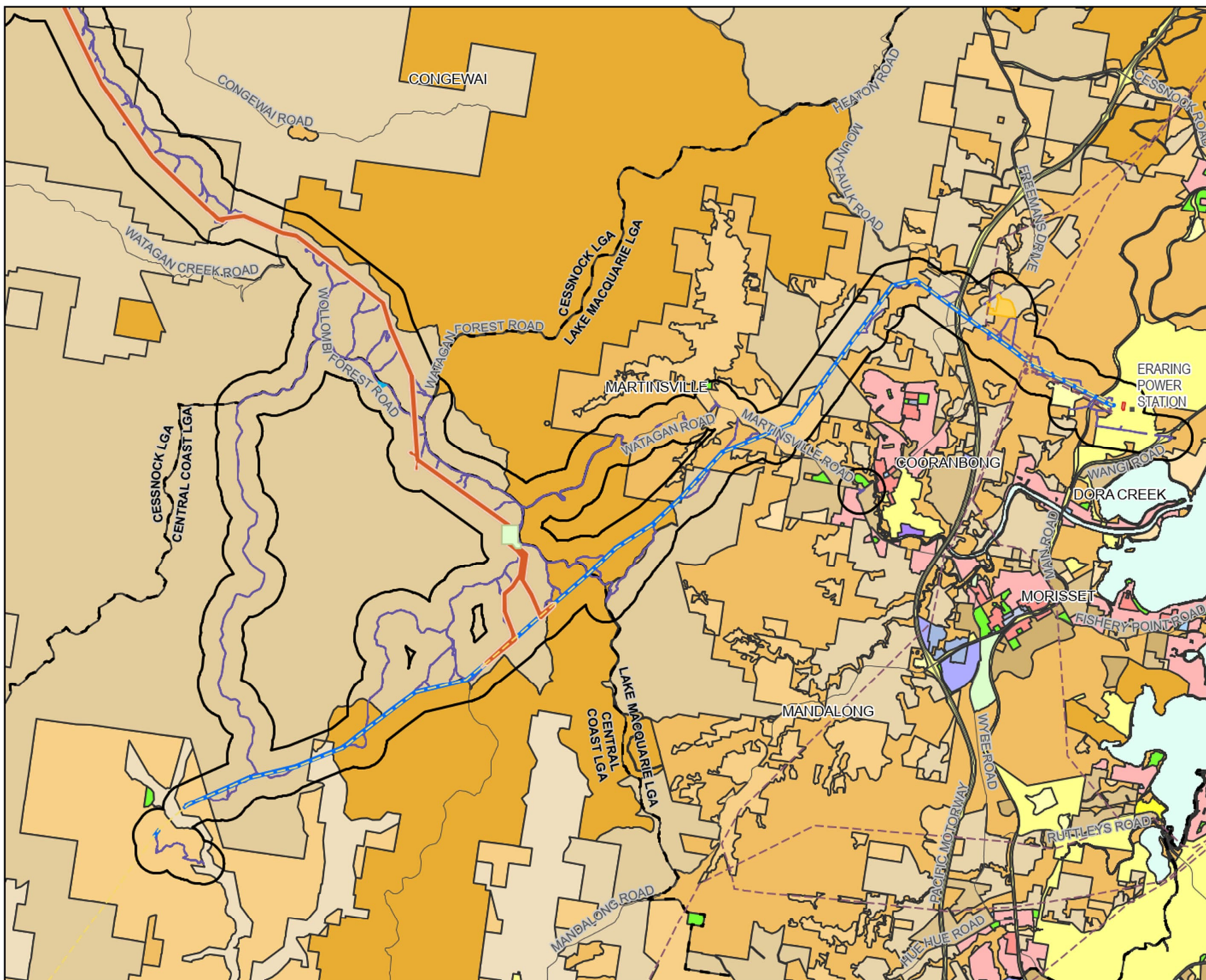
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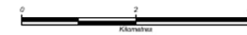
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- 500 kV transmission line
- Local government area
- Land zoning (within project impact area)
- C1 - National Parks and Nature Reserves
- C2 - Environmental Conservation/Management
- C3 - Environmental Management
- R2 - Low Density Residential
- RU1 - Primary Production
- RU2 - Rural Landscape
- RU3 - Forestry
- RU4 - Primary Production Small Lots
- SP1 - Special Activities
- SP2 - Infrastructure



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5.7 Database search results

Table 5.3 provides a summary of database searches for potential current and former contaminant sources within the contamination study area.

Table 5.3 Search of potential current and former contaminant sources within the contamination study area

Item	Details
List of contaminated sites regulated by or notified to the NSW EPA	A total of 3 sites within the contamination study area have been notified to the EPA under the <i>Contaminated Land Management Act 1997</i> (CLM Act): Mine Sites / Mine Operations — Bulga Surface Operations (Other Industry) – Bulga Environment Protection Licence (EPL) boundary intersects the project impact area. Three mine dams are located adjacent to the project impact area — Emulsion Plant, Dyno Nobel Asia Pacific Pty Ltd (Chemical Industry) 186 Long Point Road West, Warkworth – The eastern edge of the EPL boundary intersects the project impact area, however no plant infrastructure is located within the project impact area Other — Bayswater Power Station (Other Industry) – EPL boundary is within the project impact. Area. Power Station infrastructure present in several locations within the project impact area No additional information is available on the nature of the contamination for any of the 3 reported sites however, the contamination is listed as not requiring regulation under the CLM Act. Source: NSW EPA List of NSW contaminated sites notified to EPA – Accessed August 2024
Current NSW EPA licensed activities	There are several licensed activities within the contamination study area, under the <i>Protection of the Environment Operations Act 1997</i> (POEO Act): Mine Sites / Mine Operations — Hunter Valley Energy Coal, Mount Arthur Coal (EPL 11457) - the project impact area crosses through the EPL boundary traversing through an existing transmission line corridor located between 2 active mine sites — Maxwell Ventures (Management) Pty Ltd (EPL 1323), Maxwell Underground Coal Mine Project – located 300m northeast of the project impact area — Mount Thorley Operations Pty Ltd, Mount Thorley Road, Singleton (EPL 1976) – round 460m west of the project impact area — Ravensworth Operations Pty Ltd (EPL 2652), Ravensworth Mine Complex - The EPL boundary intersects the project impact area, however no mine infrastructure is located within the project impact area — Austar Coal Mine Pty Ltd, Wollombi Road, Cessnock (EPL 416) – Around 250m east of the project impact area — Bulga Coal Management Pty Ltd, Broke Road, Singleton (EPL 563) - EPL boundary intersects the project impact area. Three mine dams are located adjacent to the project impact area — Warkworth Mining Ltd, Putty Road, Singleton (EPL 1376) – intersecting the contamination study area. Located 3m west of the project impact area

Item	Details
	— HV Operations Pty Ltd (Coal Mining), Lemington Road, Singleton (EPL 640) – The project impact area intersects the EPL boundary and transects the mine operations. The project impact area overlaps with the mines HVO South Workshop and traverses around a mine dam located near this workshop area — Centennial Mandalong Pty Ltd (EPL 365), Mandalong ACC - the project impact area crosses through the EPL boundary, however no mine infrastructure is located within the project impact area — Centennial Newstan Pty Ltd ((EPL 395), Newstan Colliery – EPL boundary intersects the project impact area, however no mine infrastructure is located within the project impact area Other — Bayswater Power Station (EPL 779) – EPL boundary is within the project impact area. Power Station infrastructure present in several locations within the project impact area — Eraring Power Station (EPL 1429) – project impact area intersects with the EPL boundary and the project connects into the existing substation. — Verdant Earth Technologies Ltd, 112 Longpoint Road, Singleton (EPL 11262), Redbank Power Station – The EPL boundary intersects the project impact area, however no plant infrastructure is located within the project impact area — Dyno Nobel Asia Pacific Pty Ltd (Chemical Industry), 5 Woodlands Road, Mount Thorley (EPL 12159) – EPL boundary around 60 m west of the project impact area — Dyno Nobel Asia Pacific Pty Ltd (Chemical Industry), 186 Long Point Road West, Warkworth (EPL 12158) – The eastern edge of the EPL boundary intersects the project impact area, however no plant infrastructure is located within the project impact area — Lidell Power Station (EPL 2122) - located 380m northeast of the project impact area Source: NSW EPA POEO Act Licensed Activity Register – Accessed August 2024
Former gasworks	No former gasworks are noted within or near the contamination study area. Source: NSW EPA Location of former gasworks sites – Accessed February 2025
National waste management site / National Liquid Fuel Facilities data base	One property on the National Waste Management Site Database is located near the contamination study area: — Mushroom Composters Pty Ltd (Organics recycling facility), 333 Broke Road, Mount Thorley (EPL 10620) – Around 600 m west of the HTP corridor Source: Geoscience Australia, Waste Management Facilities – Accessed February 2025
NSW EPA PFAS investigation program	Singleton Military Area (SMA) - The Department of Defence has completed a detailed environmental investigation to better understand the nature and extent of PFAS resulting from historical use of firefighting foams on and in the area near SMA. The outcomes of the investigation have been used to develop a PFAS Management Area Plan for SMA and the surrounding area. The defined PFAS management Area is located around 3 kilometres to the east of the project impact area. Groundwater flow direction from the PFAS Management Area is inferred to the north northeast, and away from the HTP corridor. The PFAS Management Area is located down hydraulic gradient and not considered to impact on, or interact with, the project. Source: PFAS investigation program, New South Wales Environment Protection Authority and Defence PFAS investigation and management program Accessed February 2025

Item	Details
UXO database review	The HTP corridor passes alongside/through a section of the SMA – A Department of Defence Controlled Area / known UXO site. Based on the Australian Government Defence Singleton Military Area, Unexploded Ordnance Report, section 1, in Sector 4/Vere, Sector 7, Sector 8 (within which the project is partly located) there are no recorded UXO items. Note, the UXO register may not be complete and there are likely unrecorded UXO items within which are not captured in the Australian Government Defence SMA report. <i>Source: Department of Defence Unexploded Ordnance database - Accessed August 2024.</i>
Cattle dips	No cattle dips were identified within the contamination study area. <i>Source: Department of Primary Industries Cattle Dip Site Locator - Accessed February 2025.</i>

5.8 Historical aerial photograph review

In the north of the project impact area, land clearing and industrial activity can be seen beginning in the 1961 aerial photograph at the Warkworth mining area (including mining operations such as Hunter Valley Operations, United Collieries, Wambo Coal and Warkworth Mining). Increased mining activities can be seen in the 1974 aerial photograph, namely the Wambo Coal site. The Bulga Coal Complex and Mount Thorley Operations (intersecting/adjacent to the HTP corridor) can be seen operating in the 1984 aerial photograph, however the footprint of operations is limited (localised mining only).

Mining activity is visible in the 1974 aerial photograph (present day Ravensworth/Hunter Valley Operations) however operations are localised. Mining expansion continues throughout the 1970's and 80's surrounding the HTP corridor. The Bayswater Power Station is not yet present in the 1974 aerial photograph (first generator constructed in 1985).

The central and southern portions generally consist of undisturbed dense bushland (making up the present day Corrabare, Pokolbin, Olney and Watagan State forests. No evidence of significant ground disturbance or land use is observed on the historic aerial images.

The south traverses east towards the Eraring Power Station. In the 1965 aerial photograph the land surrounding Lake Eraring generally comprises cleared agricultural land. The Eraring Power Station is not yet present in the 1974 aerial photograph (construction of the power station began in 1977). Eraring Power Station and the township of Dora Creek are visible in the 1990 aerial photograph.

5.9 Site inspection

Table 5.4 provides a summary of the findings of site inspections (as described in *section 4.3.2*).

A photographic log for the site inspection is provided in *Appendix A (Photographic log)*.

Table 5.4 Site inspection observations

ACC	Distance from project impact area	Field observations
Bayswater Power Station	Within project impact area	Potential sources of contamination noted during the inspection: — Diesel fuel tank farm (ASTS) — Flocculant tanks and associated chemicals — Cooling towers — Liming plant — Water treatment system — Power infrastructure No personnel were available for interview whilst on-site.
Dyno Nobel Warkworth	Intersects project impact area	No access available. Observations from accessible public land limited.
Mt Thorley industrial estate	Around 800m west of the project impact area	No access available. Observations made from public land. The observations made for the Mt Thorley industrial complex include: — Enaex – geotanks, above ground storage tanks (ASTs), and IBC containers in west side of the site assumed empty. Fuel infrastructure in the centre of the site assumed currently in use with 1 visible monitoring well from public land — International - explosive equipment, minor storage of chemicals and shipping container notable from public land — Poltech – heavy machinery, IBC containers, pole storage and fabrication — Bridgestone Tyres and Marathon Tyres – Tyre workshops and storage areas for mining equipment tyres — SGS Laboratory — Orica Site – fuelling infrastructure with large ASTs noted on-site. Multiple fuelling trucks entering and exiting site — Samuels Transport – Fuel AST noted on-site — Total fire solutions – no large quantities of fire suppressant visible from the street. Suspected only used to house extinguishers and other minor firefighting equipment — Monadelphous – engineering company. ASTs and storage of equipment noted on-site — Other business noted in the general vicinity include mechanics, Coates Hire, drilling, electrical and conveyor companies, prime and paint companies and a scrap metal business

ACC	Distance from project impact area	Field observations
Dyno Nobel Mount Thorley	Around 60m west of the project impact area	No access available.
Mushroom Composters	Around 600m west of the project impact area	No access available. Observations made from public land. A strong organic odour was noted coming from the premises. Agricultural sprayers were observed assumed to be used for water and nutrients distribution. Other observations made include the land appeared to be natural topography, solar panels, hay bales and a weigh bridge were noted. The farm is currently on a mining lease with Bulga coal mine operations surrounding the property.
Singleton Military Area	Project impact area passes through this ACC	No access available
Mining Lease Areas – Hunter Valley Operation	Project impact area passes through this ACC	Potential sources of contamination noted during the inspection include: — Former Orica explosive importation and storage site. Ammonia phosphate believed to have been used, with potential explosive residue remaining. Currently the area is used as a laydown/storage area. Current storage includes: — ASTs – 90,000L Diesel (assumed empty/abandoned) — Pipes (concrete and PVC) — Large lubrication containers (ASTs) — Scrap metal — Site offices – demountable — Jerry cans (suspected fuel) — Tanks — Engine components/fittings — Rain tanks — IBC containers — Geofabric — Fuse boxes — Former firefighting training ground – believed to use firefighting foams and equipment to train emergency services. Currently not used. 210L drums on-site – contents unknown — Fuel storage in workshop area adjacent to the admin buildings — Wastewater treatment plant (flocculant plant) – infrastructure and chemicals storage supporting the treatment plant areas. Significant storage activities noted at the adjacent laydown include – — Hydraulic fluids — Bins — IBC containers — Drums — Hydraulic oil cans — Tyres — Metal scrape — Mechanical parts

ACC	Distance from project impact area	Field observations
		— South Tailings Dam – suspected large contamination source. — Carrington billabong – 2 monitoring wells observed. — Coal pad.
Mining Lease Areas – Mount Thorley Warwick Mine Water Management Area	Adjacent to the project impact area	No Access available
Mining Lease Areas – Bulga Coal Mine Deep Pit	Project impact areas pass through this ACC	The HTP corridor intersects mostly rehabilitated land at Bulga Coal Mine. The current nearby operations include a surge dam/ Coal Handling and Preparation Plant Dam. General site practices in the vicinity of the HTP corridor include plant operation for rehabilitation, water catchment and storage. Other potentially contaminating activities noted on-site include operating diesel pumps and coal handling plants. The defence land was immediately to the east and mushroom farm to the north.

5.10 Areas of contamination concern

Several areas of contamination concern (ACCs) were identified qualitatively from both desktop assessment and field survey. Table 5.5 provides an overview of the ACCs, and associated contaminants of concern located within the contamination study area. The location of the individual ACCs is shown on Figure 5.6.

These ACCs were identified as having the potential to cause harm to human health or ecological receivers during construction activity (land disturbance) and operation of the project, without mitigation measures in place.

The identification of areas of contamination concern does not represent actual contamination incidents or contamination conditions within the project impact area. It is a statement of the potential for contamination to be present based on historical records and existing land uses and represents a worst-case scenario.

Table 5.5 Identified areas of contamination concern within the contamination study area

Areas of contamination concern	Reason for concern	Potential sensitive receivers	Potential contaminants of concern	Likelihood for contamination (see section 4.4)
Bayswater Power Station Inside / bordering the contamination study area at the northernmost extent and next to the Bayswater south switching station.	- Spills from maintenance activities on-site and leaks from site transformers - Storage of contaminated coal ash within the Tailings dam - Potential leaks associated with fuel/transformer oil storage	— Construction/maintenance workers — Aquatic ecosystems — Terrestrial ecosystems near the substation — Off-site agricultural users on adjacent farming land	— Poly chlorinated biphenyls (PCBs) — Benzene, toluene, ethylbenzene, xylene, and naphthalene (collectively referred to as BTEXN)	High

Areas of contamination concern	Reason for concern	Potential sensitive receivers	Potential contaminants of concern	Likelihood for contamination (see section 4.4)
			— Total recoverable hydrocarbons (TRH) — Polycyclic Aromatic Hydrocarbons (PAH) — PFAS	
Redbank Power Station Project access track leads into EPL boundary	Spills from maintenance activities on-site and leaks from site transformers Potential leaks associated with fuel/transformer oil storage Storage of contaminated coal ash within the Tailings dam	— Construction/maintenance workers — Aquatic ecosystems — Terrestrial ecosystems near the substation — Off-site agricultural users on adjacent farming land	— PCBs — BTEXN — TRH — PAH — PFAS	High
Eraring Power Station Project connection into existing switchyard	Spills from maintenance activities on-site and leaks from site transformers Potential leaks associated with fuel/transformer oil storage	— Construction/maintenance workers — Aquatic ecosystems — Terrestrial ecosystems near the substation — Off-site agricultural users on adjacent farming land	— PCBs — BTEXN — TRH — PAH — PFAS	High
Mining lease areas – Coal	Uncontrolled earthworks, spills from activities on-site, dumping of wastes, mine tailings	— Construction/maintenance workers — Aquatic ecosystems — Terrestrial ecosystems — Off-site agricultural users on adjacent farming land	— Acid mine drainage — Heavy metals — PAH — TRH — Methane — High carbon material (HCM)	High
Dyno Nobel Warkworth and Mt Thorley	Explosive manufacture and storage of fuels and other chemicals	— Construction/maintenance workers — Aquatic ecosystems — Terrestrial ecosystems — Off-site agricultural users on adjacent farming land	— Explosives — Ammonia nitrate/phosphate — Fuel — TRH/BTEXN/PAH — Heavy metals	High

Areas of contamination concern	Reason for concern	Potential sensitive receivers	Potential contaminants of concern	Likelihood for contamination (see section 4.4)
Farm structures	Historical uncontrolled earthworks/filling and building structures previously demolished/degraded Storage of agricultural chemicals and potential leaks associated with site works	— Construction/maintenance workers — Aquatic ecosystems — Terrestrial ecosystems — Agricultural users	— Heavy metals — Asbestos — PAH — Pesticides — TRH	Medium
Farm dams	Historical uncontrolled earthworks/filling Accumulation of nutrients and pesticides from adjacent cropping activities	— Construction/maintenance workers — Aquatic ecosystems — Terrestrial ecosystems — Agricultural users	— Heavy metals — BTEX — Pesticides — TRH — Nutrients — E. coli (and faecal bacteria)	Medium
Singleton Military Area	Potential historical use of fire-fighting foam, storage of fuels and other chemicals Munitions testing activities	— Construction/maintenance workers — Aquatic ecosystems — Terrestrial ecosystems — Off-site agricultural users on adjacent farming land	— Heavy metals — PAH — TRH — PFAS — UXO items	Medium
Areas of active cropping/ cleared agriculture land	Historical uncontrolled earthworks/filling Potential leaks associated with site works, nutrients and pesticides from cropping activities	— Construction/maintenance workers — Terrestrial ecosystems — Aquatic ecosystems — Agricultural users	— Heavy metals — Pesticides — TRH — PAH — Nutrients	Low
Existing roadways and rail corridors	Spills from vehicles, and maintenance activities on-site Uncontrolled filling	— Construction/maintenance workers — Terrestrial ecosystems — Aquatic ecosystems — Off-site agricultural users on adjacent farming land	— BTEXN — TRH — PAH — Asbestos — Pesticides	Low
Existing towers and transmission line infrastructure	Spills from maintenance activities on-site, asbestos paints on tower infrastructure	— Construction/maintenance workers — Terrestrial ecosystems	— BTEXN — TRH — Asbestos	Low

Areas of contamination concern	Reason for concern	Potential sensitive receivers	Potential contaminants of concern	Likelihood for contamination (see <i>section 4.4</i>)
		— Aquatic ecosystems — Off-site agricultural users on adjacent farming land	— Pesticides.	

Legend

- Study area
- Project impact area
- HTP corridor
- Bayswater South switching station
- Construction support site
- Laydown area
- Adjustment to existing transmission line (lines 31 and 32)
- Upgrades to existing transmission line (lines 5A3 and 5A4)
- Access track
- Road
- Existing transmission line
- 330 kV transmission line
- 500 kV transmission line
- River
- Waterbody
- NPWS reserve
- State forest
- Local government area
- Mine operation areas
- Mine infrastructure
- Areas of contamination concern



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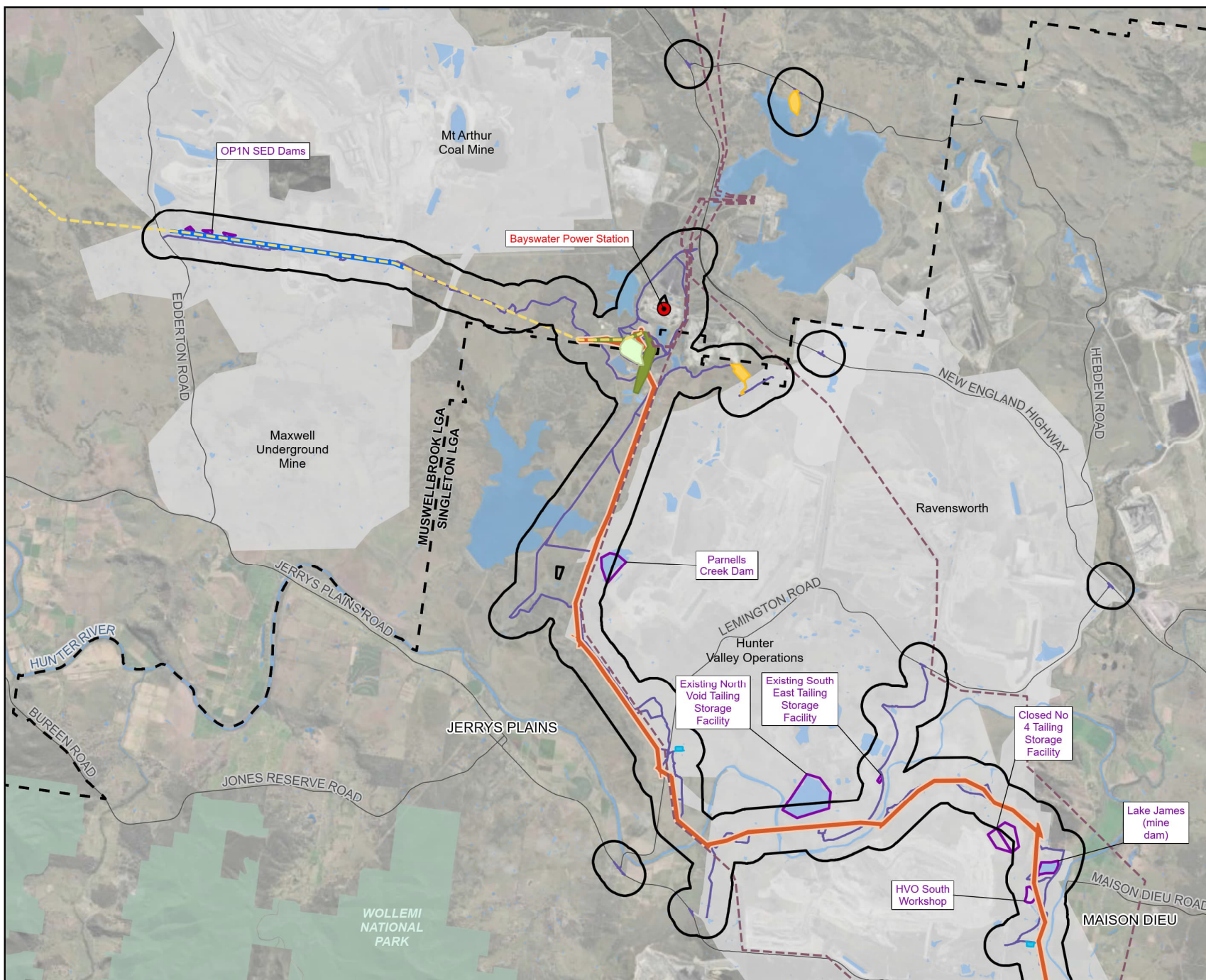
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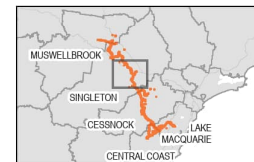


Hunter Transmission Project Figure 5.6

Areas of contamination concern
Page 2 of 4

Legend

- Study area
- Project impact area
- HTP corridor
- Construction support site
- Adjustment to existing transmission line (line 81)
- Access track
- Road
- Existing transmission line
- 330 kV transmission line
- River
- Waterbody
- NPWS reserve
- State forest
- Local government area
- Singleton military area
- Mine operation areas
- Mine infrastructure
- Areas of contamination concern



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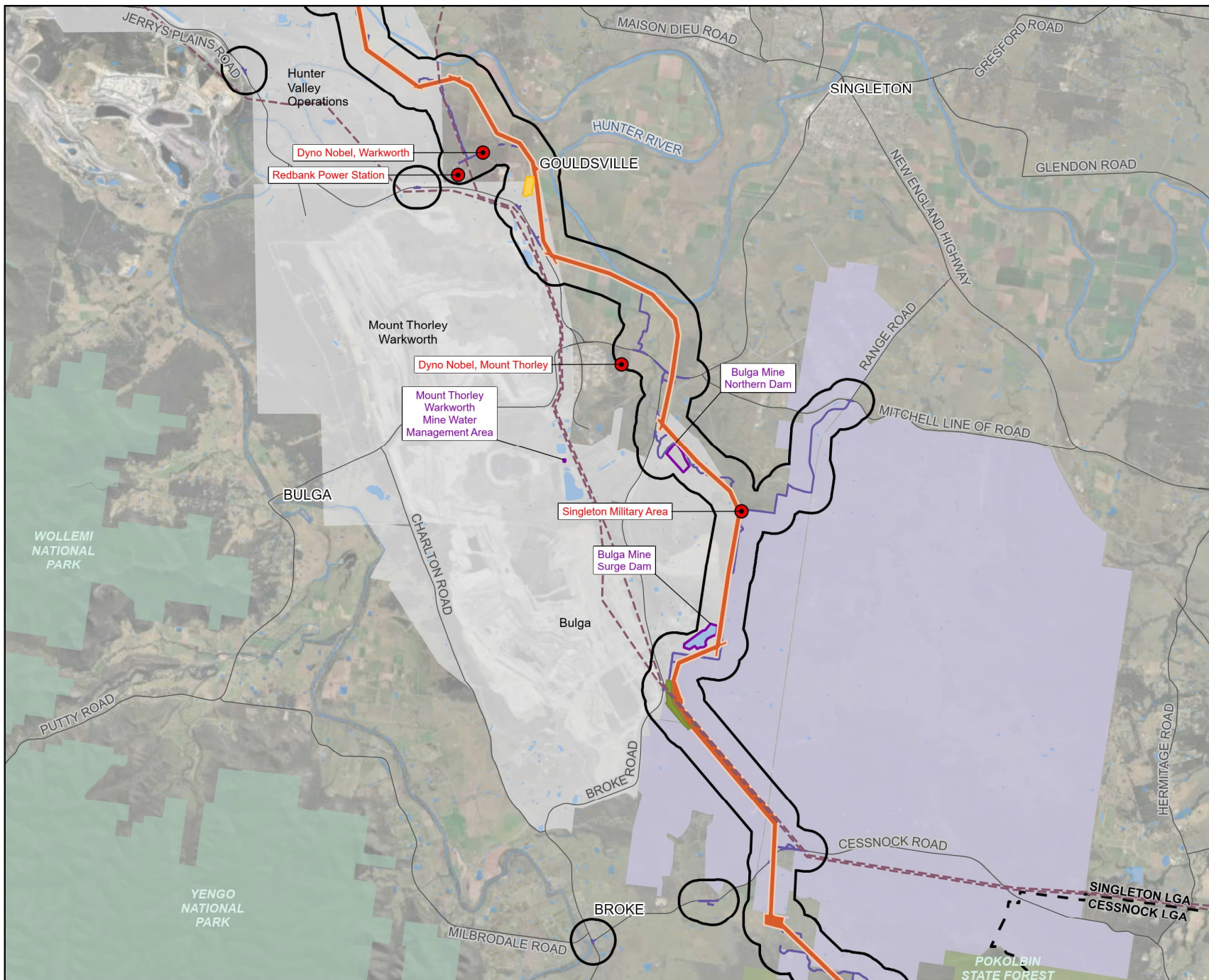
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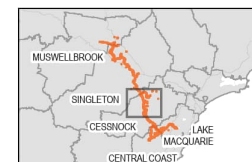


Hunter Transmission Project Figure 5.6

Areas of contamination concern
Page 3 of 4

Legend

- Study area
- Project impact area
 - HTP corridor
 - Construction support site
 - Laydown area
 - Access track
 - Road
- Existing transmission line
 - 330 kV transmission line
- Waterbody
- NPWS reserve
- State conservation area
- Flora reserve
- State forest
- Local government area
- Singleton military area



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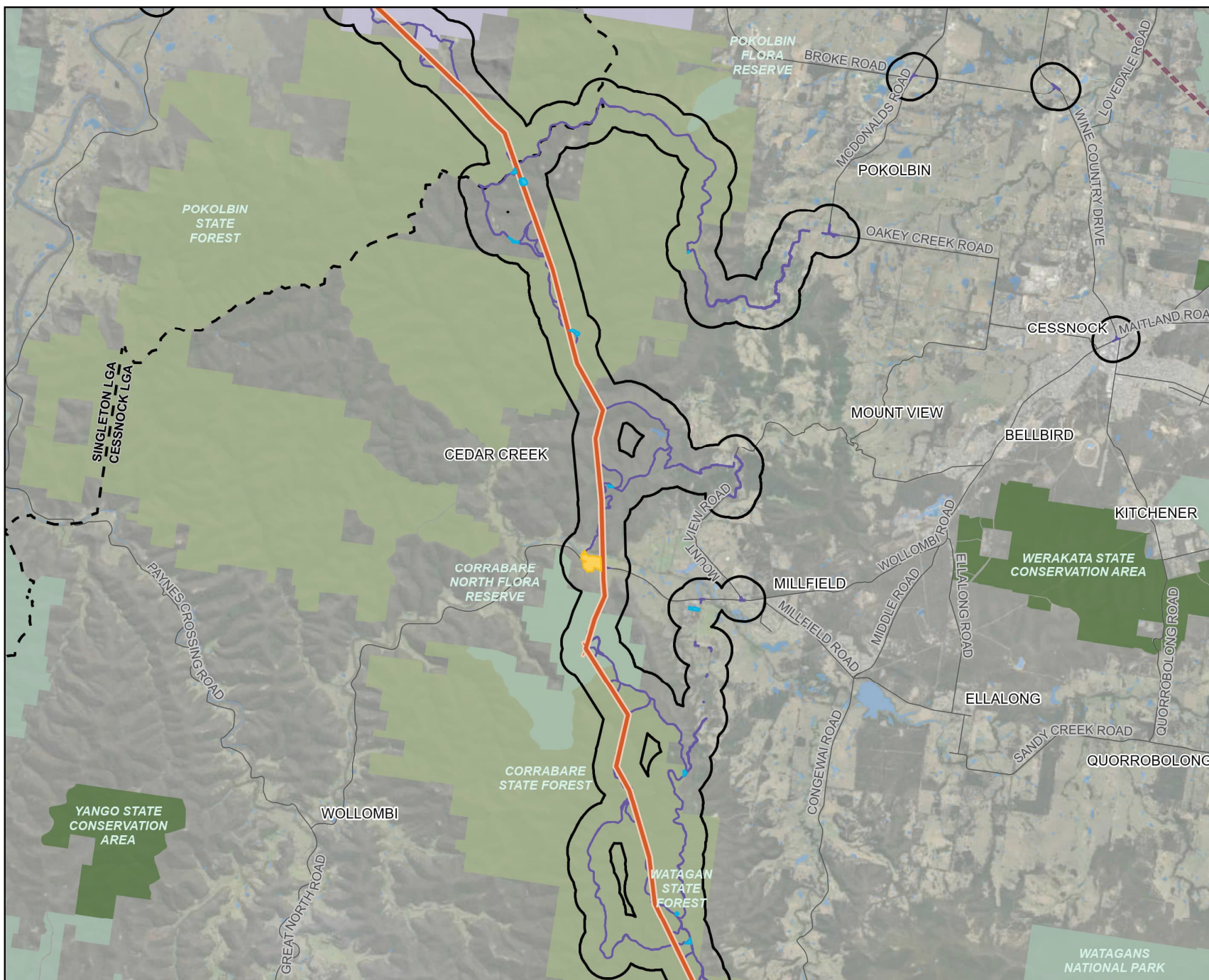
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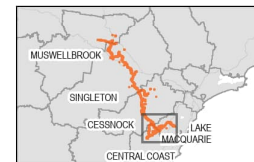


Hunter Transmission Project Figure 5.6

Areas of contamination concern
Page 4 of 4

Legend

- Study area
- Project impact area
- HTP corridor
- Olney switching station
- Construction support site
- Laydown area
- Eraring Substation upgrade
- Upgrades to existing transmission line (lines 5A1 and 5A2)
- Access track
- Road
- Existing transmission line
 - 330 kV transmission line
 - 500 kV transmission line
- River
- Waterbody
- NPWS reserve
- State conservation area
- Flora reserve
- State forest
- Local government area
- Areas of contamination concern



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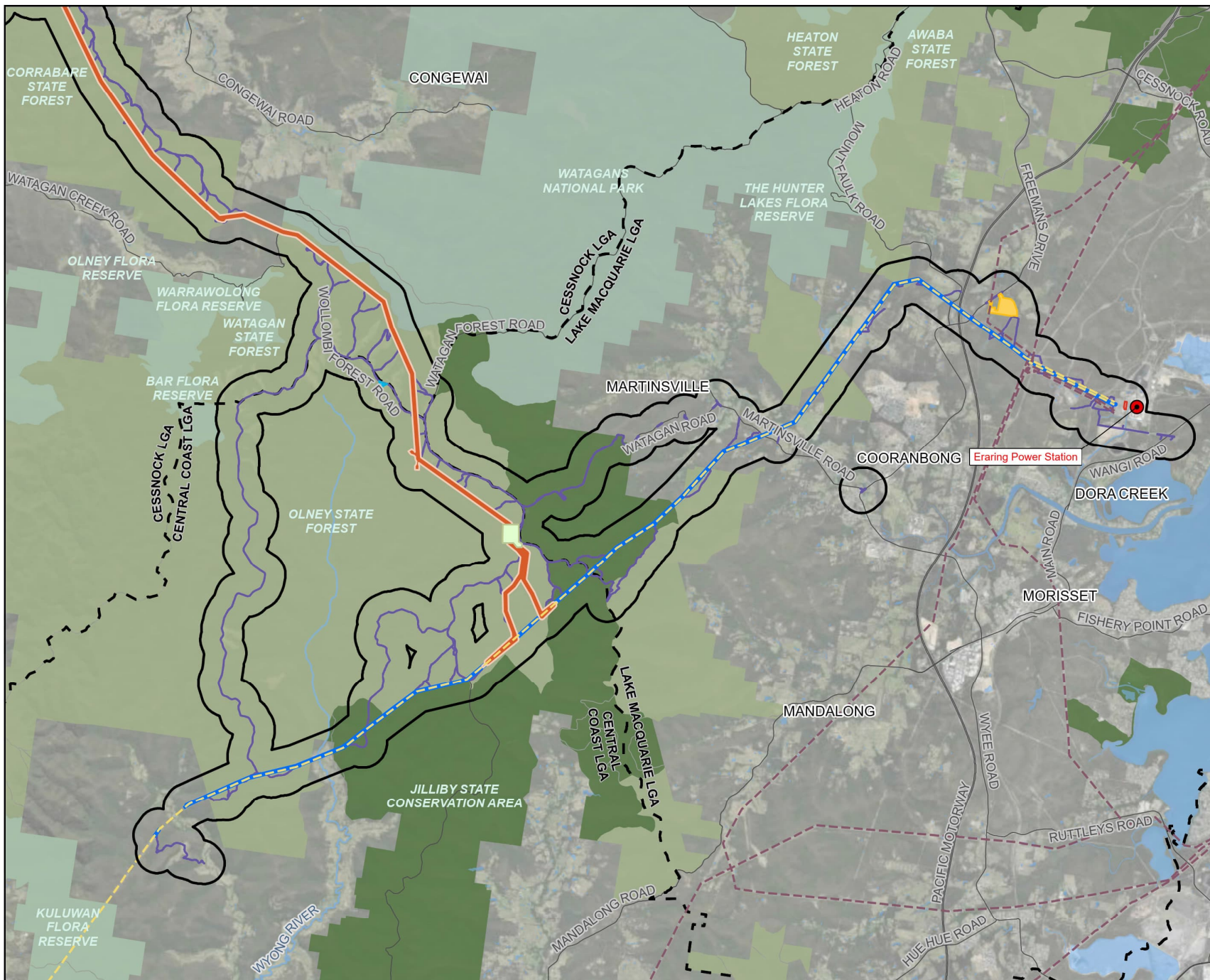
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5.11 Intrusive investigation findings

Geotechnical and contamination investigations for the project are ongoing. The relevant criteria and outcomes of the investigation reported during 2025¹ are described in this section.

Sample location maps are provided in *Appendix B (Investigation locations)*.

5.11.1 Guideline criteria

Soil

The NEPM (2013) was considered in assessing the presence and extent of soil contamination within the contamination study area. The NEPM (2013) provides health investigation levels (HILs) and health screening levels (HSLs) for the assessment of impacted soil. Risks during the construction phase, and for future site users have been considered:

- the ‘HIL/HSL C’ criteria for recreational/open space land use were conservatively adopted since land adjacent to the project is accessible to the public in parts, and
- ‘HIL/HSL-D’ criteria for commercial/industrial land use was considered for construction workers.

The NEPM (2013) provides ecological screening levels (ESLs) for TRH and BTEX compounds, and ecological investigation levels (EILs) for metals and organic substances, which are applicable for the assessment of potential risk to terrestrial ecosystems from these contaminants. The ESLs apply to different land use scenarios, and to coarse- and fine-grained soils. The EILs depend on specific soil physicochemical properties and land use scenarios. ESLs/EILs generally apply to the top 2 metres of soil. For this investigation, urban residential and public open space values, and commercial industrial land use were adopted. Based on the known soil strata of the investigation areas, the criteria for coarse-texture soil were used. The most conservative soil properties were applied for the purpose of calculating EILs for the site.

Salinity and sodicity

Salinity and sodicity have been assessed against the rankings presented in NSW DLWC (2002), Site Investigations for Urban Salinity (see Table 5.6 and Table 5.7). The electrical conductivity results reported by the laboratory have been converted into EC_e values using a multiplication factor of 8.5, which is applicable for light clays (reflective of the dominant soil geology across the investigation area).

Table 5.6 Soil assessment criteria – Salinity

Rating	EC _e (DS/M)	Effect on plants ¹
Non Saline	<2	Salinity effects are mostly negligible
Slightly Saline	2-4	Yields of sensitive crops are affected
Moderately Saline	4-8	Yields of many crops are affected
Highly Saline	8-16	Only tolerant crops yield satisfactorily
Extremely Saline	>16	Only very tolerant crops yield satisfactorily

¹ WSP January 2025a “Contamination Factual Report, Hunter Transmission Project”, WSP January 2025b “Geotechnical Factual Report, Hunter Transmission Project”, WSP February 2025, “Addendum to contamination factual report – Hunter Transmission Project” and WSP March 2025, “Second addendum to contamination factual report – Hunter Transmission Project”.

Table 5.7 Soil assessment criteria – Sodicity

Rating	Exchangeable Sodium Percent (ESP) %
Non Sodic	<5
Sodic	5-15
Highly Sodic	>15

Surface water

Schedule B1 of the NEPM (2013) defines surface water investigation levels (SWILs) that have been developed for a broad range of metals and organic contaminants in water. SWILs are applicable for assessing human health and ecological risk from direct contact (including consumption) with water. SWILs were based on the following guidelines:

- Australian and New Zealand Conservation Council/Agriculture, and Resource Management Council of Australia and New Zealand 2000, National water quality management strategy. Australian and New Zealand guidelines for fresh and marine water quality. This guideline has been superseded by an online resource prepared by the Australian and New Zealand Governments (ANZG) in 2018
- National Health and Medical Research Council (NHMRC)/National Resource Management Ministerial Council (NRMMC) 2011, Australian Drinking Water Guidelines 6 (ADWG) (Version 3.5, updated August 2018)
- NHMRC 2008, Guidelines for Managing Risk in Recreational Waters.

Trigger values for the protection of 95% of freshwater water species were selected for most contaminants, except where contaminants are potentially bio-accumulative, in which case the trigger values for the protection of 99% of species was adopted.

5.11.2 Soil analytical results

Soil samples were collected from 136 borehole locations for the contaminants of potential concern TRH, BTEXN, PAH, PCBs, pesticides, heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc) and asbestos. Additionally, 2 soil samples collected from within and adjacent to the SMA and 6 soil samples collected from within the Bayswater Power Station were analysed for PFAS.

Soil analysis reported BTEXN, pesticides and PCB concentrations below the laboratory limit of reporting (LOR). Asbestos containing material was not detected in any samples.

TRH concentrations were reported above LOR in thirteen soils samples analysed, TRH concentrations were generally below the adopted site assessment criteria. TRH >C₁₀-C₁₆ exceeded the ESL for areas of ecological significance in sample BHA10-BB_0.5-0.6. It is noted, however, that this borehole is not located within an area of ecological significance. As such, the ESLs for areas of ecological significance are not considered to be applicable to samples collected at this location. TRH >C₁₆-C₃₄ exceeded the ESL for urban residential and public open space in this sample. The concentrations of TRH >C₁₀-C₁₆ and >C₁₆-C₃₄ also marginally exceeded the ESLs in samples BH-309_0.0_0.1 and BHA16-BB_0.5-0.6. To determine whether the detected TRH concentrations were associated with naturally occurring organic matter or an anthropogenic petroleum source, silica gel clean-up and re-analysis was conducted on soil sample BH-309_0.0_0.1 and BHA16-BB_0.5-0.6. TRH compounds were below assessment criteria in these samples following silica gel clean-up.

PAHs were not detected above LOR except for fluorene and phenanthrene in BHA16-BB_0.5-0.6 at concentrations below adopted site assessment criteria and BHB05-ABE_0.1-0.3m, which recorded a concentration of benzo(a)pyrene toxicity equivalent quotient exceeding HIL-C criteria and benzo(a)pyrene exceeding the ESLs.

Heavy metals were detected in most samples, with concentrations generally below assessment criteria. Zinc in BHA14-BB_18.5-18.62 and BH319_0.0-0.1 and nickel in BHA17-BB_0.0-0.1, BHA10-BB_0.0-0.1, BHA10-BB_0.5-0.6, BHA210_0.0-0.1 and BHA210_1.0-1.1 were detected above the EILs for areas of ecological significance. It is noted, however, that these boreholes are not located within an area of ecological significance. As such, the EILs for areas of ecological significance are not considered to be applicable to samples collected at these borehole locations.

Per- and polyfluoroalkyl substances (PFAS) were not detected above laboratory LORs in the analysed soil samples, except for perfluorooctane sulfonic acid (PFOS) detected marginally above the laboratory LOR, but below the adopted criteria, in BH-6-AGL_0.0-0.1 located at Bayswater Power Station.

Based on the soil analytical results widespread contamination has not been identified across the project. Location BHB05-ABE which exceed guideline criteria is located within the Wollombi Road corridor and likely associated with incidental spills or leak from vehicles or uncontrolled fill. Location BHA10-BB_0.5-0.6 which exceed guideline criteria is located within the Hunter Valley Operations EPL mining boundary and likely associated with former mining activities. It is noted that not all the ACCs identified in Table 5.5 were not specifically targeted during this investigation. However, 19 locations were advanced within the Bayswater Power Station and 12 locations advanced within the Hunter Valley Operations mining area.

5.11.3 Analytical results – Sodic soils

Exchangeable sodium percent (ESP) an indicator of sodic soils was analysed at 6 locations within the central portion of the project impact area. Results are shown in Table 5.8.

Table 5.8 Summary results – Sodic soils

Borehole ID	Depth	ESP (%)	Sodicity Rating
BHB15-ABE (Watagan State Forest)	0.4 – 0.5	5.5	Sodic
BHA29-BB (east of Bulga Mine)	0.1	10.3	Sodic
BHB01.0.6-ABE (Singleton Military Area)	0.1	3.6	Non-sodic
BHB01-ABE (Singleton Military Area)	0.5-0.6	3.7	Non-sodic
BHA208 (HVO)	0.5-0.6	4.2	Non-sodic
BHB04_ABE (Pokolbin State Forest)	0.4-0.5	3.5	Non-sodic

5.11.4 Analytical results – Surface water

Surface water samples were collected as grab samples from 12 locations. The analytical results for the surface water samples indicated that heavy metals concentration levels were above the adopted site assessment criteria in SW3, SW5, SW9, SW11, SW12 and SW14. Hardness exceeded the aesthetic guidelines in SW1, SW2, SW3, SW7 and SW9. The pH at SW11, SW12 and SW14 was below the aesthetic drinking water threshold.

Further details related to surface water quality can be found in the *Technical report 10 – Surface water*.

Sample location maps are provided in *Appendix B (Investigation locations)*.

5.12 Mining areas

The project, particularly the northern portion of the HTP corridor, passes through areas that have been subject to recent and historical intensive mining activities. This section summarises the areas within the project impact area with a higher risk of contamination due to mining infrastructure (see Figure 2.2 for location of major operating mines). The mining titles within the vicinity of the contamination study area are shown on Figure 5.7.

Legend

- Study area
- Project impact area
- HTP corridor
- Bayswater South switching station
- Construction support site
- Laydown area
- Adjustment to existing transmission line (lines 31 and 32)
- Upgrades to existing transmission line (lines 5A3 and 5A4)
- Access track
- Existing environment
- Road
- Power station
- 330 kV transmission line
- 500 kV transmission line
- River
- Waterbody
- NPWS reserve
- State forest
- Local government area
- Mine operators
- Current mining titles (within project impact area)



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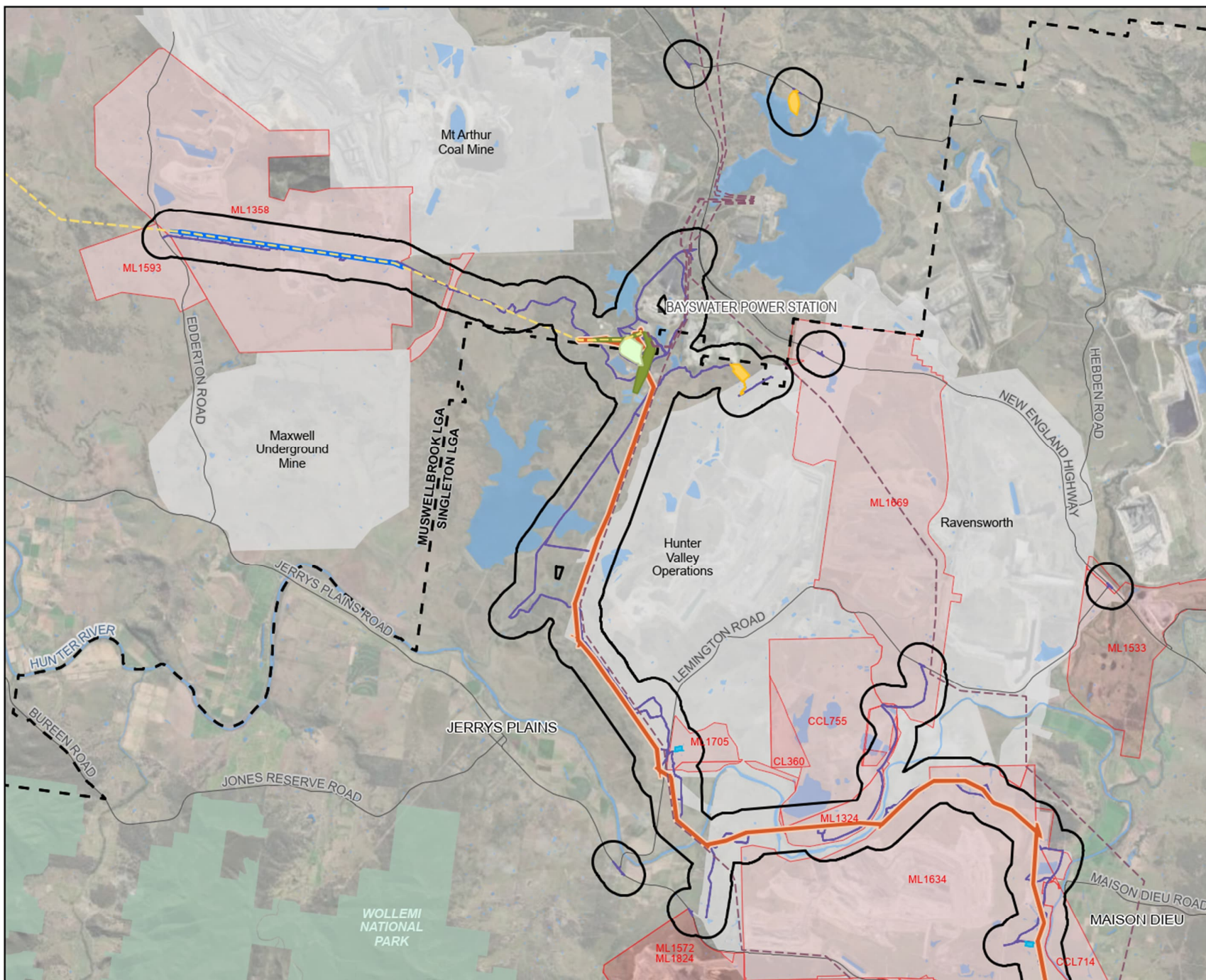
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Hunter Transmission Project Figure 5.7

Current mining titles
within project impact area
Page 2 of 4

Legend

- Study area
- Project impact area
- HTP corridor
- Construction support site
- Adjustment to existing transmission line (line 81)
- Access track
- Existing environment
 - Road
 - 330 kV transmission line
 - River
 - Waterbody
 - NPWS reserve
 - State forest
- Local government area
 - Mine operators
 - Current mining titles (within project impact area)



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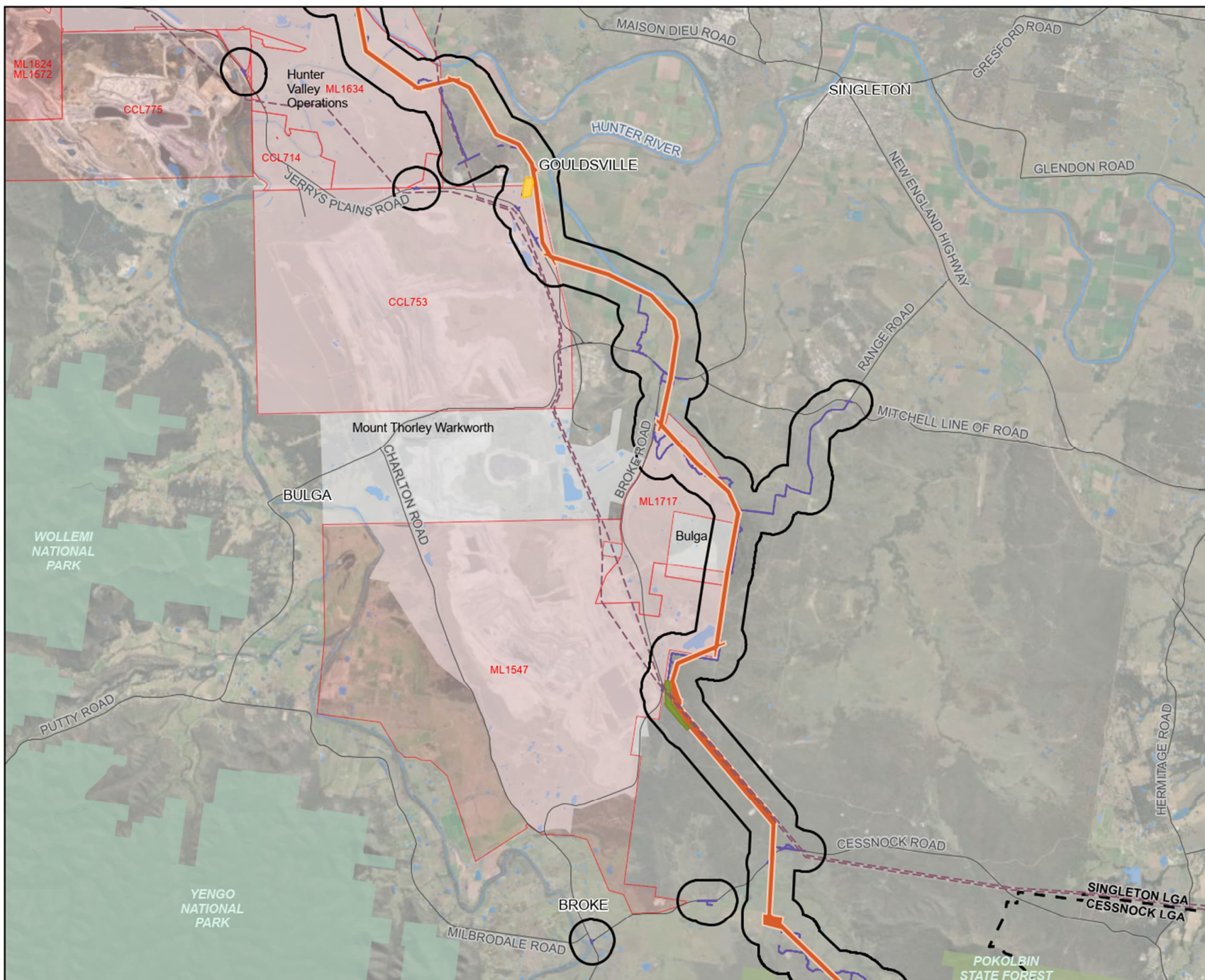
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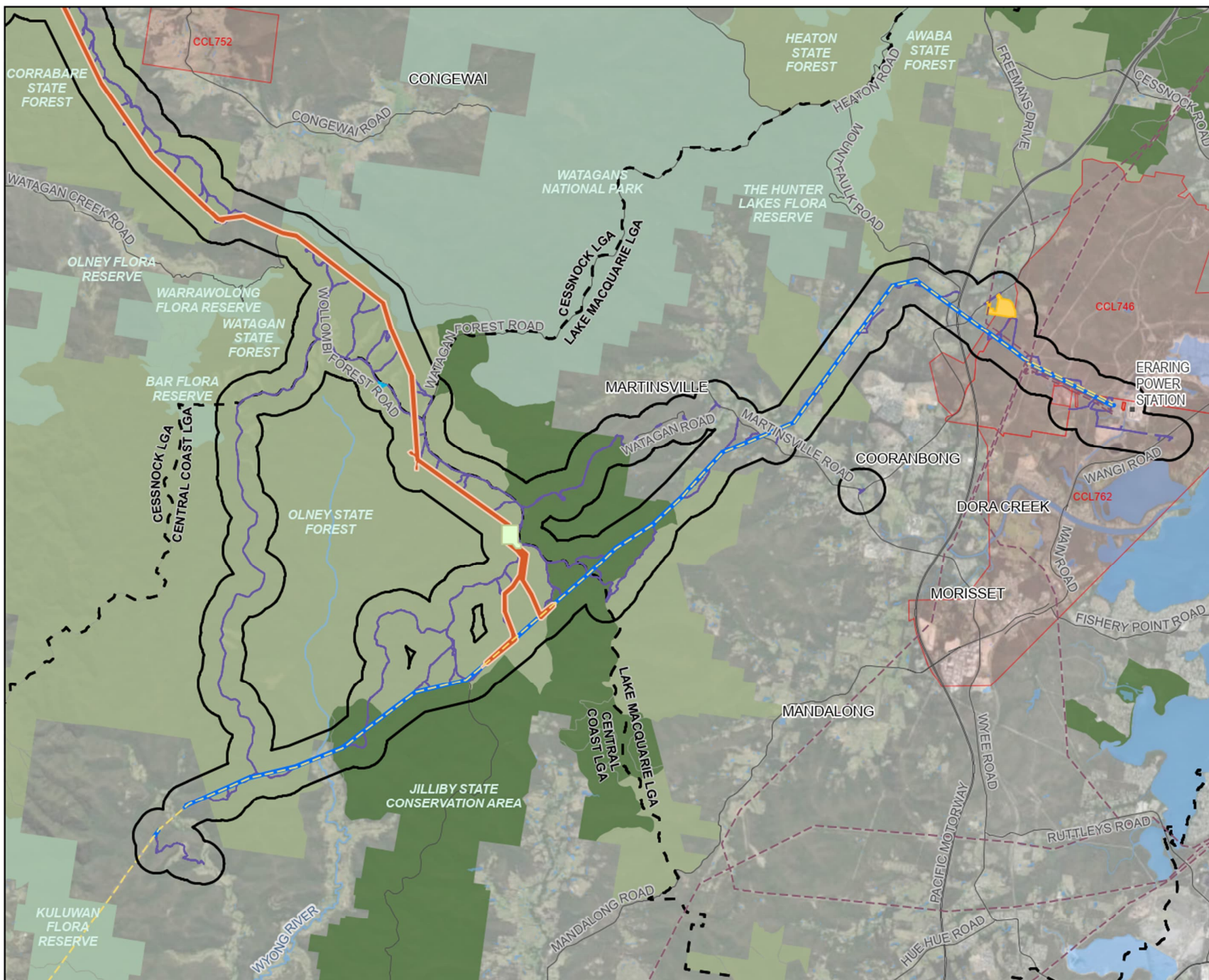
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5.12.1 Mount Arthur Coal

The project impact area traverses in a west to east direction through the active mine pit areas of Saddlers North and Saddlers South. It is noted the project impact area is within the existing Transgrid transmission line easement at this location. Three sediment dams (OP1N SED) are located to the north of the project impact area (see Figure 5.6).

5.12.2 Hunter Valley Operations (HVO)

The project impact area traverses in a west to east direction through the active mine sites of HVO North (Carrington Pit) and HVO South (Chestnut Pit). Several closed tailings storage facilities (TSF) are located within HVO with the 2 closest North C Void TSF and No 4 TSF located within 200 m of the project impact area (see Figure 5.6).

The project impact area also intersects the existing south east TSF, the HVO South Workshop (see Figure 5.8) and traverses the Lake James (mine dam). The HVO North, Parnell's Creek dam is located around 150 m east of the project impact area.



Figure 5.8 HVO South Workshop Area

5.12.3 Mount Thorley Warkworth

The project impact area is located around 200 metres east of the water management area of the Mount Thorley Warkworth mine (see Figure 5.6). A small farm dam, located on land owned Mount Thorley Warkworth mine and outside the mine lease area, is located within the project impact area.

5.12.4 Bulga Coal Mine

The Bulga Coal Mine Northern dam and Surge dam are located adjacent to the project impact area (see Figure 5.6) which passes through the upgradient streams that join into the Northern Dam.

5.12.5 Contaminants of potential concern – Mining

The main contaminants of potential concern associated with coal mining activities in the northern section of the HTP corridor are identified as follows:

- metals and heavy metals, including arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), zinc (Zn), nickel (Ni), mercury (Hg), iron (Fe), manganese (Mn), and aluminium (Al)
- HCM
- acid mine drainage
- coal mine methane
- petroleum hydrocarbons –TRH, BTEXN and PAH.

Metals and heavy metals

Mine sites may have elevated levels of naturally occurring metals or heavy metals. When these materials are disturbed and processed, the risk of leachability and associated health or environmental impacts may increase, associated with toxicity (based on their concentrations) and, for some metals, bioaccumulation. The project impact area passes through areas where legacy and current active tailing dams, pits or overburden areas are or might be located. Materials with elevated levels of metals and heavy metals will require management (where disturbed) during the construction of the project.

High carbon material (HCM)

The tailing storage facilities associated with the mine operations will contain HCM. There is also a higher likelihood of encountering HCM around areas of coal mining operations.

HCM has the potential for spontaneous combustion, where certain materials can ignite as a result of internal heat which arises spontaneously due to reactions liberating heat faster than it can be lost in the environment. Excavations in potential HCM soils risk exposure to spontaneous combustion. Spontaneous combustion can be difficult to control and/or remediate and may extend to larger areas. Potential HCM cannot be used as fill material at the surface level and needs to be appropriately capped. Therefore, careful management will be required to avoid disturbance of HCM. Targeted sampling will be undertaken to confirm if HCM would be disturbed and/or exposed. It should be noted the combustion may occur spontaneously in HCM (when HCM is exposed to oxygen during earthworks).

Acid mine drainage

Acid rock drainage occurs naturally within some environments as part of the rock weathering process but is exacerbated by large-scale earth disturbances characteristic of mining. In some mines, the liquid that drains from coal stocks, coal handling facilities, coal washeries, and coal waste tips can be highly acidic, and in such cases needs to be treated as acid rock drainage. This liquid often contains highly toxic metals, such as copper or iron. These, combined with reduced pH, can have a detrimental impact on the aquatic environment. Interaction with water management infrastructure associated with the coal mining operations should be avoided during the project.

Coal mine methane

Coal mine methane refers to methane released from the coal and surrounding rock strata due to underground mining activities. No underground mining activities have been identified within the contamination study area.

Petroleum hydrocarbons

Mining facilities, workshop areas, and equipment are sources of potential petroleum hydrocarbon related pollution. The likelihood of encountering petroleum hydrocarbon impacted soils is higher where equipment storage, petroleum storage or workshops are encountered within the project impact area. These source areas should be avoided when establishing staging/laydown and other facilities for the project.

6 Assessment of potential construction impacts

This chapter presents an assessment of the potential impacts that may occur during construction of the project. Potential construction impacts associated with contamination and soils include:

- interaction with potentially contaminated soils and groundwater as a result of sub-surface disturbance during construction, including disturbance and potential migration/mobilisation of contaminants
- spontaneous combustion of HCM disturbed during construction
- release of potentially contaminated groundwater where construction activities such as piling could intercept groundwater and require de-watering
- de-watering, management and disposal or discharge of contaminated groundwater
- managing the disposal of contaminated soils encountered during construction
- contamination of soils and groundwater due to spills or leaks of fuels, oils or other hazardous substances during construction
- direct contact and inhalation of contaminated soil and groundwater by site workers where construction activities result in the exposure of existing contamination.

6.1 Potential to encounter contamination

The identified ACCs within the contamination study area are detailed in Table 5.5. The existing mining sites and power station sites have the highest potential for contamination to be encountered during construction.

Disturbance of contaminated areas has the potential to:

- mobilise contaminants, affecting nearby soils, surface water and groundwater
- increase the migration of contaminants into surrounding areas via leaching, overland flow and/or subsurface flow (water and/or vapour) or dust, with the potential to impact on receiving environments
- increase the risk of exposure to contaminants (direct contact and/or inhalation) by site workers, visitors and the local community.

Construction activities have the potential to impact on the existing mining operation areas associated with the Mount Arthur Mine, HVO, Mt Thorley Warkworth Mine and Bulga Coal Mine at the following interfaces:

- Mount Arthur Mine – the construction impact area traverses in a west to east direction through the active mine pit areas, Saddlers Central and Saddlers North. Upgrades to the existing transmission line and access track works are proposed in this area
- HVO - the construction impact area traverses in a west to east direction through the active mine areas of HVO North (Carrington Pit) and HVO South (Chestnut Pit), intersects the HVO South Workshop, and traverses the Lake James (mine dam). The existing southeast TSF is intersected by a proposed new site access track
- Mt Thorley Warkworth Mine - the construction impact area traverses through the water management area, and intersects a small dam managed by the Mount Thorley Warkworth Mine
- The construction impact area passes through the upgradient streams that join into the Northern Dam of the Bulga Coal Mine.

Farm dams throughout the construction impact area present both erosional and contamination hazards to the surrounding environment. It is expected that impacts to farm dams would generally be avoided through continued design development where possible. If disturbance of a farm dam(s) cannot be avoided, the Environmental Management Strategy (EMS) would contain appropriate measures to manage any farm dam dewatering required during the project. A geotechnical

engineer would inspect and assess the material at the base and walls of relevant dam structures and provide recommendation on the extent of removal, replacement and/or treatment (if any) to provide a suitable foundation for dam backfill activities.

Existing soil contamination could be encountered during construction work at locations not previously identified as areas of potential concern and within areas of uncontrolled fill. An unexpected contamination finds procedure (an example of which is provided in *Appendix C (Unexpected finds procedure)*) would be developed as part of the EMS.

The risk of disturbing or encountering contaminated material during construction varies depending on the extent and type of contamination and the nature of the construction work being undertaken. Based on available information a preliminary risk rating has been assigned to each area of contamination concern and construction activity based on the potential for the activity to cause exposure of sensitive receivers to contamination. This information is shown in Table 6.1.

Table 6.1 Preliminary risk ranking of areas of contamination concern

Area of contamination concern (see <i>section 5.10</i>)	Construction activity	Potential construction impact	Likelihood for contamination to be present	Consequence/pathways	Preliminary risk evaluation
Existing infrastructure at Bayswater Power Station	Excavation activities (earthworks), vegetation clearing, vehicle movement, temporary stockpiling and utilities works	Power station infrastructure within the construction impact area (next to the Bayswater south switching station at the northernmost extent of the project) includes a substation switch yard, cooling water reservoir, brine concentrator (contaminated water), effluent ponds and water waste decanting basin. The main Bayswater Power Station building is located outside the HTP corridor to the north. Source: Potential contaminants of concern associated with electrical substations include PCBs, BTEXN, PAH and hydrocarbons. Potential contaminants of concern associated with surface water features (i.e. brine concentrator, effluent ponds) include heavy metals, salinity, nutrients and PFAS. Potential Sensitive Receivers: If not managed appropriately, construction activities have the potential to encounter contaminated soil or groundwater which may impact on human health and/or the environment through: — Direct contact, ingestion, and inhalation by construction workers — Surface water run-off and discharge into receiving environment (aquatic and terrestrial ecosystems)	High likelihood for soil contaminants to be present High likelihood for contaminated water within surface water features (i.e. brine concentrator, effluent ponds) which have the potential to impact on groundwater	Moderate Exposure pathways complete during construction (without the implementation of appropriate controls)	High
	Pile construction	Source: Potential contaminants of concern associated with electrical substations include PCBs, BTEXN and hydrocarbons. Potential Sensitive Receivers: If not managed appropriately, construction activities have the potential to encounter contaminated groundwater which has the potential to impact on human health and/or the environment through: — Direct contact, ingestion, and inhalation by construction workers — Incidental discharge into receiving environment (aquatic and terrestrial ecosystems)	Groundwater depth within the construction impact area is believed to be variable although generally between 2-35 mBGL Medium likelihood for groundwater contamination to be present within the construction impact area, where it intersects the Bayswater Power Station footprint.	Moderate Exposure pathways complete during construction (without the implementation of appropriate controls) Groundwater volumes during construction within the Bayswater Power Station footprint would be negligible	Medium
Redbank Power Station Project access track leads into EPL boundary	Access road upgrade (minor earthworks)	Source: Potential contaminants of concern associated with electrical substations include PCBs, BTEXN, PAH and hydrocarbons. Potential contaminants of concern associated with surface water features (effluent ponds) include heavy metals, salinity, nutrients and PFAS. Potential Sensitive Receivers: If not managed appropriately, construction activities have the potential to encounter contaminated soil and groundwater which may impact on human health and/or the environment through: — Direct contact, ingestion, and inhalation by construction workers — Surface water run-off and discharge into receiving environment (aquatic and terrestrial ecosystems)	High likelihood for soil contaminants to be present in areas surrounding the plant infrastructure. Construction impact area does not encroach into the plant areas (upgrade to site access road only) reducing likelihood to medium	Minor Exposure pathways complete during construction (without the implementation of appropriate controls) however, construction disturbance will be limited	Low
Eraring Power Station Project connection into existing switchyard	Utility connection work (including excavation) and sub-station upgrade activities	Source: Potential contaminants of concern associated with electrical substations include PCBs, BTEXN, PAH and hydrocarbons. Potential Sensitive Receivers: If not managed appropriately, construction activities have the potential to encounter contaminated soil and groundwater which may impact on human health and/or the environment through: — Direct contact, ingestion, and inhalation by construction workers — Surface water run-off and discharge into receiving environment (aquatic and terrestrial ecosystems)	High likelihood for soil contaminants to be present	Moderate Exposure pathways complete during construction (without the implementation of appropriate controls)	High

Area of contamination concern (see <i>section 5.10</i>)	Construction activity	Potential construction impact	Likelihood for contamination to be present	Consequence/pathways	Preliminary risk evaluation
Existing towers and transmission line infrastructure	Excavation activities (earthworks), vegetation clearing, vehicle movement, temporary stockpiling and utilities works	Source: Potential contaminants of concern associated with the construction and maintenance activities surrounding towers and transmission line infrastructure include pesticides, asbestos and hydrocarbons. Potential Sensitive Receivers: If not managed appropriately, disturbance of contaminated soil near existing towers and transmission line infrastructure could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: — Direct contact, ingestion, and inhalation by construction workers — Off-site transport of contaminants via vehicle/plant movements — Risk of contaminated dust exposure to construction workers — Surface water run-off and discharge into receiving environment (aquatic and terrestrial ecosystems)	Low likelihood for contaminants to be present	Minor Exposure pathways complete during construction (without the implementation of appropriate controls)	Low
	Adjacent pile construction	Source: Potential contaminants of concern associated with maintenance activity surrounding existing towers and transmission line infrastructure include pesticides and hydrocarbons. Potential Sensitive Receivers: If not managed appropriately, construction de-watering activities have the potential to encounter contaminated groundwater which could impact human health and/or the environment: — Direct contact, ingestion, and inhalation by construction workers — Incidental discharge into receiving environment (aquatic and terrestrial ecosystems)	Groundwater depth within the construction impact area is observed to be variable, generally between 2-35 mBGL Low likelihood for groundwater contamination to be present within the construction impact area, where it intersects existing towers and transmission line infrastructure.	Minor Exposure pathways complete during construction (without the implementation of appropriate controls). Groundwater volumes during construction would be negligible within the construction impact area, where it intersects existing towers and transmission line infrastructure.	Low
Farm structures	Excavation activities (earthworks), vegetation clearing, vehicle movement, temporary stockpiling and utilities works	Source: Potential contaminants of concern associated with farm structures, include uncontrolled fill material and spills from vehicles. Contaminants of concern associated with uncontrolled fill including TRH, heavy metals, PAH, pesticides and asbestos. Potential Sensitive Receivers: If not managed appropriately, disturbance of contaminated soil associated with farm structures could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: — Direct contact, ingestion, and inhalation by construction workers — Off-site transport of contaminants via vehicle/plant movements — Risk of dust exposure to construction workers — Surface water run-off and discharge into receiving environment (aquatic and terrestrial ecosystems)	Medium likelihood for contaminants to be present, however if contamination is present, it is likely to be localised.	Minor Exposure pathways complete during construction (without the implementation of appropriate controls).	Low
	Pile construction	Source: Potential contaminants of concern associated with farm structures, include uncontrolled fill material and spills from vehicles. Contaminants of concern associated with uncontrolled fill include TRH, heavy metals, PAH and pesticides. Potential Sensitive Receivers: If not managed appropriately, construction activities have the potential to encounter contaminated groundwater which has the potential to impact on human health and/or the environment: — Direct contact, ingestion, and inhalation by construction workers — Incidental discharge into receiving environment (aquatic and terrestrial ecosystems)	Groundwater depth within the construction impact area is observed to be variable, generally between 2-35 mBGL Low likelihood for groundwater contamination to be present in the vicinity of farm structures within the construction impact area.	Minor Exposure pathways complete during construction (without the implementation of appropriate controls). Groundwater volumes during project construction would be negligible in the vicinity of farm structures within the construction impact area.	Low

Area of contamination concern (see <i>section 5.10</i>)	Construction activity	Potential construction impact	Likelihood for contamination to be present	Consequence/pathways	Preliminary risk evaluation
Farm Dams	Excavation activities such as earthworks, vegetation clearing, vehicle movement, temporary stockpiling and utilities works	Source: Potential contaminants of concern associated with farm dams, include uncontrolled fill material and release of potentially contaminated water. Contaminants of concern associated with uncontrolled fill include TRH, heavy metals, PAH, pesticides, and asbestos. Contaminants of concern associated with surface waters within farm dams include heavy metals, E. coli (and faecal bacteria), and nutrients. Pathway-Receivers: If not managed appropriately, disturbance of contaminated soil/waters could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: — Direct contact, ingestion, and inhalation by construction workers — Off-site transport of contaminants via vehicle/plant movements — Risk of dust exposure to construction workers — Incidental discharge into receiving environments (aquatic and terrestrial ecosystems)	Medium likelihood for contaminants to be present.	Moderate Exposure pathways complete if dam dewatering/backfill is required (without the implementation of appropriate controls).	Medium
Areas of active cropping/cleared agricultural land	Excavation activities such as earthworks, vegetation clearing, vehicle movement, temporary stockpiling and utilities works	Source: Potential contaminants of concern associated with cleared agricultural land include TRH, heavy metals, pesticides and PAH. Potential Sensitive Receivers: If not managed appropriately, disturbance of contaminated soil could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: — Direct contact, ingestion, and inhalation by construction workers — Off-site transport of contaminants via vehicle/plant movements — Risk of dust exposure to construction workers — Surface water run-off and discharge into receiving environment (aquatic and terrestrial ecosystems)	Low likelihood for contaminants to be present.	Minor Exposure pathways complete during construction (without the implementation of appropriate controls).	Low
	Pile construction	Source: Potential contaminants of concern associated with cleared agricultural land include TRH, heavy metals, pesticides and PAH. Potential Sensitive Receivers: If not managed appropriately, construction activities have the potential to encounter contaminated groundwater which has the potential to impact on human health and/or the environment: — Direct contact, ingestion, and inhalation by construction workers — Incidental discharge into receiving environment (aquatic and terrestrial ecosystems)	Groundwater depth within the construction impact area is observed to be variable, generally between 2-35 mBGL Low likelihood for groundwater contamination to be present.	Minor Exposure pathways complete during construction (without the implementation of appropriate controls). Groundwater volumes in areas of active cropping/ cleared agricultural land during construction would be negligible.	Low
Existing roadways and rail corridor	Excavation activities such as earthworks, vegetation clearing, vehicle movement, temporary stockpiling and utilities works	Source: Potential contaminants of concern associated with roadways and rail corridor include uncontrolled fill material and spills from vehicles. Contaminants of concern associated with the use of uncontrolled fill include TRH, heavy metals, PAH, pesticides and asbestos. Potential Sensitive Receivers: If not managed appropriately, disturbance of contaminated soil could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: — Direct contact, ingestion, and inhalation by construction workers — Off-site transport of contaminants via vehicle/plant movements — Risk of dust exposure to construction workers — Surface water run-off and discharge into receiving environment (aquatic and terrestrial ecosystems)	Low likelihood for contaminants to be present.	Minor Exposure pathways complete during construction (without the implementation of appropriate controls).	Low

Area of contamination concern (see <i>section 5.10</i>)	Construction activity	Potential construction impact	Likelihood for contamination to be present	Consequence/pathways	Preliminary risk evaluation
Dyno Nobel Mount Thorley	Access track upgrade (minor earthworks)	Source: Potential contaminants of concern include explosives, ammonia nitrate/phosphate, TRH, heavy metals and PAH. Potential Sensitive Receivers: If not managed appropriately, disturbance of contaminated soil could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: — Direct contact, ingestion, and inhalation by construction workers — Off-site transport of contaminants via vehicle/plant movements — Risk of dust exposure to construction workers — Risk due to ignition of explosive substances — Incidental discharge into receiving environments (aquatic and terrestrial ecosystems)	High likelihood for contaminants to be present.	Minor	Medium
Dyno Nobel Warkworth	Excavation activities such as earthworks, vegetation clearing, vehicle movement, temporary stockpiling and utilities works	Source: Potential contaminants of concern include explosives, ammonia nitrate/phosphate, TRH, heavy metals and PAH. Potential Sensitive Receivers: If not managed appropriately, disturbance of contaminated soil could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: — Direct contact, ingestion, and inhalation by construction workers — Off-site transport of contaminants via vehicle/plant movements — Risk of dust exposure to construction workers — Risk due to ignition of explosive substances — Surface water run-off and discharge into receiving environment (aquatic and terrestrial ecosystems)	High likelihood for contaminants to be present.	Moderate	High
	Piling Activities	Source: Potential contaminants of concern include explosives, ammonia nitrate/phosphate, TRH, heavy metals and PAH. Potential Sensitive Receivers: If not managed appropriately, construction activities have the potential to encounter contaminated groundwater which could impact human health and/or the environment: — Direct contact, ingestion, and inhalation by construction workers — Risk due to ignition of explosive substances — Incidental discharge into receiving environment (aquatic and terrestrial ecosystems)			
Singleton Military Area	Excavation activities such as earthworks, vegetation clearing, vehicle movement, temporary stockpiling and utilities works	A review of available aerial imagery (2014 to 2024) did not identify any discernible built features that present as potential contamination sources within the construction impact area. Source: Potential contaminants of concern include fuels, heavy metals, PAH, TRH, PFAS and UXO items. Potential Sensitive Receivers: If not managed appropriately, disturbance of contaminated soil could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: — Direct contact, ingestion, and inhalation by construction workers — Off-site transport of contaminants via vehicle/plant movements — Risk of dust exposure to construction workers — Risk due to ignition of UXO — Surface water run-off and discharge into receiving environment (aquatic and terrestrial ecosystems)	Low to Medium likelihood for contaminants to be present.	Moderate	Medium

Area of contamination concern (see <i>section 5.10</i>)	Construction activity	Potential construction impact	Likelihood for contamination to be present	Consequence/pathways	Preliminary risk evaluation
	Piling Activities	The defined PFAS management Area documented by NSW EPA is located around 3 kilometres to the northeast of the HTP corridor. Groundwater flow direction from the PFAS Management Area is inferred to the north northeast, and away from the HTP corridor. Source: Potential contaminants of concern include fuels, heavy metals, PAH, TRH, PFAS and UXO items. Potential Sensitive Receivers: If not managed appropriately, construction activities have the potential to encounter contaminated groundwater which could impact human health and/or the environment: — Direct contact, ingestion, and inhalation by construction workers — Incidental discharge into receiving environment (aquatic and terrestrial ecosystems)	Low to Medium likelihood for contaminants to be present.	Minor (for groundwater pathway) to Moderate (for UXO) Exposure pathways complete during construction (without the implementation of appropriate controls). Groundwater volumes during construction would be negligible	Medium
Mining lease areas Scenario A – Areas outside active mine footprints including mining access roads	Excavation activities such as earthworks, vegetation clearing, vehicle movement, temporary stockpiling and utilities works	Source: Potential contaminants of concern include acid mine drainage, methane, TRH, heavy metals and PAH. Potential Sensitive Receivers: If not managed appropriately, disturbance of contaminated soil could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: — Direct contact, ingestion, and inhalation by construction workers — Off-site transport of contaminants via vehicle/plant movements — Risk of dust exposure to construction workers — Surface water run-off and discharge into receiving environment (aquatic and terrestrial ecosystems) — Ingress/accumulation of methane gases within open excavations	Low likelihood for soil contaminants to be present based on contamination investigations undertaken for the project.	Moderate Exposure pathways complete during construction (without the implementation of appropriate controls).	Low
	Pile construction	Source: Potential contaminants of concern include acid mine drainage, methane, TRH, heavy metals and PAH. Potential Sensitive Receivers: If not managed appropriately, construction activities have the potential to encounter contaminated groundwater which could impact human health and/or the environment: — Direct contact, ingestion, and inhalation by construction workers — Incidental discharge into receiving environment (aquatic and terrestrial ecosystems) — Potential explosive atmosphere (methane)	Groundwater depth within the construction impact area is observed to be variable, generally between 2-35 mBGL Medium likelihood for groundwater contamination to be present within the construction impact area where it intersects the areas outside active mine footprints.	Moderate Exposure pathways complete during construction (without the implementation of appropriate controls). Volumes during construction would be negligible within the construction impact area where it intersects the areas outside active mine footprints.	Medium

Area of contamination concern (see <i>section 5.10</i>)	Construction activity	Potential construction impact	Likelihood for contamination to be present	Consequence/pathways	Preliminary risk evaluation
Mining lease areas Scenario B – Active Surface Mining, Mine Surface Water Infrastructure, Areas intersecting Water Treatment Plants, Tailings Piles	Excavation activities such as earthworks, vegetation clearing, vehicle movement, temporary stockpiling and utilities works	Source: Potential contaminants of concern include acid mine drainage, methane, TRH, heavy metals, HCM and PAH. Potential Sensitive Receivers: If not managed appropriately, disturbance of contaminated soil could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: — Direct contact, ingestion, and inhalation by construction workers — Off-site transport of contaminants via vehicle/plant movements — Risk of dust exposure to construction workers — Risk due to ignition of HCM — Surface water run-off and discharge into receiving environment (aquatic and terrestrial ecosystems)	High likelihood for contaminants to be present.	Significant Exposure pathways complete during construction (without the implementation of appropriate controls).	High
	Pile construction	Source: Potential contaminants of concern include acid mine drainage, methane, TRH, heavy metals, HCM and PAH. Potential Sensitive Receivers: If not managed appropriately, construction activities have the potential to encounter contaminated groundwater which could impact human health and/or the environment: — Direct contact, ingestion, and inhalation by construction workers — Risk due to ignition of HCM — Incidental discharge into receiving environment (aquatic and terrestrial ecosystems)	Groundwater depth within the project impact is observed to be variable, generally between 2-35 mBGL Medium likelihood for groundwater contamination to be present.	Moderate Exposure pathways complete during construction (without the implementation of appropriate controls). Volumes during construction would be minimal.	Medium

6.2 Potential impacts to the project from existing sources of contamination

6.2.1 *Naturally occurring asbestos*

Based on the information reviewed, there is no known or expected naturally occurring asbestos minerals or serpentine and amphibole occurrence within the contamination study area. Therefore, no naturally occurring asbestos impacts are expected in relation to the construction of the project. Residual risk will be managed in accordance with an unexpected contaminated finds procedure (see *Appendix C (Unexpected finds procedure)*).

6.2.2 *Soil contamination*

Construction activities including excavation (earthworks), vegetation clearing, vehicle movements and utility works, would disturb the soil. This could result in the exposure of existing contaminated soils, where present, which could lead to ecological or human health impacts, if not properly managed. Most areas of contamination concern within the construction impact area were evaluated as having a low contamination risk during construction.

The mine lease areas were assessed to pose a medium to high risk during construction due to the higher potential to encounter soil contamination during excavation activities, including exposing areas of HCM in discrete locations. The existing power stations and Dyno Nobel Warwick were also evaluated to pose a medium to high risk during construction based on a high likelihood for contamination (i.e. diesel fuel tank farm, flocculant tanks and associated chemicals, water treatment system and power infrastructure) identified during site inspections.

It is noted that the risk rankings in Table 6.1 are prior to the implementation of the recommended management measures identified in *Chapter 8*. The potential risks associated with unexpected contamination finds (including potential uncontrolled filling) have not been assessed. This risk will be managed in accordance with an unexpected contaminated finds procedure (see *Appendix C (Unexpected finds procedure)*).

Following the implementation of recommended management measures (see *Chapter 8*), it is anticipated that the identified risk to the project from encountering contaminated soil will be effectively managed through the implementation of controls as part of the EMS and unexpected finds protocol.

6.2.3 *Surface water and groundwater contamination*

Groundwater impact assessment (see *Technical Report 11 – Groundwater impact assessment*): documents the impacts on groundwater aquifers and groundwater dependent ecosystems and includes the consideration of groundwater supply for the project demands.

Table 6.1 identifies the likelihood for groundwater contamination to be present at each of the identified ACCs, a high likelihood of groundwater contamination was associated with the Dyno Nobel and Bayswater Power Station Sites. Subsurface excavations below the water table are anticipated to be minor with incidental volumes of groundwater take during dewatering. Disturbance volumes during piling would be minimal. Contaminated groundwater from identified areas of contamination concern poses a low to medium risk to the environment during construction of the project.

Within the construction impact area there is the potential for construction activities to interact with the surface water and ground water management infrastructure at the active mine sites and Bayswater Power Station. Water retained within the management infrastructure will be contaminated (i.e. high salinity, low pH, heavy metals). There is a risk of contaminated surface water discharge into the receiving environment if any of the existing water management infrastructure was disturbed during project construction activities.

Following the implementation of recommended management measures (see *Chapter 8*), it is anticipated that the identified risk to the project from encountering contaminated groundwater will be effectively managed through the implementation of controls as part of the EMS and unexpected finds protocol.

A soil and water management sub-plan will also be prepared and contain details of appropriate measures for managing groundwater during construction. Stormwater overflow will be diverted around excavations to the extent practicable.

6.3 Potential impacts to the soil environment from construction activities

6.3.1 *Top-down contamination sources*

Storage and laydown areas would be used to store construction materials, plant and equipment and recovered waste and recycling materials. Hazardous and dangerous goods storage would include petroleum, diesel, liquefied petroleum gas, herbicides, pesticides and mineral oils that would be secured in purpose-built bunded and secure areas, where required.

During construction, there is the potential for impacts from the improper storage and management of waste, resulting in the exposure of the surrounding soil and water environments to contamination from spills and leaks from plant and equipment during standard operations or incidents.

With appropriate and standard construction controls in place as part of the EMS, the risks from these activities would be minimised.

6.3.2 *Acid sulfate soils and acid rock*

Based on the information reviewed as part of the desktop assessment and summarised in *section 5.2.4*, there is a low probability of encountering acid sulfate soils within the contamination study area. Should disturbance of waterlogged areas be required, a preliminary assessment in accordance with the Acid Sulfate Soil Manual (see Figure 3.1) will be undertaken to determine whether acid sulfate soils are present and if the proposed works are likely to disturb these soils. Management measures will be implemented to minimise the potential disturbance and mobilisation of acid sulfate soils.

6.3.3 *Salinity*

Development of rural land can change the movement of surface and groundwater, resulting changes to the way salts and other minerals interact. When the water table rises close to the surface, it can carry dissolved salts that are typically locked in the soil and rock profile to the surface causing increased soil salinity.

The current hydrogeological environment is not anticipated to be altered significantly by construction of the project. As such, no significant impact on soil salinity is anticipated from the project.

Construction within areas where evidence of salting has been identified or is observed during construction will be managed under the EMS and will be carried out in accordance with the NSW Department of Primary Industries (2014) Salinity Training Handbook.

6.3.4 *Soil erosion and sediment transportation*

The highest potential for soil erosion during construction would be associated with the disturbance of soils on existing slopes. Soil types within the construction impact area have a moderate potential for dispersion due to their sodic nature. Off-site transportation of sediments and soils could mobilise contaminated soils (if present) to sensitive receivers which may cause the contamination of surface water bodies.

With appropriate and standard construction controls in place as part of the EMS, the risks associated with sodic soils would be minimised.

7 Assessment of potential operational impacts

This chapter presents an assessment of the potential impacts that are expected to occur as part of operation. These include:

- increased runoff from new impervious surfaces resulting in the mobilisation of underlying salts and migration of contaminants
- accidental spillage of petroleum, chemicals, or other hazardous materials because of leakage or vehicle accident, which could result in contamination of the surrounding environment
- impacts to surface water features and their associated groundwater aquifers.

7.1 Potential impacts from existing potential sources of contamination to the environment and exposure to users

The operation of the project is not expected to result in the exposure of potentially contaminated soil or groundwater to the surrounding environment and other sensitive receivers (e.g., maintenance workers or farmers). Soil disturbance activities during operation would not be part of the general maintenance activities as the infrastructure components would generally be above ground.

An easement will be negotiated with landowners to facilitate worker access for operation and maintenance activities so that potential contamination is not tracked on/off-site.

No groundwater take would be required during the operation of the project.

7.2 Potential impacts to the environment from operational activities

The potential operational impacts to the environment from the project relate to:

- potential contamination of soil, surface water and/or groundwater from hydrocarbons (fuels, diesel, oils), arising from incidents involving vehicle accidents
- leaks and/or spills in the transmission line easement or at the switching stations.

Spill volumes from such incidents (should they occur) are likely to be minor and localised in nature. Notwithstanding, there is still potential for hydrocarbon fuel to migrate off-site. Spill containment facilities (such as bunded containers, designated fill points, and spill kits) will be used on maintenance work sites and switching station sites. Furthermore, an incident response procedure will be developed and implemented during operation to manage the contamination risk from these occurrences.

8 Management

8.1 Environmental management

Potential contamination impacts during construction and operation of the project (in terms of both causing contamination or creating impacts as a result of existing contamination sources) are expected to be limited, and will be further reduced with the implementation of the mitigation measures outlined below (see Table 8.1). These measures will be further developed within the EMS and the soil and water management sub-plan.

The mining sites that overlap with the construction impact area are regulated under the associated EPLs (see Table 5.3) where relevant environmental performance indicators are monitored regularly. Additional monitoring and environmental management actions will be required within the mining areas that would be intersected by the project, primarily targeting areas of planned disturbance during construction and relevant sensitive receivers.

The mitigation measures will be implemented and monitored for their effectiveness during construction.

Operational controls will be managed within an operational environmental management system.

8.2 Mitigation measures

Mitigation measures proposed to avoid or minimise impacts during construction and operation of the project are listed in Table 8.1. These measures will be included in the issue-specific environmental management plans for the Hunter Transmission Project (HTP).

Table 8.1 Mitigation measures

ID	Impact	Identified mitigation measure	Timing	Applicable location(s)
C1	Contamination exposure (human health and/or the environment)	Develop a Contamination Management Plan that: • Includes measures to avoid or minimise disturbance to areas of medium to high risk of contamination where possible • Ensures that prior to construction, areas of medium to high contamination risk are tested to confirm the presence/absence of contaminants of concern • Includes an unexpected finds protocol to manage the discovery of previously unidentified contaminated material (including acid sulfate soils, naturally occurring asbestos and the discovery of high carbon material within mining complexes outside of areas indicated by mine operators where this occurs) Investigation and management of contamination will be carried out in accordance with the relevant legislation, standards and guidelines, including but not limited to the <i>National Environment Protection (Assessment of Contamination) Measure 1999</i>, as amended 2013, and all relevant guidelines made or approved under the <i>NSW Contaminated Land</i>	Detailed design and construction	All locations

ID	Impact	Identified mitigation measure	Timing	Applicable location(s)
		<i>Management Act 1997 and the NSW Protection of the Environment Operations Act 1997.</i>		
C2	Mobilisation of saline soils	Prior to ground disturbance, a visual inspection will be undertaken to identify areas that potentially contain saline soils. Areas where evidence of salting is observed or recorded will be subject to further testing as required. If salinity is confirmed, excavated soils will be managed in accordance with Book 4 Dryland Salinity: Productive use of Saline Land and Water (NSW DECC 2008) to prevent impacts from salinity.	Construction	All locations
C3	Impacts due to spontaneous combustion from disturbance of high carbon material	Disturbance of areas of active (and previously active) surface mining, underground mine access and process routes will be avoided where possible. Where this cannot be avoided, testing of the material(s) will be undertaken to confirm if High Carbon Material would be disturbed and/or exposed. Appropriate safeguards will be implemented to control the risk of spontaneous combustion (in accordance with the Industry and Investment NSW, 2011 'MDG Spontaneous Combustion Management Guideline').	Detailed design, pre-construction and construction	Mount Arthur, HVO, Mount Thorley Warkworth and Bulga Mine Sites (Scenario B Active Surface Mining, Mine Surface Water Infrastructure, Areas intersecting Water Treatment Plants, Tailings Piles)
C4	Contamination exposure to human health and/or the environment	Disturbance to areas of medium to high risk of contamination will be avoided or minimised where practicable during construction. Investigation and management of contamination will be carried out in accordance with the relevant legislation, standards and guidelines, including but not limited to the National Environment Protection (Assessment of Contamination) Measure 1999, as amended 2013, and all relevant guidelines made or approved under the <i>Contaminated Land Management Act 1997</i> and the <i>Protection of the Environment Operations Act 1997</i> .	Detailed design and construction	Areas of medium to high contamination risk
C5	Contamination exposure to human health and/or the environment	Prior to construction, areas subject to disturbance within the Mount Arthur, HVO, Mount Thorley Warkworth and Bulga Coal Mine lease areas will be tested to confirm the presence/absence of contaminants of concern. Interface with existing mine surface and groundwater infrastructure should be avoided to the extent practicable.	Detailed design and pre-construction	Mount Arthur, HVO, Mount Thorley Warkworth and Bulga Coal Mine sites.

ID	Impact	Identified mitigation measure	Timing	Applicable location(s)
C6	Contamination exposure to human health and/or the environment	Additional investigations will be undertaken to confirm the presence/absence of the contaminants of concern prior to commencing ground disturbance within 50 metres of farm structures or farm dams (if applicable).	Detailed design and pre-construction	Ground disturbance within the construction impact area within 50 metres of farm structures or farm dams
C7	Contamination impact to human health and/or the environment	An unexpected finds protocol will be developed and implemented to manage the discovery of previously unidentified contaminated material.	Construction	All locations
C8	Soil and/or water pollution	Construction materials, spoil and waste will be stored/ managed in accordance with applicable EPA requirements to minimise the potential for the project to result in the contamination of soil, groundwater, and/or surface water quality.	Construction	All locations
C9	UXO	UXO will be managed in accordance with Defence Unexploded Ordnance Management Manual (DUXOMM) and in consultation with the Department of Defence. A site-specific risk assessment will be completed in consultation with the Department of Defence for construction impact areas in the Singleton Military Area. The risk assessment will be carried out by a Department of Defence accredited specialist prior to any activities that could interact with UXO, and will include field verification. The risk assessment will identify appropriate mitigation practices and include input from an appropriate UXO specialist. This will include identifying if, and when an explosives engineer is required during site activities. The management actions identified in the risk assessment will be implemented prior to and during all relevant site activities. All personnel conducting intrusive works within an identified UXO area will be provided with appropriate safety and awareness briefing(s) prior to the participating in the intrusive works.	Pre-construction and construction	All locations
C10	Soil and/or water pollution	Incident response procedures will be implemented to avoid and manage accidental spillages of fuels, chemicals or fluids during operation and maintenance activities. Environmental spill kits will be provided at strategic, accessible locations, and staff will be trained in spill	Construction Operation	All locations

ID	Impact	Identified mitigation measure	Timing	Applicable location(s)
		response procedures (as a minimum, spill kits will be located at the tower construction sites and switching stations).		
-	Erosion and sedimentation during construction	Manage erosion and sedimentation through the implementation of Erosion and Sediment Control Plans in accordance with mitigation measure SW1 and SW3.	Detailed design Construction	All locations
-	Soil and/or water pollution from the project	Store chemicals, fuels and other hazardous substances in accordance with Mitigation Measure DG1, DG2, DG3 and DG4	Construction Operation	All locations

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Appendix A

Photographic log



	Photographic Log	
Client Name EnergyCo	Site Location Baywater Power Station	Project No. PS138812



Photo 1. Coal Fire Stacks



Photo 1. Lime softening plant



Photo 3. Multiple dams present on site



Photo 4. IBCs and Drums on-site – unknown contents



Photo 5. Storage of chemicals used in flocculant processes



Photo 6. Fuel tank farm – multiple diesel and water tanks and supporting infrastructure

	Photographic Log	
Client Name EnergyCo	Site Location Mushroom Composters	Project No. PS138812



Photo 1. Roadside – no signs of illegal dumping



Photo 2. Mushroom farm – no access – general farming practices observed



Photo 3. Mushroom farm – no access – general farming practices observed

	Photographic Log	
Client Name EnergyCo	Site Location Mining Lease Areas - Hunter Valley Operation	Project No. PS138812



Photo 1. Historical fire-fighting training ground. Currently used as laydown for un-used equipment



Photo 2. Historical Orica Explosive Laydown. Currently used as laydown. Decommissioned 90,000L diesel USTs



Photo 3. Historical Orica Explosive Laydown. Currently used as laydown for un-used equipment and materials



Photo 4. Historical Orica Explosive Laydown. Currently used as laydown for un-used equipment and materials



Photo 5. Historical Orica Explosive Laydown. Staining noted on ground.



Photo 6. Lake James – used for water storage and under permission discharge to Hunter River

	Photographic Log	
Client Name EnergyCo	Site Location Mining Lease Areas - Hunter Valley Operation	Project No. PS138812



Photo 7. AST Farm and fuel infrastructure



Photo 8. Tailings Dam



Photo 9. Laydown area – supporting flocculant treatment plant immediately opposite



Photo 10. Flocculant treatment plant

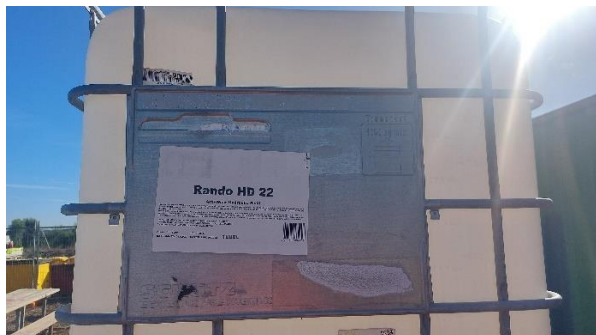


Photo 11. Storage of chemicals used on flocculant treatment plant



Photo 12. Carrington Billabong – monitoring wells present plant

	Photographic Log	
Client Name EnergyCo	Site Location Mt.Thorley Industrial Area	Project No. PS138812



Photo 1. Total Fire – assumed to store minor amounts of firefighting foam



Photo 2. Total Fire – assumed to store minor amounts of firefighting foam



Photo 3. Tyre Fitting Centre – tyres and metal waste observed



Photo 4. Orica fuel depot – above ground storage tanks and fuel infrastructure



Photo 5. Bridgestone mining tyre centre.



Photo 6. Enaex – ASTs, containers, IBCs and drums observed on site

	Photographic Log	
Client Name EnergyCo	Site Location Mt.Thorley Industrial Area	Project No. PS138812



Photo 7. Enaex – ASTs, containers, IBCs and drums observed on site



Photo 8. Enaex – ASTs and fuel infrastructure

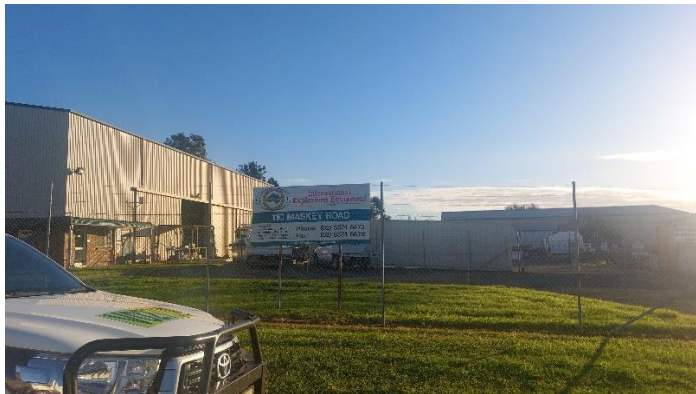


Photo 9. International Explosive Equipment



Photo 10. Samuels Transport – Fuel infrastructure and AST noted adjacent shed



Photo 11. Mallaby Sheet Metal



Photo 12. Monadelphous – engineering company. Mining and mechanical infrastructure across the site

	Photographic Log	
Client Name EnergyCo	Site Location Mining Lease Areas - Bulga Mine Site	Project No. PS138812



Photo 1. Dam – assumed to support the coal handling plant



Photo 2. Rehabilitation Area – composed of waste dirt and rock



Photo 3. Rehabilitation Area – composed of waste dirt and rock



Photo 4. Dam – unknown use.



Photo 5. Diesel fuel – supports pumping station

Appendix B

Investigation locations



Legend

- Study area
- Tower location
- Proposed transmission line
- Existing transmission line
- Road
- Watercourse
- Waterbody
- + Borehole
- + Borehole (with groundwater well installed)
- Large diameter auger
- ▲ Electrical resistivity test



Coordinate system: GDA2020 MGA Zone 56

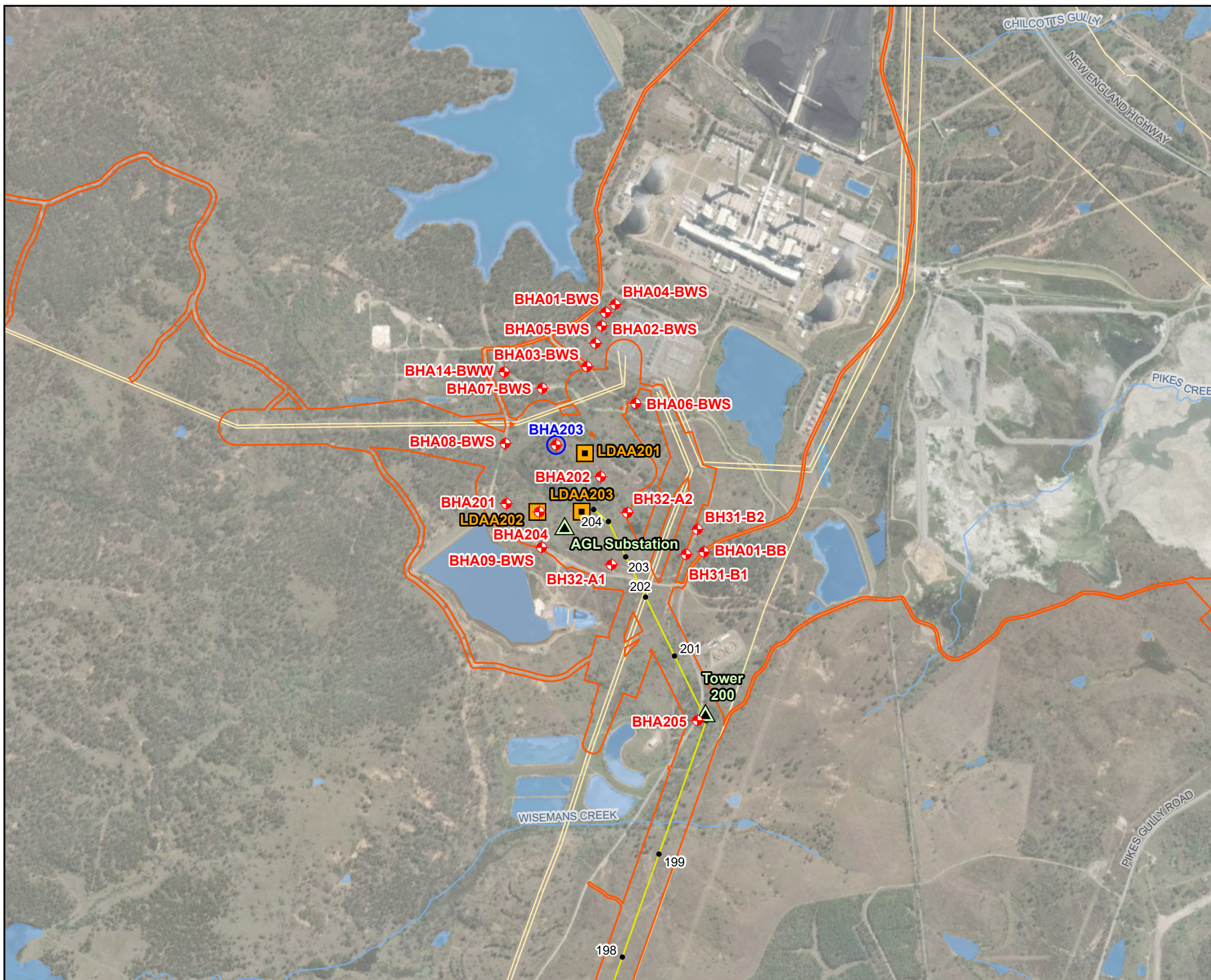
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Data sources: EMM, Geoscience Australia, NSW State Government, WSP
World Imagery: Maxar

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Legend

- Study area
- Tower location
- Proposed transmission line
- Existing transmission line
- Road
- Watercourse
- Waterbody
- Borehole
- Borehole (with groundwater well installed)
- Large diameter auger
- Electrical resistivity test



Coordinate system: GDA2020 MGA Zone 56

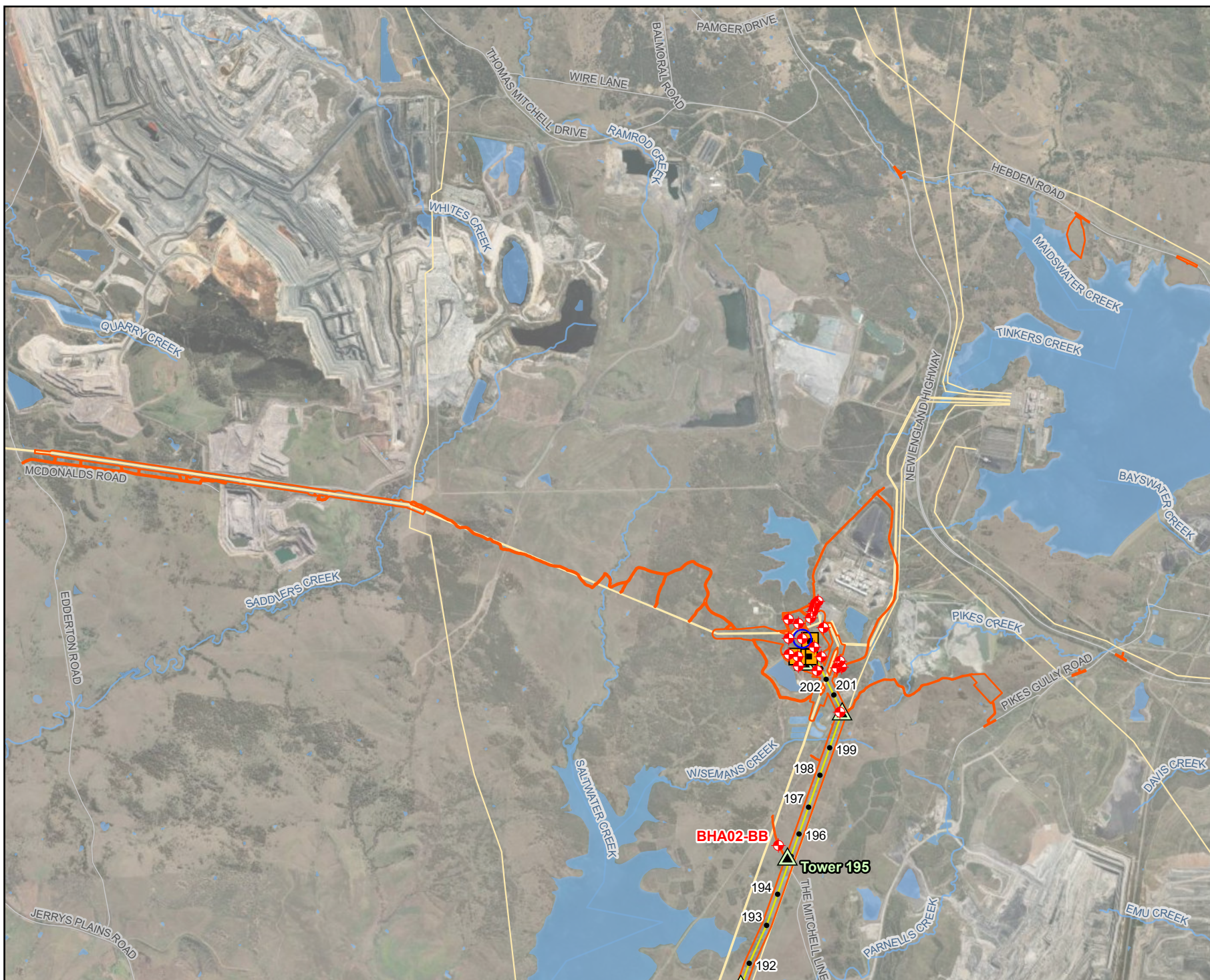
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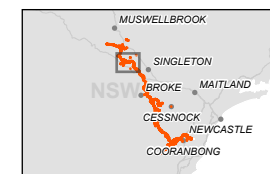
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Legend

- Study area
- Tower location
- Proposed transmission line
- Existing transmission line
- Road
- Watercourse
- Waterbody
- NPWS estate
- + Borehole
- + Borehole (with groundwater well installed)
- ▲ Electrical resistivity test
- ▲ Surface water test



0 1 2
Kilometres



Coordinate system: GDA2020 MGA Zone 56

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Data sources: EMM, Geoscience Australia, NSW State Government, WSP
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Legend

- Study area
- Tower location
- Proposed transmission line
- Existing transmission line
- Road
- Watercourse
- Waterbody
- + Borehole
- + Borehole (with groundwater well installed)
- ▲ Electrical resistivity test
- ▲ Surface water test



Coordinate system: GDA2020 MGA Zone 56

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Legend

- Study area
- Tower location
- Proposed transmission line
- Existing transmission line
- Road
- Watercourse
- Waterbody
- Flora reserve
- State forest
- + Borehole
- + Borehole (with groundwater well installed)
- Large diameter auger
- ▲ Electrical resistivity test
- ▲ Surface water test



0 1 2
Kilometres



Coordinate system: GDA2020 MGA Zone 56

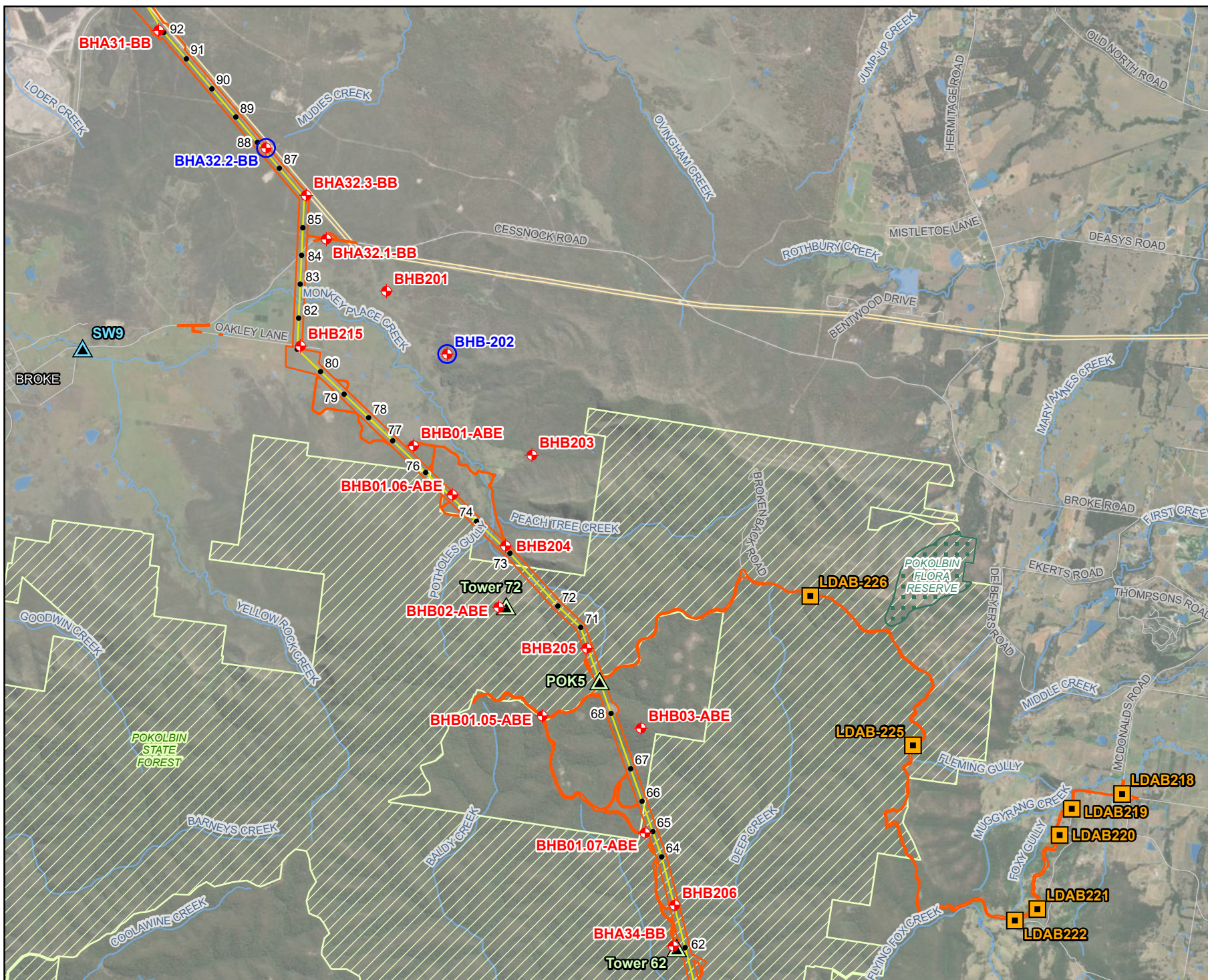
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Legend

- Study area
- Tower location
- Proposed transmission line
- Existing transmission line
- Road
- Watercourse
- Waterbody
- NPWS estate
- Flora reserve
- State forest
- + Borehole
- Large diameter auger
- ▲ Electrical resistivity test
- ▲ Surface water test



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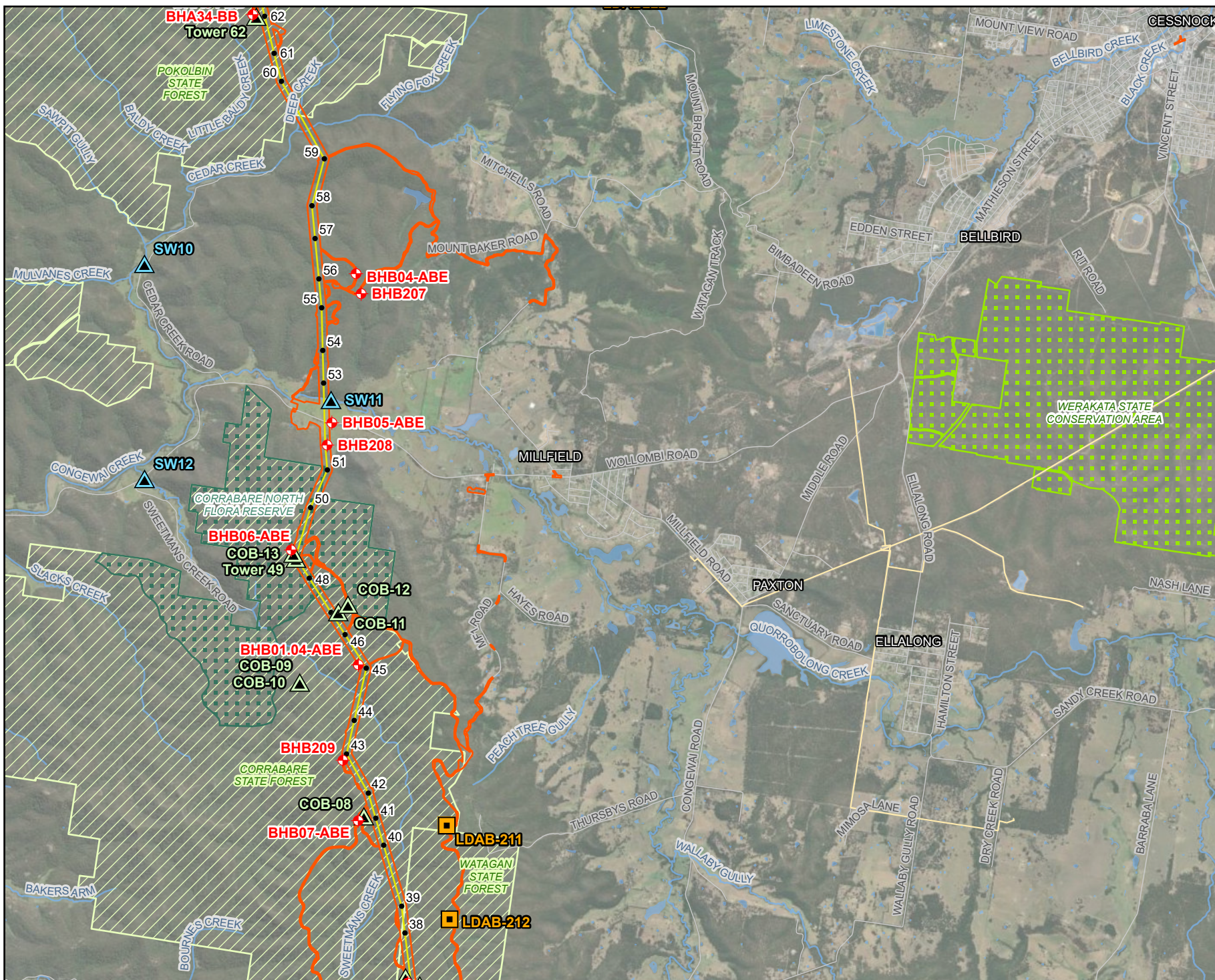
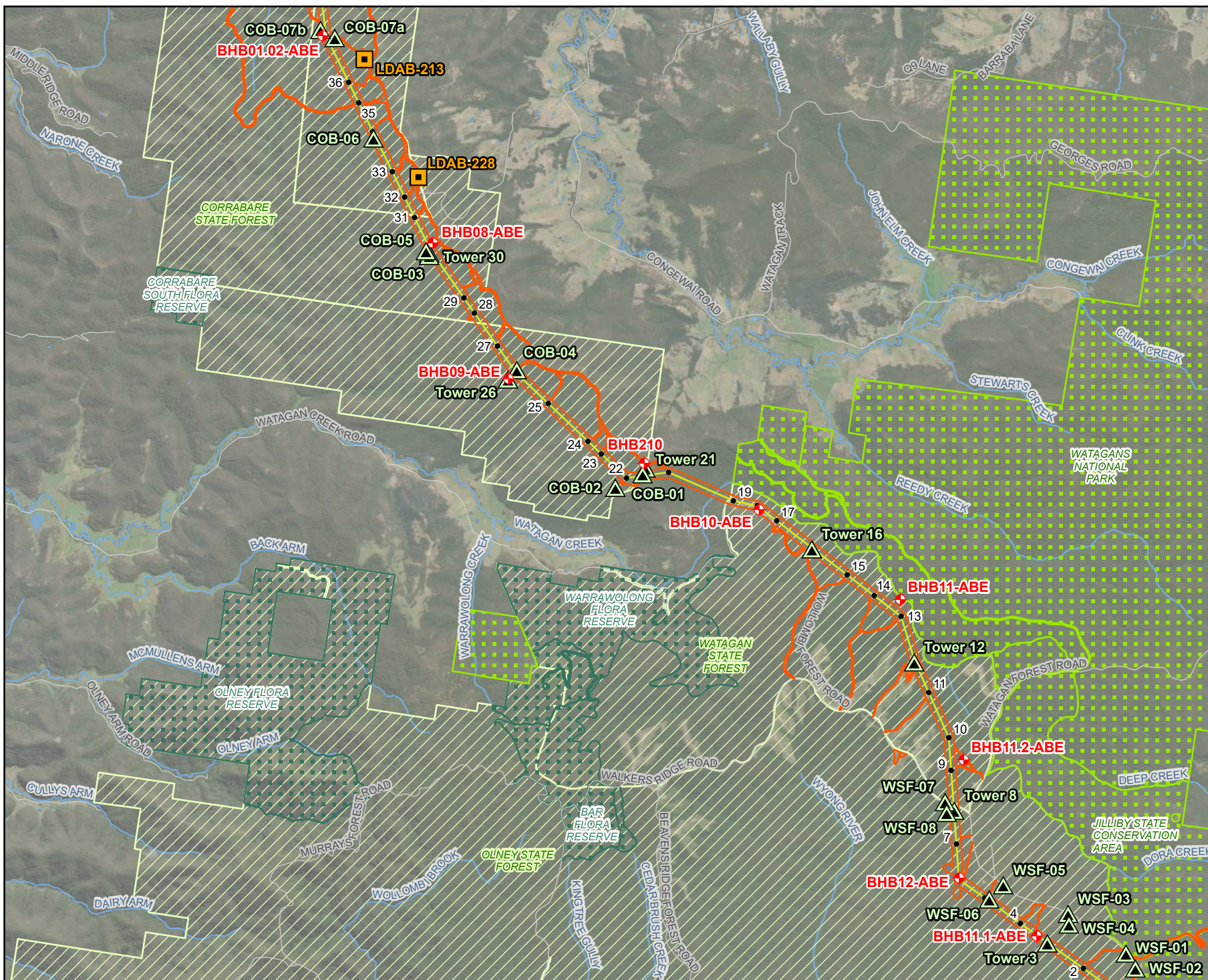


Figure A07
Test location plan
Page 7 of 9



Legend

-  Study area
- Tower location
-  Proposed transmission line
-  Road
-  Watercourse
-  Waterbody
-  NPWS estate
-  Flora reserve
-  State forest
-  Borehole
-  Large diameter auger
-  Electrical resistivity test



Coordinate system: GDA2020 MGA Zone 56

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Figure A07
Test location plan
Page 8 of 9



-  Study area
- Tower location
-  Proposed transmission line
-  Existing transmission line
-  Road
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-  State forest
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-  Large diameter auger
-  Electrical resistivity test
-  Surface water test



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Legend

- Study area
- Existing transmission line
- Road
- Watercourse
- Waterbody
- NPWS estate
- Flora reserve
- State forest
- ◆ Borehole
- ▲ Surface water test



Coordinate system: GDA2020 MGA Zone 56

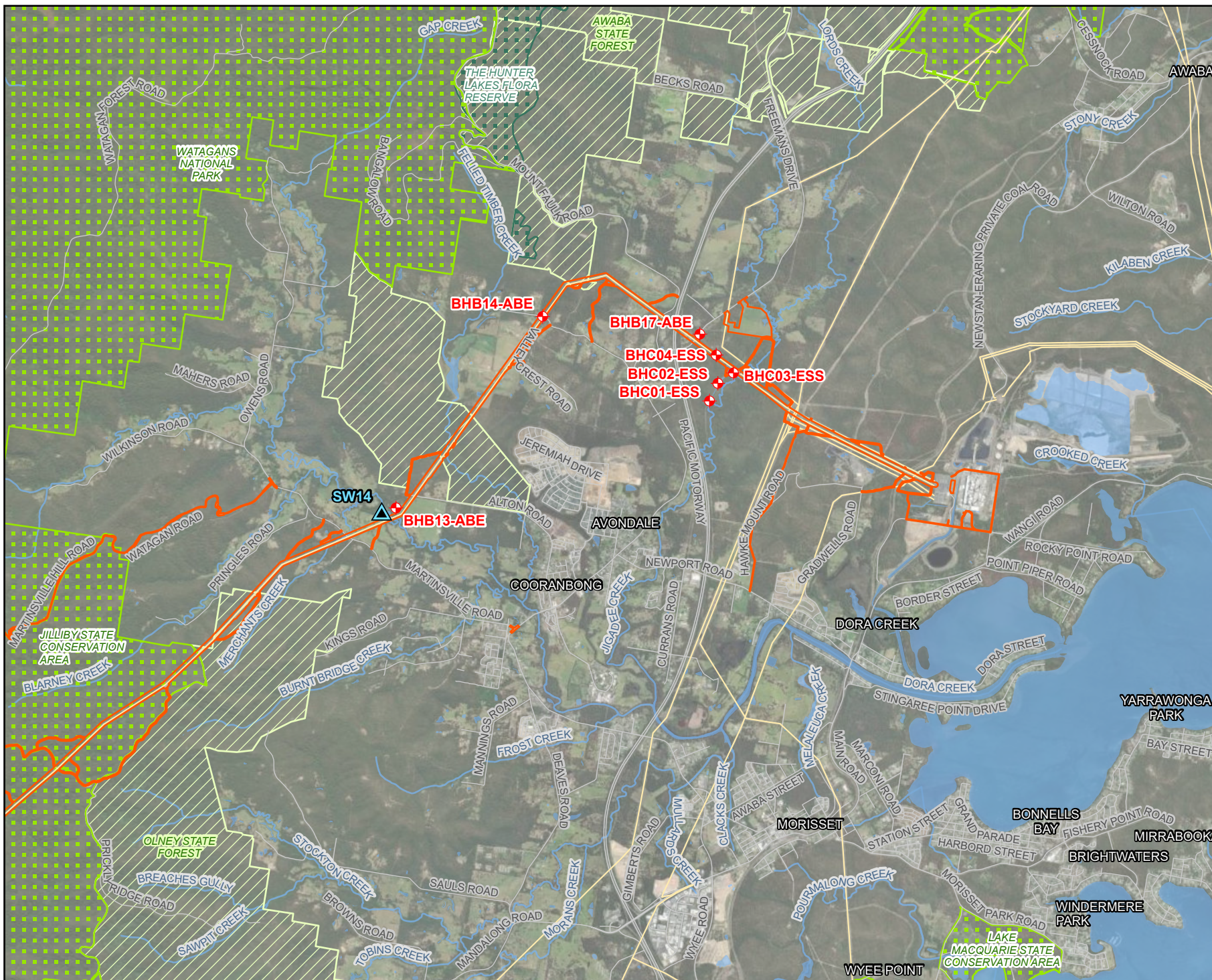
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Appendix C

Unexpected finds procedure



The following document details protocols regarding what must be done if potentially contaminated or hazardous materials are unexpectedly encountered during construction activities.

B1.1 What is an unexpected find and where could it be?

An unexpected find is likely to comprise of any buried material which is not a typical soil material (i.e., fill, soil, rock) or waters which are suspected of being contaminated or Potential Asbestos Containing Materials are encountered during development works. There could be many kinds of unexpected materials that could be encountered during excavation works including (but not limited to):

- buried wastes
- buried containers/drums
- discoloured and odorous soils and groundwater/seepage
- underground tanks
- munitions/unexploded ordnance (UXO)
- asbestos (the management of unexpected asbestos finds is presented as a separate protocol).

These unexpected finds are likely to be associated with poor waste disposal or construction activities.

B1.2 Where is there a risk of encountering an unexpected find?

The higher risk activities for encountering unexpected finds during construction activities are considered to be excavation works.

Higher risk areas for encountering unexpected finds during construction activities are considered to be:

- areas within and immediately adjacent to current or historical refuelling facilities, mechanical and industrial operations, and historical airport operations.

B1.3 What to do if an unexpected find is encountered?

Cease any further excavation or ground disturbance, in the area of the find(s).

The discoverer of the find(s) will notify machinery operators in the immediate vicinity of the find(s) so that work can be temporarily halted; and

The site supervisor and the Principal will be informed of the find(s).

Do not remove or unnecessarily disturb the area of the find(s).

Ensure that the area of the find(s) is adequately marked as a no-go area for machinery or further disturbance and that the potential for accidental impact is avoided.

Note the location and nature of the finds, and report the find to:

- Site Supervisor
- Environmental Consultant.

Where feasible, ensure that any excavation remains open so that the finds can be recorded and verified. Excavation may be backfilled if this is necessary to comply with work safety requirements. An excavation that remains open should only be left unattended if it is safe and adequate protective fencing is installed around it.

Following consultation with the *environmental consultant*, and, where advised, any other relevant stakeholder groups, the significance of the finds should be assessed, and an appropriate management strategy followed. Depending on project resources and the nature of the find(s), this process may require input from external consultants.

Development works in the area of the find(s) may re-commence, if and when outlined by the management strategy, developed in consultation with, and approved by the relevant environmental advisor.

For munitions and UXO, a project representative will need to contact the local police to organise attendance and disposal of munitions/UXO by Defence personnel.

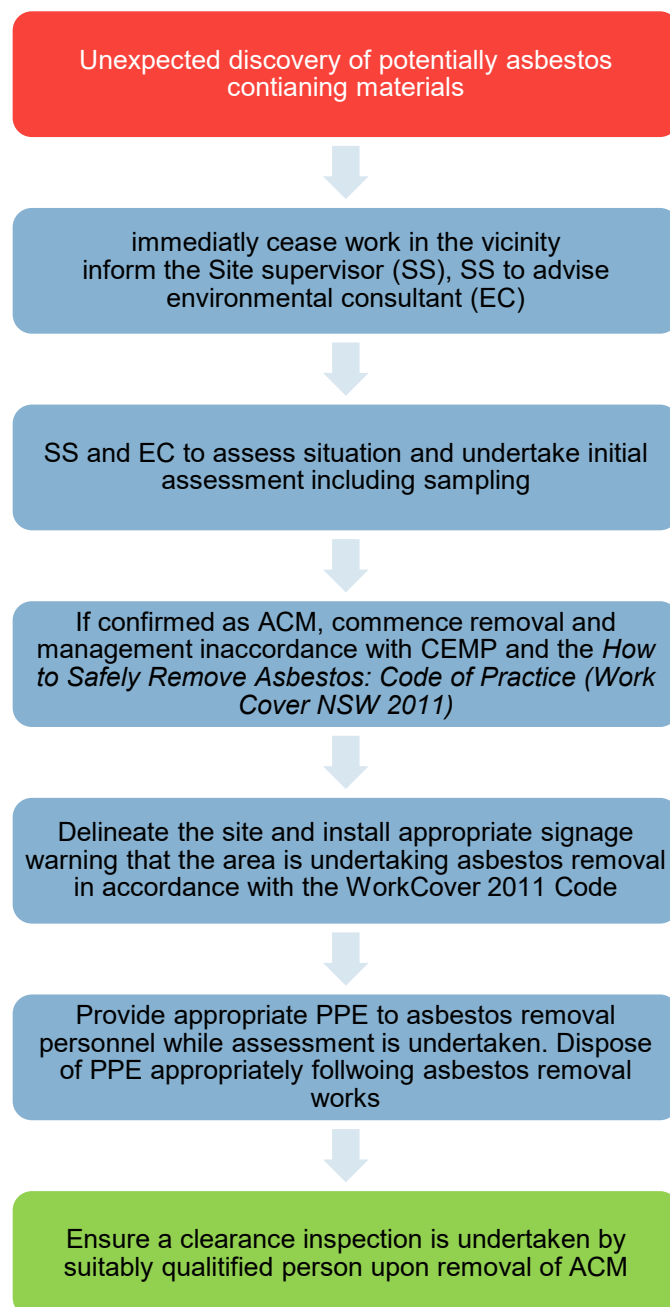
A flow chart demonstrating the requirements for managing unexpected finds is provided below.

B1.4 Legislative, standards and codes of practise

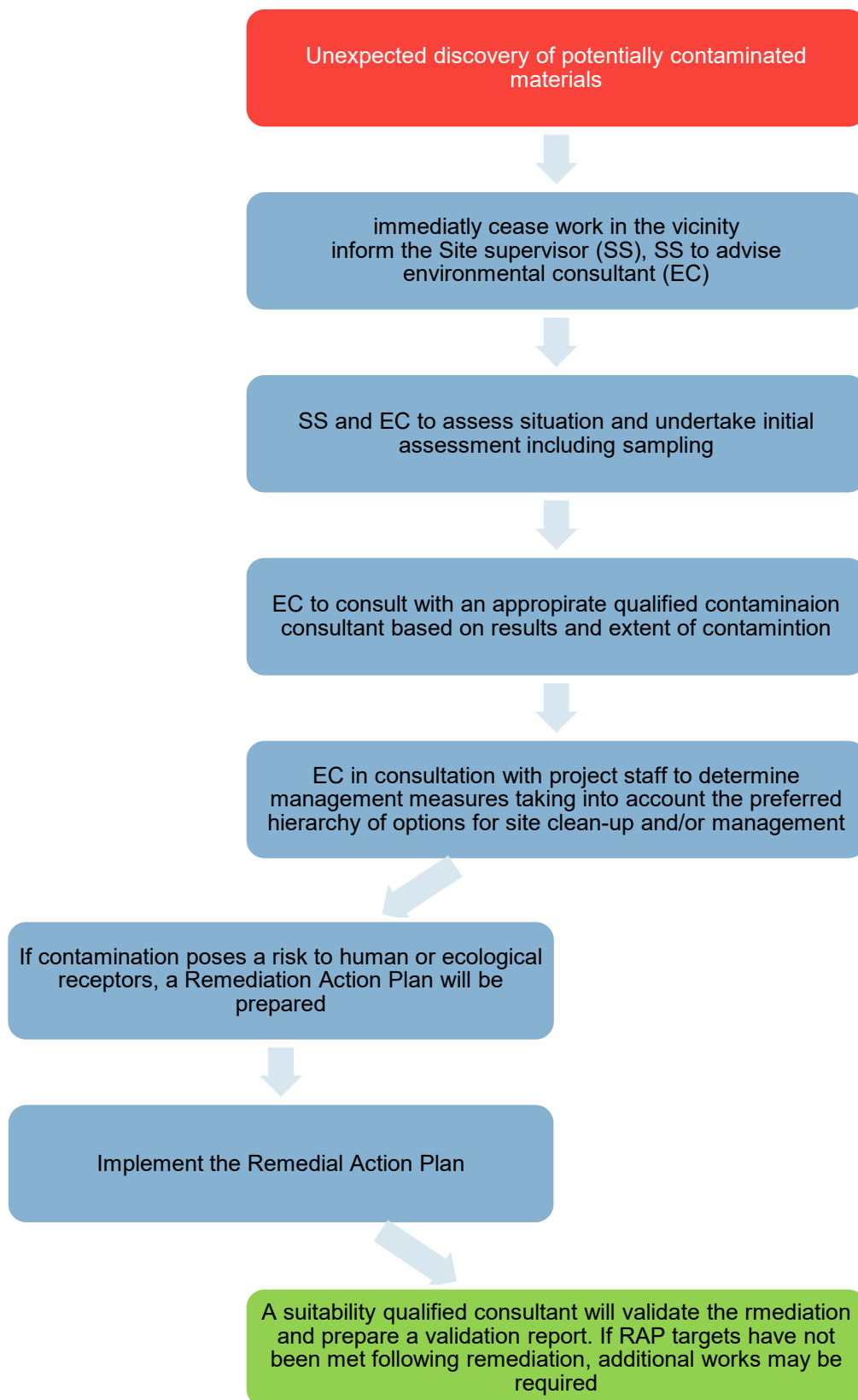
These protocols have been developed to ensure adherence to relevant legislative, standards and codes of practices.

- Occupational Health and Safety Act 2000 and associated regulations
- Contaminated Land Management Act 1997.

B1.5 Potential asbestos containing materials



B1.6 Potential contamination



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